Legislative Assembly of Alberta

The 28th Legislature
First Session

Standing Committee
on
Resource Stewardship

Hydroelectric Energy Production
in Northern Alberta
Stakeholder Presentations

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Standing Committee on Resource Stewardship

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Standing Committee on Resource Stewardship

Participants

10:32 a.m. Thursday, December 13, 2012

[Ms Kennedy-Glans in the chair]

The Chair: Okay, folks. I think we're ready to start here. All right. I thank everybody for coming. I know it's hard. We're out of session, and it's extra effort, and I appreciate that very much. We've got quite a few people today on teleconference. What we'll do is go around the room, introduce the people who are here in physical presence and then the people on teleconference.

You know me, Donna Kennedy-Glans.

Mr. Rowe: Bruce Rowe, MLA for Olds-Didsbury-Three Hills, deputy chair.

Mr. Allen: Mike Allen, Fort McMurray-Wood Buffalo, and I'm here on behalf of Ron Casey today.

Mr. Xiao: David Xiao for Edmonton-McClung.

Mr. Anglin: Joe Anglin, Rimbey-Rocky Mountain House-Sundre.

Mr. Adams: Hi. I'm Ken Adams, senior vice-president of power supply at Manitoba Hydro.

Ms Dean: Hi. Good morning. Shannon Dean, Senior Parliamentary Counsel and director of House services.

Mr. Barnes: Drew Barnes, Cypress-Medicine Hat.

Ms Fenske: Good morning. Jacquie Fenske, MLA, Fort Saskatchewan-Vegreville.

Ms Kubinec: Maureen Kubinec, MLA, Barrhead-Morinville-Westlock.

Dr. Massolin: Good morning. Philip Massolin, manager of research services.

Mr. Cao: Wayne Cao, MLA from Calgary-Fort.

Dr. Brown: Neil Brown. I'm the MLA for Calgary-Mackay-Nose Hill.

Mr. Tyrell: I'm Chris Tyrell, the committee clerk.

The Chair: All right. Wonderful. On conference call if you can pipe up.

Mr. Lemke: Ken Lemke, MLA, Stony Plain. Thank you.

The Chair: Linda Johnson.

Ms L. Johnson: Yes. MLA, Calgary-Glenmore.

The Chair: Rick Fraser. I think he is there. Okay. When Rick comes on, we'll catch him. Maybe he's gone to get a coffee.

Mr. Anderson: Rob Anderson, Airdrie.

The Chair: Wonderful. Thanks very much, folks. We definitely have quorum. That's wonderful.

Pearl Calahasen just walked in. Welcome, Pearl.

Ms Calahasen: Hello. Lesser Slave Lake.

The Chair: All right. Well, let's go through the agenda quickly. You've got the agenda in front of you. Can I have a motion to approve the agenda for this meeting, December 13?

Mr. Xiao: Yeah.

The Chair: Thank you, David Xiao. All in favour? Any objections? Motion passed.

Okay. Now we can take a look at the meeting minutes from our last meeting, chaired by our vice-chair here. I've heard it was quite wonderful. If everybody has had a chance to look at those meeting minutes and if they're comfortable with those, could somebody move that we adopt them as circulated?

Mr. Xiao: I move again.

The Chair: Mr. Anglin beat you to it. All in favour? Any opposed? Motion carried.

That means we can get into the meat of why we're here. Again, Mr. Adams, thank you very, very much for making your way here to Alberta from Manitoba. We have from now until noon to be able to hear from Mr. Adams and then to ask questions. I think you are familiar with the process, Mr. Adams, but if you make a presentation, I think we're talking about 15 minutes. Mr. Adams did provide presentation materials to all of us in advance, so if anybody doesn't have those, just put their hand up so that our clerk can provide a copy. Then we will have rounds of questions from all of the caucuses, starting with the Wildrose caucus, five minutes of question and answer, then the PC caucus. The Liberal caucus and the NDP caucus are not represented at this moment although Deron Bilous did indicate this morning he would be here, so I fully expect they will show up and will have questions.

Mr. Adams, as you are aware, everything is recorded in *Hansard.* With that, I will turn it over to you to present to us. Thank you.

Manitoba Hydro

Mr. Adams: Okay. Thank you, Madam Chair. I'm here representing a utility, and as such I will give you the perspective of a developer-operator of hydro plants in northern Manitoba. I do not represent the government, but as a Crown-owned utility, clearly, a lot of what we do is pretty well governed by what the government wants us to do. I appreciate that you have a different regime here in Alberta, but I think a lot of what I say is transferable, probably with some modifications to suit the specific location.

The other thing I think you'll find is that much of what I say is going to be support for some of the evidence that you've heard before from previous presenters, even the Environmental Law Centre. Our experience is very similar to some of theirs.

As I said, I am senior vice-president of Manitoba Hydro. Just so there's no misunderstanding regarding any conflicts of interest, we do sell a very, very small amount of electricity into Alberta, not very much because we've got to come through Saskatchewan. I'm also chairman of the board of Teshmont Consultants, which has an office in Calgary and does a lot of transmission design and planning work in Alberta. I will be happy to share business cards with anybody who wants to pursue it.

As I said, we're a Crown-owned utility. We are the sole supplier of electricity in Manitoba. We're the sole distributor of natural gas. Our annual electricity revenues are in the order of $1.6 billion, of which something close to 16 per cent goes straight into the government coffers. We're not in any way subsidized by the government. In fact, we're a pretty good source of revenue. The main thing we get from the government is that they guarantee our bond issues or our borrowing, which has a significant financial impact for us because we get probably a hundred basis points off

the interest rates we would otherwise have to pay, which is very, very significant in a capital-intensive industry.

10:40

Why hydro in Manitoba? I look out the window, and I see the North Saskatchewan River. That finishes up in Lake Winnipeg, and then there's approximately a 700-foot drop from Lake Winnipeg to Hudson Bay and a huge amount of water. We're at the downstream end of a tremendous catchment area. We have very, very little coal. We have very, very little oil or gas. We have no uranium. We have tons of wind. But as much as a hundred years ago the federal government identified tremendous opportunities for hydro development, particularly in northern Manitoba, so that's where we've tended to move to in the last 50 years.

Now, I haven't been there for 50 years, but I've been there for a large chunk of it, so a lot of what I say is going to be my own personal experience.

A little bit of history. We actually have developed the north in waves. The initial wave was back in the '50s and the '60s, when we developed a couple of relatively small stations in the north. In the '60s and '70s we moved into large hydro development in the lower Nelson River. The '70s was also when we did most of the major waterway modifications. I'll come back to that in a minute. Then we went into hiatus for about 10 years and came back and developed a few more, and then we went into hiatus again for another 10 years. We're now back into the development business.

I tried to break things down. It's a little bit hard to follow this one, but if you look, there's colour coding here. At the bottom of the table you'll see there are four hydro stations which we've colour-coded blue. They're all what we call run-of-the-river plants. I've read some of the transcription, and I do want to make sure we understand the terminology. A run-of-the-river plant still has a dam. It creates a forebay, but what you can't do is modify the flow, so what comes in at the top end has got to go out at the bottom end more or less instantaneously. You can still have a 300-foot head dam, but it's a run-of-the-river plant. You're not modifying the flows any.

The pink, whatever you call that, beigy colour is the major flow-modification projects. If you look at it carefully, they were all done 35 years or in one case up to 50 years ago. A couple of interesting things about that: the Lake Winnipeg regulation project actually kept the lake well within its normal range and, in fact, was primarily driven as a flood control program for the people living right around the perimeter of the lake. Many of these hydro projects around the world tend to be multi-use. You could use the same reservoir for hydro production, for irrigation, for a town's water supply, for navigation purposes, and so forth. It starts to get a little bit complicated.

The other one there that we've coded in white: there was no generation on that, but what that did is that it diverted one river into another. The interesting thing about that is that it's much more economic to develop additional generation in one riverbed than it is to develop two separate riverbeds. Whether or not that would be applicable or doable today, I'm not too sure. That was back in the '70s, and the world was a different place.

I was tempted to put another column on the right-hand side, and it was going to say "environmental and social impact." That tends to be a subjective type of thing, so I'll give it to you in words, but I'm never going to write it down. Generally speaking, where there's a blue, the social and environmental impacts are quite manageable and tend to be relatively insignificant.

Where you divert one river into another, the environmental impacts and, if there are people living around there, the social impacts are going to be huge. Where you modify the flows of a river or you use a reservoir to store water and there's significant fluctuation, then there are fairly significant impacts – well, potentially significant impacts – associated with them as well. Where I say significant storage and moderate flow modifications, that's pretty well code for significant environmental impacts. And not all hydro projects are the same.

Then try to break that history into periods. Going back to the '50s and '60s, I think it would be fair to say that if you're looking at aboriginal consultation and the accommodation that goes with it, there was none, at least from a developer's perspective. We have a letter on file from the government of the day saying: "Don't worry about them. We'll look after them." That's come back to haunt us for the last 50 years. Then as you go through the periods, you get to the point where by the late 1990s and the early 2000s we had come to the conclusion that unless we were able to accommodate the aboriginal interests and get them to support the projects, them being the people living in the immediate area, we weren't going to build anything more.

What that has morphed into is full-blown partnerships with the local aboriginal people. Frankly, I'm not too sure that we'll use identical partnership forms going forward, but I can't imagine us going forward without some sort of arrangement where the overall objective is that the local aboriginal communities are better off with the project than they would have been without. Again, that can be a little bit subjective, but we want them to think that they're better off with than without.

Similarly, if you look at the environmental impact type of history, back in the '50s and '60s the world was infinite, could absorb all the CO_2 and carbon monoxide and nitrous oxides that we could possibly produce, and nobody cared. Again, as we go through these decades, we have experienced a greater and greater and greater influence and import from the environmental aspects to the point now where we have fish biologists as part of the design teams. We will modify the design of a project quite significantly to accommodate the important environmental impacts. So there's a point when we produce an environmental impact statement where we can say that the environmental impacts are insignificant or have been mitigated.

The regulatory regime – and I'm going to come back to that again in a minute – again, back 50 years ago was very, very technical. A bunch of engineers in our shop and a bunch of engineers in the government sat down and said, "Is this going to work?" "Yup," and we got a licence. As times have evolved, I think the regulatory regime has actually been behind the social and the environmental aspects. It always seems to be playing catch-up, to the point where for the last 10 years it's been incredibly complex. Again, I think the environmental law group who were here a few weeks ago gave you a pretty good feel for that. Our hope going forward is that it becomes somewhat more streamlined. Now, that doesn't mean to say that anybody wants to shortcut the review processes, but I think we do need to make them more efficient.

Again, looking at it from a developer's perspective, we have certain expectations of government, and I have to assume that anybody who wishes to develop hydro projects in Alberta is going to have somewhat similar expectations of you. First and foremost is the whole concept of provincial policy. In Manitoba we actually have four rivers that run roughly southwest to northeast into Hudson Bay. Two of those have been basically dedicated to hydro development. The other two, the Seal River and the Hayes River, are what are called heritage rivers, and by policy nobody is allowed to touch them. I think it's absolutely important that those sorts of policies are laid out clearly by the government before anybody even starts to think about developing a hydro project.

10:50

The other thing that's critically important – and it is certainly for us as a downstream province – is that most of the water that we get originates in northwest Ontario, Minnesota, Alberta, or Saskatchewan, so before I'm going to spend $6 billion on building a hydro project, I want to know what the water regime is going to be. We're okay; we've got the prairie provinces water apportionment agreement. I understand that there's a fair amount of work being done with B.C. and Alberta and the Northwest Territories, but I wouldn't put a shovel in the ground until that was signed, sealed, and delivered.

Section 35 consultations: it's not our responsibility; it's yours. We can help – and we should because we're probably in the best position to explain the impacts and the nature of the project – but the provincial government and the federal government are the ones that are making the resource allocations, and you've got to do that section 35 consultation early and efficiently.

One of the issues that we've experienced both inside our province and with the federal government is that they've put in place this rigorous regulatory regime and then have inadequately resourced it. It's very, very important that the civil service, who really have to do the nitty-gritty work on the applications, have the horsepower and the time and the resources to do their job properly. I'm going to come back to these sorts of things when I start talking about the money later on.

The other one is regulatory processes. If they're at all fuzzy, it makes life very difficult for us. It's particularly important when you've got both provincial and federal jurisdictions relating to the same waterway. Again, the environmental law people spent a fair amount of time discussing that with you. We look to our government, and I suspect it would be the same here. It's important that the provincial government and the federal government harmonize, co-ordinate, and otherwise co-operate in the regulatory process, not to water it down but to make it effective and efficient.

The other one that, I suspect, if I read the terms of reference of this committee properly, is probably not in your beat is that none of us builds a hydro plant in the expectation that we're not going to get paid for the electricity. The commercial environment in which we can sell that electricity, given that we're not going to start selling anything for eight, nine, 10 years, is absolutely critical. Otherwise, we're not going to get funded. See, the feature of a hydro project is that all the cost is upfront.

We just finished building a project at a $1.3 billion capital cost. Our operating cost is probably less than $8 million a year. In the grand scheme of things the operating cost is not very significant, but you can imagine capitalizing and paying the interest on $1.3 billion. Our fixed costs are horrendous, so we've got to be comfortable that we're going to be able to cover those fixed costs.

Looking at it as a developer, the project construction and operation in the north is very challenging. You know, you've got all sorts of things related to distance, climate, ice conditions in the river, and so forth. In my opinion, they're relatively straightforward to deal with. You've got a couple of investor-owned utilities in the province that are very, very capable of dealing with that sort of thing. There are very strong consulting engineering groups that are around that are used to doing it.

I'd say that what's challenging is managing. What is particularly difficult is the development schedule. I always say, a little tongue-in-cheek, that when you get around to construction, that's the easy part. It's not that easy, but compared to the first 10 years, it's relatively easy. It's visible, and it's easy to see. But it's not unusual to spend 10 years in the project development phase. In that period you've got to do an awful lot of work, spend a lot of engineering money, a lot of environmental money, and be prepared to modify the design of the project to accommodate the other issues. It's messy. It's cyclical. You put something on the table; people take shots at it. You go back and do it again and again and again. It's difficult, it's time consuming, but it's absolutely critical so that when you do get to construction, when you're really spending big money, nothing goes wrong.

And we are talking about big money. The top graph is the cumulative expenditure on one of our fairly significant hydro projects. The total in-service cost is going to be in the order of about $6 billion, but you can see that before we get regulatory approval, we will have to have spent something pushing a quarter or a third of that. Now, maybe in part it's a feature of the way we finance these things. All our costs are just capitalized and keep rolling forward, including the interest and so forth.

The other thing you notice is that there's a huge tail on this. If you say that the first in-service date is day zero, we've been working on this project for over 20 years. I think Jacob Irving, when he was here, used the term "patient capital." You'd better believe it. Contrasting that with a combined-cycle gas facility, down below, the expenditure prior to getting the licence is almost insignificant, and the time periods are so much condensed that if I was a private utility, I would be very, very leery about venturing into the hydro world without all sorts of safety net provisions.

Now, in our case we do the same. We are happy to invest in a 1,000-megawatt or a 1,500-megawatt hydro plant, but we won't do it on spec. We will make sure that we've got at least half of the output spoken for by somebody else who's going to pay good money for it for probably the next 25 years before we'll proceed with it. We are fortunate in the position that we're pretty well interconnected into the U.S. and a little bit less so into Ontario and Saskatchewan, so we're able to find utilities who are prepared to guarantee that they're going to buy the energy for a fairly significant period of time. I find it hard to imagine anybody would develop a large hydro plant in northern Alberta without some sort of comparable purchase guarantee. Now, I haven't spoken to them – you know, their business model is their own business – but I've been around the world quite a bit, and most people won't do it on spec.

A couple of final thoughts. Like I said, a power purchase agreement or a power sales agreement, depending on which side of the fence you're on, I think is absolutely critical. It's a little bit like with wind. Wind developers can't get financed unless they've got a power purchase agreement. Hydro developers pretty much throughout the world are the same.

The other one that's absolutely critical is transmission. If anything is the Achilles heel of major hydro developers, it's access to adequate transmission, particularly given the fact that you have good water years and you have bad water years. You've got to have transmission to get the energy out when you've got lots of energy, which means it's going to sit there when you don't have lots of energy. But if you can't get the energy out when you've got lots of it, then your economics go all to pot.

The other thing that we have found is one of these hackneyed terms. We use the term "social licence." We have to have the support of just about all of the stakeholders – you're never going to get all of them, I suppose, but the vast majority of people – because we are messing with a natural resource, and once you develop a river, it's unlikely to go back to nature over the next 200 or 300 years, anyway. It's a once-in-a-lifetime decision, so you've got to have political support, social support, and so on to do it.

The one thing that I will put out: I'm also vice-president of the IHA, the International Hydropower Association, in London. They have developed a very, very solid what they call a sustainability

assessment protocol. It was developed in conjunction with various banks – the World Bank, development banks – various environmental organizations such as the World Wildlife Fund, Oxfam, Transparency International. It's a very, very good process to use to assess where you are in the development program. It's online. It's easy to get. It doesn't cost you anything to go through the preliminary steps. But it does help point out the issues that have got to be addressed in developing a major hydro project on a major river anywhere in the world, particularly in our part of the world.

I'm looking forward to answering your questions.

11:00

The Chair: Mr. Adams, that was profound. You came very, very highly recommended, and it's a gift for us to have access to the experience that you've had.

Before we start with the Wildrose caucus questions, I'm just going to mention that Deron Bilous has joined us. Also, Steve Young is now online.

All right. I will turn it over to your caucus, Mr. Rowe, for five minutes of questions and then the PCs. Dr. Brown has indicated he's got questions.

Mr. Rowe: Go ahead, Drew.

Mr. Barnes: Yeah. Thank you, Bruce. If I could, first of all, about the Manitoba Hydro situation, the lowest retail electricity rates: I understand there's quite a subsidy involved in how that happens. I'm wondering: as this evolved with Manitoba Hydro, how much money did the government of Manitoba have into it? The loan guarantee that you spoke about: it looks like that could cost somewhere in the vicinity of $50 million or $100 million a year. I'd like to hear if there are any other ways to do that besides having the government guarantee a loan.

Mr. Adams: Okay. The government of Manitoba has never invested any cash in Manitoba Hydro. We're a hundred per cent debt financed except for retained earnings, which right now account for about 25 per cent of our equity. There's no subsidy from the province, and I'll come back to the debt guarantee. The subsidy we use is basically from our export earnings. We get roughly a third of our electricity revenue, a little bit less perhaps, 30 per cent of our electricity revenue, at least up until the last two years, selling electricity into the U.S. and Ontario and a very, very small part into Alberta at prices way above our cost of production. So we've been able to use the profits from the export markets to keep rates low in Manitoba. In the long run we don't see that changing.

The debt guarantee provided by the province: we pay them an extra 1 per cent per year on the money that we've borrowed, which amounts to something in the order of about $100 million a year. I mean, I've heard various opinions as to the value of that guarantee, but typically it would be in the order of a quarter to half a per cent. At a 1 per cent guarantee fee I think the province is adequately covered.

Mr. Barnes: A follow-up question, please. The lowest retail electricity rates: how much lower than Alberta's are they? How much lower than the Canadian average are they?

Mr. Adams: Of the Canadian average probably about 25 per cent lower. I'm not too sure. I can't speak to Alberta's specifically.

Mr. Barnes: Thank you.

Mr. Adams: I can tell you that they're half of Ontario's.

The Chair: Your caucus has another couple of minutes if anyone has a question.

Mr. Anderson: I have a question.

The Chair: Rob Anderson. You and Joe will have to decide which one of you goes ahead here.

Mr. Anderson: Well, I'll just take 10 seconds. I don't know. Maybe Joe is asking the same thing. You did mention loan guarantees of some kind. You're saying you're not getting a subsidy from the taxpayer, which is fantastic. I'm just wondering how much the government has had to guarantee from a liability perspective in order to go forward with these projects.

Mr. Adams: I don't have the specific number off the top of my head, but I would say right now probably about $9 billion.

Mr. Anderson: Okay. That would be part of the subsidy. That would have been money that would have had to have – actually, it's got $9 billion in guarantees from the government, but that's the extent of the involvement of the government in your operations.

Mr. Adams: Yes.

Mr. Anderson: Okay.

The Chair: We have about a minute if you'd like.

Mr. Anglin: With regard to power purchase agreements or however you want to refer to it, did the government have any role in guaranteeing the purchase of electricity from Manitoba Hydro so these developments could go forward?

Mr. Adams: No. The power purchase agreements we have are with people outside of the province.

Mr. Anglin: Okay. Last but not least since we've just got a second here, you talked about the provincial-federal regulatory integration. You just barely touched on it. I was wondering if you could expand upon that a little bit.

Mr. Adams: Okay. The federal government comes at it from about four or five different directions, but the two key ones are the Navigable Waters Protection Act and the Fisheries Act and, of course, the Canadian Environmental Assessment Act, which is more of an umbrella type of thing. So there is a regulatory process that's specified in the CEAA. We have to get licences or approvals through the federal government.

The province also has an environmental act, and we also need to get water licences under the Water Power Act. They are two different things, and the processes as they are written in the legislation are not quite comparable, but there is an agreement between the province and the federal government on integrating the processes so we only have to do one environmental review. There is only one set of hearings. The federal government has a representative in Winnipeg who works very closely with their counterpart in the provincial government to try to streamline these processes.

The Chair: Okay. Thank you.

I think we'll turn it over to the PC caucus now. Dr. Brown, you wanted to start for us.

I'd also mention to those on the phone, teleconference, and to other colleagues here that if you have questions after Dr. Brown's, just indicate.

Dr. Brown: Thank you, Chair. Thank you, Mr. Adams, for your presentation. I have a lot of questions here, but I'll try and limit myself to just one or two. Given the fact that you have these long-term contractual commitments for the sale of your electricity and such, can you tell us about your projected surplus given any potential increases in hydroelectric development in Manitoba in the coming decades? Related to that, is there a potential for increased transmission infrastructure to western Canada?

Mr. Adams: We're a monopoly in Manitoba, so the environment is quite a bit different from here. What we try to do is project what our domestic requirements are going to be going forward. Our load forecast will suggest that we need 35,000 gigawatt hours by 2025. The load goes up a little bit each year. It doesn't go up in big chunks. Whereas when you bring a hydro station on, it comes on in big chunks. By definition, once we bring a hydro station on to meet Manitoba load, we're going to have a lot of surplus energy until the load catches up.

The other thing that we can do is that we can move the in-service date forward. That allows us to go to a utility in either the U.S. or in Canada and forward sell electricity for a certain period of time before we think we need to repatriate it for our own purposes. We try to make sure that any surplus is pretty well spoken for. As I said earlier, we won't put in a 1,000-megawatt generating station unless we're satisfied that we've got half of that sold.

11:10

There is a limit to how fast we can develop activities. Two big hydro stations at the same time stretches our resources quite significantly. We have looked at the feasibility of prebuilding hydro plants and selling into Saskatchewan and Alberta on several occasions over the last few years. One of the problems with selling into Alberta is a little bit like bringing coal to Newcastle. It's an energy-rich province. The transmission to get it here is horrendously expensive. My own perspective is that it's going to be very, very hard to justify. To get large amounts of electricity between Alberta and Manitoba or either way – we're talking a minimum 500-kV transmission line for a thousand kilometres – is going to be probably in excess of a billion and a half dollars. To make that sort of investment and then be out of pay for that on the difference in value of energy is going to be very difficult.

Now, with the new federal rules on coal-burning plants – and who knows what they're going to do on gas plants in the future? – that may change, but every time we've looked at it in the past, it's been very difficult to make the case. From a Manitoba Hydro perspective we would just as soon have a variety of customers than have all our eggs in one basket. So we're always looking to diversify a little bit.

The Chair: Thank you.

Ms Calahasen, you had a question?

Ms Calahasen: Yes, I did. Thank you very much for the information. It's really sobering to think about how long an investment possibility will take, especially in the hydro sector.

I'm really interested in the aboriginal consultation accommodation that you have identified. I know things have changed. You know, the landscape has changed. From the '50s to the 2000s you have identified it as real consultation and full consultation. I'm wondering what those two different areas are. As governments I know Manitoba was neck to neck with us when we were dealing with the aboriginal consultation policy.

Mr. Adams: Don't hang me on the specific words, but what I was trying to do is paint a picture of a changing landscape. Back in the '60s I can remember going out with survey crews and painting a line on a rock and saying: this is where the water is going to come to. I'm not too sure I would classify that as consultation, but it was information.

What we've done over the years now is to the point where – if you look at my second slide, you'll see that I'm chairman of the board of two hydro projects: the Keeyask and the Wuskwatim. They're full-blown partnerships with aboriginal partners. So where we started off talking to them about the project, saying, "This is what we think it's going to look like; this is how we're going to deal with it," instead of Teshmont coming out with a mitigation or an adverse effects agreement, we finished up creating a partnership where they've actually got some of their own money in the project. So it's a pretty fundamental change.

Now, that's from our perspective as a developer. Obviously, the federal and provincial governments have their own consultation mechanism because in the end they're the ones who are allocating the resource.

Ms Calahasen: May I . . .

The Chair: I think we'll stop now. Maybe when we get to the next round, Ms Calahasen.

Ms Calahasen: Thank you.

The Chair: The Liberal caucus isn't here, so we'll move to Mr. Bilous for the NDP caucus.

Mr. Bilous: Sure. Thank you. I apologize for being late, and I apologize for having to run out of here in 15 minutes. Thank you very much for coming.

I wanted to just ask a couple of quick questions about the fact that the landscape in Manitoba is quite different from Alberta. I don't mean geographically. I mean the fact that much of our electricity is generated through coal and coal-fired plants. I'm wondering: how competitive do you see hydroelectricity with our current coal-powered plants in Alberta? I understand that many of them are coming to term and coming to the end of their life, so Alberta needs to look to alternative ways of generating electricity. How do you see hydro or hydro stations in northern Alberta either breaking into the market or fitting in with our existing coal-fired plants?

Mr. Adams: I have to preface any answer by saying that I'm not familiar enough with the landscape in Alberta to give you a really competent answer. I think a huge amount depends upon how the regulatory environment unfolds with respect to coal. If carbon sequestration becomes feasible and you can continue to develop coal plants forever, the hydro plants will probably be competitive, but it's a different form of competition. With a coal plant you've still got a fairly significant operating cost. With a hydro plant you really don't. The energy purchase regime has to recognize that it's a fundamentally different type of thing, the same as most places are doing with wind. Most wind projects are take or pay. You know, they're at the bottom of the stack, and they must run. Hydro is a lot more flexible than wind. It can be a must-run plant or it can be a peaking plant, but the regime has got to adapt to it.

We find that we can compete with options in the U.S. Midwest – Minnesota, Wisconsin, Illinois – but they're not sitting on top of a coal pile and, at least to date, they haven't been sitting on top of a lot of gas or fuel oil. We can compete with them. I would suspect that properly designed, properly organized, and well-operated plants in northern Alberta should be able to compete with other

options over the long run. Now, having said that, the first 10 years of a hydro plant are really hard on the balance sheet.

Mr. Bilous: Okay. I apologize for missing part of your presentation. When Manitoba Hydro was first bringing plants online, how did you rectify the books as far as a plant taking roughly 10 years to come online and, obviously, borrowing that kind of money and not getting a return for at least 10 years? What role did the government play, if any, in that?

Mr. Adams: Again, the only role that government plays is to guarantee the debt. We keep all of the construction costs, including the accumulating interest, in a capital account until it comes online. A significant part of our cost is the accumulated interest up to the date of in-service. We try to minimize rate shock for customers although on a couple of occasions it hasn't worked out that way.

Mr. Bilous: Okay. Last question: how has Manitoba Hydro involved aboriginal communities? I don't mean just through consultation. Were there other opportunities or are there opportunities for aboriginal communities to be involved, or does it just end at consultation?

Mr. Adams: No, no. We have many aboriginal communities, something like about 60 separate communities, of which about 15 are fairly significantly involved in our activities. The involvement varies, as I said before, from full-blown partnership in the development of the project to fairly significant construction contracts, which they may have been able to win on a competitive basis, but normally we don't do that. We'll set the contract aside and try to negotiate a deal with them.

11:20

The last part of that, of course, is intended to be capacity building, and the other aspect is direct employment either with us or with the contractors. Something like 45 per cent of my employees in northern Manitoba claim to be aboriginal, and some of them have been around long enough that they're starting to move into the supervisory and management ranks.

We will try to buy goods and services from local communities to the extent we can even if in some cases it represents a premium over what we think the market value would be. Now, again, we're not bidding into a competitive market in Manitoba so that in the end our customers are going to pay for any of those sorts of things.

Mr. Bilous: Thank you.

The Chair: Okay. I think we'll move to the Wildrose caucus for another round here.

Just another note. Rick Fraser is on the line, but he's unable to get off mute. Rick, we're glad that you're listening in and regret that we can't hear from you.

We'll turn it over to the Wildrose caucus again.

Mr. Rowe: I just have a couple of things. Most of my questions have been answered. You state that you have 500,000 domestic electricity customers. My question is – oh, I'll back up a little bit. You've got a total of just under 6,000 megawatts of output, or generation, right now. What percentage of that output would be used by industrial customers?

Mr. Adams: We tend not to think of capacity. We tend to think of energy. The reason for that is that there's a fundamental difference between a hydro system like ours and a thermal system like mostly what you've got. We're not really constrained by capacity. We're constrained by energy. Now, having said that, roughly a third of the energy that we sell in Manitoba is consumed by industrial customers. So that would be a third of two-thirds, whatever that is. Two-ninths of the energy we produce is for industrial customers, a third is exported, and commercial and residential is roughly at two-ninths each again.

Mr. Rowe: That 6,000 megawatts of generation: do you have to develop more, or is that serving your purposes now? I see you have two planned projects.

Mr. Adams: We need new generation in and around 2020 to meet Manitoba load.

Mr. Rowe: Okay. And those two projects that are planned: what are they?

Mr. Adams: Keeyask is scheduled to be in service 2019.

Mr. Rowe: But what's their output?

Mr. Adams: It would be 695 megawatts.

Mr. Rowe: Combined?

Mr. Adams: No. Keeyask will be 695, and Conawapa will be in the order of 1,500.

Mr. Rowe: Oh. Okay. Thank you.

Joe, do you have anything?

Mr. Anglin: Yeah. I've got a couple of questions here, particularly on the issue of aboriginal partnerships. I think this is an important aspect of what we might be dealing with. I'm just curious. In these partnerships that you've undertaken, do the aboriginal partnerships also include the aboriginals being able to market electricity south of the border or to other provinces? In other words, you talked about employment and some of the community, but I'm more interested in: is there some sort of business aspect to these partnerships for their own economic development?

Mr. Adams: Not for the electricity. Under the agreement with the communities Manitoba Hydro buys the electricity, and then Manitoba Hydro markets it.

Now, you can't underestimate the value of having one of your aboriginal partners sitting next to you when you're in a regulatory hearing like this in Minneapolis as part of the marketing team. As I say, we are a monopoly, and nobody else is allowed to sell power in Manitoba. We operate the system as a whole to maximize net revenue as opposed to operating individual plants to maximize benefits from each plant, and that's because you have to use the water over and over again. In some places you might want to store it for later use and so on, so it's a very, very complex operating regime.

Mr. Anglin: Also, does Manitoba Hydro enter into any other partnerships with either private companies or other governments? Where I'm going with this in particular is that we're looking to develop our own hydro potential up north. You mentioned that it's extremely costly for a transmission line of a thousand kilometres or more, but we're still looking at that same kind of distance in many regards. So what's the difference between running a thousand kilometres north, from here to the Slave River area or even the Northwest Territories, versus over to Manitoba Hydro? I was wondering if you could actually come back to your comments on

an east-west grid, particularly from our perspective, where we're looking at a layered, or staged, investment of $60 billion, which is one figure that was thrown out. A $2 billion, $3 billion line is fairly small in comparison. I just threw a lot out at you.

Mr. Adams: Okay. Let's back up a bit. As I said, we've looked at east-west grids on many occasions. We haven't really looked at it in the context of a coal-constrained environment. We're in a position where we've effectively sold out just about everything that we can produce for the next 15 years. We're not in a position to sell any significant additional amounts of power probably until about the late 2020s. Now, that's not to say that we wouldn't be prepared to sit down and discuss it with somebody, but again what we would insist on is something that's outside the current market laws of Alberta because we're going to want a take-or-pay contract for a long period of time.

You're right. A thousand kilometres of line is a thousand kilometres of line. It may be a little bit more expensive across the north but not that much. You know, you've got Saskatchewan in between as well, so that complicates things a little bit.

The Chair: Saskatchewan may not think so.

Mr. Adams: There is a very significant issue for us – and I think it would be the same for somebody developing in the north – and that's the variation between high flow and low flow. We have to design a system to be what we call dependable under very low-flow conditions. You need a huge, great big market to be able to sell the surplus when you've got high-flow conditions. We had the benefit of being able to ship into the U.S. Midwest, which is for all intents and purposes a bottomless pit, whereas there are limitations as to what Alberta can consume. It's pretty tough to get through into B.C. and then get down into the U.S. west coast. So you run into all of these sorts of limitations. It's pretty hard to see us being in a position to develop anything in the time frames that you're looking at.

The Chair: Okay. I think we'll turn it over to the PC caucus again. Ms Kubinec had a question, and then Ms Fenske. Is there anybody online who had a question? Okay.

Ms Kubinec.

Ms Kubinec: Thank you, and thank you for coming, Mr. Adams. This has been fascinating. I'm really learning a lot. I do have a question about transmission. You transmit as well. Is that correct?

Mr. Adams: Yes.

Ms Kubinec: Am I correct that you're looking at building another line from Churchill south? If you could tell me a little bit about that process and the aboriginal consultation in that piece of it.

Mr. Adams: Okay. We have two DC lines, not from Churchill but from Gillam – it's only a hundred kilometres away – down to the Winnipeg area. We're in the process of going through the licensing for a third line, which we came to the conclusion we needed to bring our reliability of delivery up to an adequate standard.

11:30

It's not my area. Our transmission is another business unit within Manitoba Hydro, but I have a pretty good idea of what they're up to. They've had a consultation program going for about the last four years in every community along the way, aboriginal or otherwise. Nobody wants a transmission line in their backyard. I mean, a spade is a spade. They have engaged extensively with the aboriginal communities. I'm not too sure that they're always going to come to an agreement with the aboriginal communities. We do try to avoid areas of significant interest, whether it's historic, cultural, provincial parks, federal issues, but in the end the transmission line has got to go somewhere, so somebody's ox is going to be gored.

The provincial government has also had its own section 35 consultations with the aboriginal communities. There are different perspectives as to what constitutes consultation. At the one extreme you have people who say: well, I've talked to them. And at the other extreme you have people saying that unless you have acceded to all their requests, you haven't consulted. We try to land somewhere in between.

The Chair: Thank you.

Okay. Ms Fenske.

Ms Fenske: Thank you. Thank you very much for being with us today. I want to kind of continue where Mr. Anglin was because I am interested in the opportunity of partnership, and certainly your partnership with First Nations is very different than if it were with a provincial government. Now, your look at the east-west line was, of course, if you were the supplier and you were the transmitter, but if you had a partner in that, though the market isn't that large in Alberta, would that in any way shape the opportunity to provide electricity?

Mr. Adams: Okay. The east-west line: I've always assumed that it would have to be a partnership. With three provinces involved in three quite different electricity regimes, it would have to be a partnership, whether it's a public-private partnership or whether it's a completely publicly owned partnership. I know in Manitoba it could not be privately owned. That's the provincial government policy position.

In the end the partnership per se is going to make money out of it. There's going to be a per-megawatt-hour charge for the transmission simply to pay for it unless the federal government in their good graces decides they think they want to invest in it for some other reason.

So in the end I don't think it's ownership that matters. It doesn't matter whether it's owned by the Alberta government or whether it's owned by TransAlta or TransCanada. It's got to pay for itself. That's been the challenge all along, trying to find enough energy to move on it with a difference in value at each end to justify the carriage cost.

Ms Fenske: The distance.

If Alberta opened up to hydro generation and said, "Yes, we're going that way," would Manitoba Hydro be looking at a potential development? You know, I mean, we've had private companies or Crown corporations that have spun off to private companies, or our municipalities have owned electrical companies, and now they've gone global. Is that ever on Manitoba Hydro's landscape?

Mr. Adams: That would be a policy decision that the board needed to make. I'm not really in a position to comment on behalf of the board, but my advice to the board would be no because we're stretched to handle what we've got on the books ourselves for the next 15 years.

Ms Fenske: Okay. Thank you very much.

The Chair: I promised Mr. Adams we wouldn't ask him that question.

I think given the time we've got – we've got 20 minutes – I would recommend that we do one more round of Wildrose caucus

questions and one more round of PC caucus questions. Mr. Cao has a question. And then we'd get to the general business and just do some work in terms of planning. Is that amenable to everyone? Okay.

So the Wildrose caucus. Rob Anderson? Mr. Barnes?

Mr. Rowe: Mr. Barnes has one, I believe.

The Chair: Mr. Barnes has one?

Mr. Barnes: Yeah. If I could again, please. You'd mentioned earlier a very, very significant margin. You mentioned a project that was $1.3 billion in cost with only $8 million operating cost. I'm wondering about two questions from that. If Manitoba Hydro's financial statements would fall the same way, your billion dollars in revenue would break down to a very, very small percentage of operating costs other than capital payback and depreciation and those kinds of things.

Then my second question to that would be: what is Manitoba Hydro's policy for paying back the capital? Do you do it over 20 years, over 30 years? Do you have a policy on that, please?

Mr. Adams: Yeah. Our fixed costs, which are depreciation and interest charges, account for probably about 65 per cent of our annual operating cost, so the operating cost is probably about 35 per cent, but at the generation end of things the fixed cost is a much higher percentage. We're fully integrated, vertically integrated, so we've got the transmission costs built in there, which, again, is like hydro. It's for high capital, low operating. But as you get closer and closer to the customer, the balance changes. In my business unit our operating costs probably represent about 15 per cent of our total cost because we're very highly capital oriented.

Also, a lot of our capital cost is historic. I've got plants that are 100 years old. They've been completely written off. We've also got some that are 50 years old and haven't been written off. Now, from an accounting perspective we depreciate the plants in various amounts depending on what it is. For the mechanical equipment it's probably about 40 years. For the concrete it's close to a hundred years. So the customers are effectively paying for that plant over the lifetime of the plant.

Actual payback of the loans depends on the nature of the loan. We've got a constant refinance. We don't project finance. Everything we do is balance sheet financing, so there's a constant turnover of old bonds, old loans that need to be paid off and then refinanced.

Mr. Barnes: Do you have any thoughts on what a private company would want paid back on a hydro project in the north?

Mr. Adams: I think it depends on the regulatory regime. I think, quite frankly, you're better off to ask the private companies that, but I think they have less patience than us.

Mr. Barnes: Okay. Thank you.

Mr. Anglin: Just to kind of close out, I guess, our questioning, did Manitoba Hydro incorporate demand-side management programs in its facilitation of electricity?

Mr. Adams: We have the most aggressive demand-side management program of any utility I know of, and we've had it for about 20 years. The reason we do it is twofold. Fundamentally, everything we can save at home and not charge our customers 6 cents for we can sell abroad and get 8 cents for.

11:40

Mr. Anglin: I think you might have just answered my follow-up question. I want to know how this is paying back your system. Well, I guess it would be the one utility.

Mr. Adams: There are two dimensions to it. Demand-side management in the very short term: like I say, any kilowatt hour we don't sell in Manitoba we can sell somewhere else and up until the last few years at a much better price than what we were getting in Manitoba. The second one is that it defers the need for new generation, and new generation invariably is far more expensive than old generation, so the customers benefit from a deferral cost as well. Now, we may then advance the plant anyway and sell it abroad, but it's an economic mechanism. All of our demand-side program management programs to date have been on the basis that they make money for us.

Mr. Anglin: Okay. Thank you.

The Chair: All right. I think we'll turn it back to the PC caucus. I've got Mr. Cao and Mr. Xiao, and if you'll indulge the chair, I have a question, too. And Dr. Brown.

Mr. Cao: Thank you, Mr. Ken Adams. You're an excellent voice for me to learn about the hydro side of business in Manitoba. Just before I go on, my first winter in Canada from California was in Manitoba, Winnipeg, so I'm used to it.

Mr. Adams: So this is a vacation.

Mr. Cao: My question is: with the investment at the beginning so big, when you in your business look around the world, is there any private company that, you know, sunk their money for 10 years before they could get anything out of it?

Mr. Adams: They do, usually with some sort of franchise or concession arrangement. For example, in Brazil most of the big new hydro plants are being financed, designed, built by private companies. But they have a couple of things there. In Brazil the government has tended to do a lot of the very early engineering and environmental work, so the companies don't come in till somewhat later in the game. Then they have a power purchase agreement that goes forward in many cases for the life of the plant. A lot of the World Bank financed projects are being done by private companies but, again, with a power purchase or a power sales agreement in place and some sort of licence arrangement, particularly in Third World countries where they don't have the capacity themselves to do it.

But, yeah, I would say that the vast majority of hydro development throughout the world has been by private companies, but there's usually a government backstopping it in some way. It may even be a third-party government through the World Bank or through the Asian Development Bank or something like that.

Mr. Cao: May I have a short one, a small one supplementary to this?

The Chair: Absolutely.

Mr. Cao: You showed us that in the '60s you had things going very fast and doing well and done, and now you have a lot of long-time consultation that makes it even longer. From that kind of timeline or perspective, do you feel that things are better? Is it just because of more people getting involved, so it takes a long time, and that's all? I'm just thinking about the plants: you said a

hundred years ago and 50 years ago and so on, you know, and now the result of it.

Mr. Adams: My personal opinion is that I think we do build better plants these days. We are far more sensitive to the impacts, both social and environmental, and we modify the plants and the processes to accommodate them. It does take longer, and from that perspective it's not better. But a modern hydro plant is going to be there for 200 or 300 years. It's not going to fall down. If you look at the life cycle, spending an extra five years at the front is probably not a bad thing.

Mr. Cao: Thank you.

The Chair: Mr. Xiao gave up his space to me, so I'm grateful for that. Thank you.

I have a question for you about the choices that we could make in Alberta about where to start with hydroelectricity. You mentioned that now you have many, many hydroelectric dams in Manitoba, so it's a different question, but we've not done this before in a significant way. How would you recommend that we look at the policy question of how to do this efficiently in northern Alberta?

Mr. Adams: I'm reluctant to make a recommendation because I really don't know enough about northern Alberta or the state of the work that has been done. I know that there have been some preliminary evaluations done, maybe more than preliminary – I don't know – of the three rivers in the north by ATCO and TransCanada and various consultants. I think a good place to start is a natural resource development policy. Fundamentally, are you as a province willing to, quote, sacrifice these rivers to hydro development? As I said before, once you develop a river for hydro, it is going to be different. It's not natural anymore, more or less forever. At least in our lifetimes it's forever.

It seems to me that the government of Alberta is responsible for policy for use of the natural resources and land allocations and things. That's why I welcome the opportunity to talk here. I think for this committee if there's one really good thing it could come out with, it's a policy for hydro development in principle. Then turn it over to the engineering people, the environmental people and look at the options. Hydro works much better when you've got storage water associated with it. It makes the economics more useful. It makes the project itself more useful because you can adjust the production to meet demand. But storage creates environmental issues, so I think what you need are some qualified people to look at the options and not in huge detail. I don't think you need the huge detail at this point. Then come back and say: "This is the way we want to develop these rivers," or "We don't want to develop these rivers," or "We want to do this one but not that one."

The other thing I think I'd come back to is to make sure that you've got the upstream provinces – well, B.C. I guess is the only upstream one – and the downstream ones onboard with you. Otherwise, you're going to be tied up forever in arguing about the fundamental management of the resource.

The Chair: If everyone is comfortable, we'll have one more question from Dr. Brown.

Dr. Brown: Mr. Adams, you mentioned earlier the federal environmental standards for coal-fired plants. Basically, what they're saying is that any new coal-fired plants are going to have to conform to the standards of a gas-fired plant, which means, essentially, that carbon sequestration has to be part of the process in a practical sense. Gas is very abundant now with tight gas coming on and coal-bed gas and shale gas, and the price looks like it's going to be depressed for decades to come. As you probably know, Alberta has a $15-a-tonne carbon tax on any large CO_2 users, industrial users. Have you given any thought to the idea of what that would mean in terms of, you know, future policy, in terms of the competitiveness of hydroelectric? In other words, what would the carbon tax have to be in order to swing that pendulum away from the cheap gas to a nonemitting source like hydroelectric?

11:50

Mr. Adams: I've heard varying opinions on that one, but probably a carbon tax in the order of about $30. Now, a lot depends on the base price of the natural gas. If it's going to stay down at – what is it now? – $3.85, it's going to be tough for anything to compete with it. Most of the information that I've received suggests that it's not going to stay at $3.85, but it's certainly not going to go back up to $13.

Dr. Brown: I know. It's a tough question.

The Chair: Well, there's much to talk about, and I certainly hope we continue to stay engaged. We're grateful that you're following the deliberations of this committee. If you ever have thoughts, we're always open to your thoughts.

I'm going to now suggest, if you will allow me, that we just finish up some general business and then have a lunch break.

Ms Calahasen: Thank you very much.

The Chair: Yes. Thank you.

Just to recap where we are because we won't be together again until probably February – I got the marching orders very clearly about January – as an update Mr. Prentice is not able to join our committee in the time frame that we have. We have to be concluded by March, so we've decided to remove the possibility of having Mr. Prentice and Shawn Atleo present.

The working group, the representatives of the various caucuses, has met with the LAO personnel to kind of work through a schedule for February. I wanted to share some of that with you. Also, Mr. Tyrell put in front of you a proposed meeting schedule for January and February. If you don't have one, just put your hand up, and we'll get one to you.

What we're looking at is that ATCO had indicated that they would share with our working group, so representatives of all caucuses, their visuals. They've taken a lot of imagery of the site that they're looking at, and they would share those with us. I'm proposing and we've discussed the possibility of meeting at the Calgary-Varsity constituency office in Calgary, just representatives of the four caucuses, to look at that material with ATCO, and we will share that with the full committee. So I just want to report on that

The second thing I want to table is that TransAlta had offered to give us a tour of some of their run-of-river facilities on the Bow River. What we are looking at is February 1. The LAO would organize a bus for all of us, whoever can go, to do a visit into the Kananaskis facility and the Bearspaw facility, so all near Calgary, probably broken up by a lunch. We would invite somebody from TransAlta and others with knowledge of those facilities to give us some technical backing explanation.

I guess my question to you is, first of all: who is interested in participating in that on February 1? Does anybody have any questions? If we could make a motion on that, that would be wonderful.

Ms Calahasen: Does it have to be February 1? It's just that the ag societies are coming in on February 1, so I'm just wondering if that's the best day for everybody.

Dr. Brown: I'm not available.

The Chair: Dr. Brown is saying that he's not available that day.

Mr. Tyrell, there are other options available? We're just trying to get it in before session starts to sit again. That's what our goal was. And not in January. I heard that somewhere.

Mr. Tyrell: Nothing has actually been scheduled yet. They offered to do it in early February. I threw that out as a possible date, but if there's a date that works better for more committee members, we can always . . .

Ms Calahasen: That following week is good for me. I don't know about the rest, though.

Mr. Xiao: The question is: when will we be back in the House?

Ms Calahasen: Probably in the middle of February, I would think. I don't know.

The Chair: Because we don't have a sense of timing here, why don't we make a motion that

> the Standing Committee on Resource Stewardship approve an educational tour for members of the committee to visit two dam sites currently operated by TransAlta in the Calgary area in early February.

Dates to be confirmed and organized by our secretary, who probably doesn't like doing that. Maybe just the best dates available.

Dr. Brown: Circulate some dates, and then ask whether people are available, and take the one that's the best for most people.

The Chair: Would you like to make that motion, then, Dr. Brown?

Dr. Brown: I don't think we need a motion. No. Just do it.

The Chair: We actually do need a motion.

Mr. Xiao: Yeah, I'll move that.

The Chair: Okay. Thank you, Mr. Xiao.

All in favour? Any objections? The motion is carried. Thank you, Mr. Tyrell, for that.

In the same vein as scheduling, the other groups that are really critical – and we've been deferring them not because they're not the most important group but because we just wanted to get the technical information and the fiscal information first – are the First Nations and Métis stakeholders. Mr. Tyrell has been in touch, and I will actually ask him to give an update directly on this. But we're looking at bringing in Treaty 8 First Nations and Métis representatives.

Mr. Tyrell, maybe you can just give us an update on that.

Mr. Tyrell: Sure. I have put in calls to Treaty 8 First Nations of Alberta as well as the Métis Nation of Alberta and the Métis Settlements General Council. So far I've heard back from Treaty 8. They are interested in participating in February, so it's just a matter of picking dates, which I assume we'll do here today.

The other two I've left voice mail messages for, so I hope to hear back from them the end of this week or early next week.

The Chair: The concept would be to have a panel with representatives from the First Nations and Métis communities. One of the ideas that we were discussing this morning in our working group and have been discussing with LAO for logistics is trying to organize ourselves so that we have one day like we have today, where we have a half day dedicated to a First Nations and Métis panel and the other half of the day scheduled for the economics groups.

Again, Dr. Massolin has been in contact with the economics groups. Maybe if you can just give us a quick update on who is able to present there.

Dr. Massolin: Sure, Madam Chair. As listed here on the schedule that's been provided to you, there are two academics who have expressed an interest and availability to present to the committee, Dr. Feehan and Dr. Bernard, both of whom, as I have explained previously, are experts in electricity economics and would be happy to present and answer questions.

The Chair: So if everyone is comfortable, we were looking at the dates of February 4 or 5 for full-day meetings. Does that seem comfortable for everybody? Okay. What we'll do again is to have Mr. Tyrell reach out and do that as part of a request. I think it will probably be the 4th or the 5th.

The other suggestion – and this is a broader discussion. We have a responsibility to do estimates as well. That process is being worked on right now, what that will look like. It depends on when the 2013-14 budget is presented. Then our committee and the other two standing committees will have responsibilities yet to be fully fleshed out. That will be intense work when that happens. If that happens in February, which is traditionally when it happens, we won't have a lot of time for this committee to be meeting.

One of the discussions this morning was that in order to give Dr. Massolin, who is going to write our reports, some sense of a road map of where we would like this to go, one of the ideas would be to have a full-day meeting like we're having now, followed by a half-day meeting to talk about the design of the report: the road map, the things we want to address, how we would like Dr. Massolin to approach this so that he can get started on it. How do you feel about that? How does that feel?

12:00

Ms Calahasen: I think it would be really fruitful for us to be able to do that because I think that's the kind of information so that when we're talking about all of the presenters and all of the information we've received, then we can go back and see if there's anything that we have missed. In that way, we can fill in the information and request the information to be able to deal with that. I don't know if that gives Dr. Massolin any kind of comfort. I think it would be really important for us to have something to go on, at least a road map of some sort.

The Chair: All right.

Mr. Barnes: I, too, would agree with that. A day and a half seemed a bit long, but I think it's a worthwhile exercise to do that so we all have some input into where it's headed.

The Chair: Mr. Barnes, I agree with you. We were thinking about consolidating it all into one day and evening, but the concern is that you have an opportunity to digest. That's a lot of absorbing. The road mapping is something that you may want to reflect on a little bit and then come back to the discussion group with ideas.

Mr. Barnes: Yeah. Possibly.

The Chair: Any other thoughts on that?

Ms Calahasen: I think we can do that. We can arrange for that, and then we can determine. You know, it doesn't mean that it's written in blood.

The Chair: Okay. Well, why don't we put circles, then, around February 4 and 5?

Also, Mr. Tyrell will come up with some dates for the educational tour, a site visit in Calgary. Is it Chinese New Year's? When is that, Mr. Xiao?

Mr. Xiao: I've got too many events. I can't even remember.

The Chair: All right. Well, thank you.

Then we will adjourn for lunch and be back here at 1 o'clock sharp for the environmental panel.

Thank you.

[The committee adjourned from 12:02 p.m. to 1 p.m.]

The Chair: All right, folks. I think we'll start the afternoon session. I think that online there is one person, Rick Fraser, who may still be on mute. Rick, we're happy you're still there. Thank you.

I'd also like to introduce to our group here two people presenting: Dr. Bill Donahue, who is with Water Matters, and Jason Switzer, with the Pembina Institute. We are absolutely delighted that you would have made the trek from Edmonton and Calgary to be here with us.

We were also going to have Dr. Rob Powell from World Wildlife Fund Canada, but he, for personal reasons, wasn't able to attend, so we regret that.

You're a very exciting panel. We're really looking forward to diving into the environmental side of these questions this afternoon. As we discussed and you discussed with Chris Tyrell: 10 minutes each for presentation. We have a format for questioning that's based on individual caucuses, so five minutes from the Wildrose caucus, five minutes from the PC caucus, five minutes from the NDP caucus. We don't have anybody from the Liberal caucus here right at this moment. We're just going to cycle through questions and answers, but we'll do back-to-back presentations.

Dr. Donahue, we'll start with yours if that's okay.

Dr. Donahue: Actually, I think Jason is going first.

The Chair: Oh, you've already decided. That's wonderful.

We'll start with the Pembina Institute. Thank you.

Pembina Institute
Water Matters Society of Alberta

Mr. Switzer: Thanks very much, Donna. Thank you, all, for giving me this opportunity to address the Legislature. I'd like to maybe start with a brief personal comment on large hydroelectric development, which is where my expertise has been.

In 2000 I was about the same distance as I am from your chair here today from Nelson Mandela. President Mandela was launching the report for the World Commission on Dams. I had been a member of the secretariat for the dams commission, which was a global review of the role of large dams in development. At that point, the environmental organizations, the environmental community, the World Bank, the large dam-building nations, and dam construction groups had reached a kind of loggerheads and had realized that the only way there was going to be a rational outcome in which some dams could proceed, where clear development benefits were there and where the environmental issues could be managed, would be through some sort of coming together and resolution of the major questions that were outstanding. Under what conditions do large dams make sense? Under what conditions do they contribute to a broader, more sustainable development? How to ensure that the local rights are respected in the process of decision-making and, in particular, that those who bear the risks and the harms associated with development have a share in the benefits and a say in the decision-making around it.

I'll come back to the World Commission on Dams, but I'd just like to say that this whole question is incredibly important, so I'm very glad that our government and you have all taken the opportunity to focus on this big question.

The Pembina Institute is a sustainable energy solutions think tank. We view ourselves as one of Canada's leading voices on energy and environmental questions. Through a mix of research, public policy, advocacy, and consulting work, working with government and industry, we believe that we help to promote the transition to a clean-energy economy. We have offices across the country, about 50 staff, and work in a range of areas spanning climate change, energy policy through renewable energy and energy efficiency, and, of course, oil sands and unconventional oil and gas development.

A brief overview of what I'd like to talk about, very quickly: what role hydro could play in the Alberta grid mix; the imperative for action from a greenhouse gas perspective; comparison on an environmental basis and an economic one, of course, versus the alternatives; the key social licence challenges; and then a summary and some suggestions.

You've heard from a number of presenters that Alberta has tremendous untapped hydroelectricity potential, 12,000 megawatts of untapped potential. Really quite extraordinary when you think about that. That's a world-scale resource equivalent to our existing coal capacity today. Of course, not all of this would ever be developed, even in the most optimistic of scenarios for hydro, but it gives some sense of the scale of our resource and what that could mean.

Of course, this slide, which you may have seen as well, represents the challenge, looking forward, that the AESO projects that in the long term we're going to need to replace about 12,000 megawatts of capacity. How we're going to get there is uncertain, so between the retirements and the predicted load growth there's a lot of ground to make up. Neglected in there, of course, is the role of efficiency and demand-side management. It's a lot cheaper to save energy than to build new generation, so as a good environmental advocate I'd be remiss if I didn't mention that efficiency is a lot cheaper than many of the alternatives and is actually revenue positive in most instances.

The greenhouse gas comparative. Here you see an unhappy story. Alberta has the most greenhouse gas-intensive grid in Canada. You can see relative to the Canadian average on the far left there that we're considerably higher. In fact, the real challenge, if you look over to the right, is that – B.C., Quebec, and I'll leave out the maritime states for the moment, as well as Newfoundland – the lowest carbon grid intensity in Canada, of course, has been driven largely by hydro and to a certain extent as well by nuclear. The question really is: how do you get from where we are to where we'd like to be in the future, and what are the steps that you can take to get us there?

There are a number of options for greenhouse gas reduction, nuclear being one, but of course social licence challenges in the development of nuclear have been very challenging. CCS, carbon capture and storage, is very slow to materialize. We're fortunate in that we have one, possibly two projects moving forward in Alberta, another in Saskatchewan; others are much slower to come on stream. In the U.S. the CCS progress has largely ground to a

halt although there is some encouraging movement. Internationally these projects have been very challenging to bring to a commercial state.

Other renewables, of course, are competing with what has now become, contrary to all expectations, a long-term, very rosy projection for availability of natural gas. We're awash in natural gas. The shale gale has completely reversed market expectations in terms of what we're likely to see. When I worked for Shell, for several years we were operating on the basis of a kind of long-term view of natural gas prices that began at about $8 per gigajoule and escalated upwards. Today we're in the $3 to $4, possibly $4.50 range out as far as the eye can see. So things have changed, and what that means is that other renewables have a much higher hurdle rate to get over.

Demand-side management is difficult in a deregulated environment but not impossible. Investors who are looking for reliable, predictable returns may find that there are opportunities in the private capital market to pay for many of the retrofits and efficiency measures, but the reality is that we've got a long way to go on efficiency. We have a limited number of wedges. Many of them are challenged. Taking them to scale has been tough, and that means that hydro has an important role to play in our energy future.

Comparison versus the alternatives. Here in incredibly small print – and I'll make sure that we provide you with a printout of these slides – you'll see the levelized cost of energy. Here hydro compares both very well and unfavourably, depending on context. The projections for the take-home cost for hydro or run-of-river hydro relative to the alternatives is generally very good in a long-term sense, but in a short-term, competition-for-capital environment they do poorly relative to some of the alternatives. There it's less capital intensive up front to build new combined-cycle gas turbines for cogen. Certainly, cogen is a heck of a lot cheaper when you're paying for it on the back of a large demand for steam load to produce oil.

So in a broad sense if you think in the long term, then hydro is a very good investment. It can run for a hundred years or even more. When I did my undergraduate work, I had the privilege of working on the reconstitution of a hydro dam in Quebec, and what was interesting about this dam was that it had already been in operation for about 80 years. Rehabilitating this dam was going to add another 50 to 60 years of lifespan to the dam. So the opportunity there is that, you know, when you build these things, you're building them for the long term as opposed to building them for just the next 25 years, and that has tremendous value from a long-term public citizen perspective.

1:10

Let me move on to greenhouse gas intensity. Here, unfortunately, even smaller, what you do see is that hydro, which is roughly in the middle there – I wonder. If I were to get up and walk over to the screen, would that upset the cart a little too much? I can't do that? Very well.

Hydro is in the middle there. You can see a small white bar that shows the sort of maximum range and minimum range of greenhouse gas emissions, and here you can see that from kind of a life cycle greenhouse gas emissions intensity basis hydro is the best bang for the buck almost without any compromise in terms of reducing our carbon footprint and meeting our electricity needs. This assessment does exclude land-use change, but I have another slide where I can provide you with a bit more information on that. The answer is that hydro still comes out ahead.

In terms of water consumption hydroelectric actually, depending on the process and depending on how you draw the boundaries, either does very well or very poorly. Hydroelectric 2 refers to large dams, and here what you're looking at is evaporation loss. These large reservoirs lose a lot of water back into the atmosphere. Now, whether you can consider that a loss or really just a return to the hydrological cycle is a very important question when you compare it with, for example, the production of shale gas, where you're actually taking fresh water from the surface, injecting it into large formation and, therefore, taking it out of circulation forever, in perpetuity.

Hydroelectric 1 is the run-of-river type of dam. There you see that, again, water consumption is very low, compares very favourably, which should be of interest to anyone who's interested in power generation in a water-constrained environment.

In terms of land use, again, hydro does either well or poorly depending on what we're comparing it to and how we're implementing it. Run of river does very well whereas a large dam where you're flooding significant acreage in order to create reservoirs does comparatively poorly relative to, for example, producing natural gas or tapping deep geothermal or producing nuclear power. So, again, you know, all of these options involve trade-offs. I think what we can say notably is that hydro does pretty well relative to the alternatives and depending on how it's executed.

The other thing to think about is improvement, and I alluded to an experience in Quebec looking at upgrading and rehabilitating an older dam. Technology has continued to get better, and many dams that were built in the '50s, '60s, or earlier can be upgraded and their performance and economic life extended for many years, perhaps in perpetuity, depending on how that's done.

Here's just an example of the improvement of turbine performance since the turn of the century up to just 2000. You can see that turbines have gotten a lot better and even continue today to improve significantly. New material advances, improved computer modelling, and a better understanding of hydrodynamic flow all mean that turbines that we can anticipate seeing in the future will be significantly better, far more efficient, and far more effective at generating power.

However, the big hurdle is public acceptability of dams, a significant barrier to capital projects development. This is a study undertaken by Goldman Sachs indicating that when looking at the 190 large energy infrastructure projects, that they called their 190 projects that will change the world, some 70 per cent or more were delayed, deferred, or cancelled as a result of nontechnical risk, what they refer to as a mix of political, social, environmental, and stakeholder-related challenges that either delayed the project, harmed its economics, or prevented it from being completed entirely.

The World Commission on Dams, so going back a ways now, spent a considerable amount of time reviewing the evidence on large dams and came to a set of principles for credible public decision-making around gaining public acceptance, undertaking a comprehensive options assessment for meeting the same sets of needs, be they water storage, ensuring navigable waters, irrigation and flood control, and generation of power.

Sustaining rivers and livelihoods, ensuring that you've defined what the ecological baseline flow is to ensure that the ecosystems are protected, managing the loss of fisheries and other traditional uses, and so on.

Recognizing entitlements and sharing benefits. A key issue with dam implementation has been the allocation of risk and reward. Those who've borne the risks largely have not benefited to the same extent as capitals in the development of these projects.

Ensuring compliance, making sure that the projects are executed and implemented in the way that has been promised as part of their approvals and so on.

Sharing rivers. Of course, many rivers cross boundaries. Alberta shares rivers with B.C., with the U.S., with its neighbours. Making sure that rivers are managed appropriately is a key element of this.

Some final thoughts in terms of enablers for social licence. Number one, carbon price. If the carbon price is there, you improve the economics. We have a modest carbon price in Alberta. Certainly, it's not enough, but it's starting to help. We can do a lot more here.

Patient capital. Capital markets aren't doing so well these days. I think that if you could make 5 per cent return guaranteed, most people would view that as a positive. Certainly, looking at my RRSP this month, I've come to that conclusion myself.

Regulatory clarification. There are a number of things that need to be clarified to help these projects move forward, so understanding what those pinch points are.

Quantification of ancillary benefits. Dams offer, potentially, a tremendous value as a hedge against uncertainty. While the shale gale is running its course, people are rapidly shifting their development to oil and, of course, looking for new markets to soak up all that gas. There is a possibility that we may hit a pinch point and that prices will spike. How do you deal with that volatility, and how does that play out for the consumer? There is a very important role to play in hedging against an uncertain future.

It's hard to quantify, but of course the health benefits associated with putting more hydro on the grid cannot be underestimated. How many lives would be saved associated with reducing air pollutants and improving air quality? We live in a water-constrained environment. Climate change is going to and has already begun to change the hydrologic cycle – the peaks, the lows – so what that means for water storage versus drought. I believe that dams have an important role to play in enabling us to store water in the event that we have several years of low flows, and that has a tremendous value for rural farming communities, rural electrification – there are benefits there – and, of course, in firming up the grid.

Some quick conclusions. We believe that hydro can and should play an important role, but don't forget efficiency. Hydro compares well versus the alternatives, and it is an essential greenhouse gas reduction wedge. In light of the slow pace of progress on some of the other wedges we really need to see hydro take its appropriate place. However, social licence and a credible decision-making process are critical. You need a carbon price, clarification of key regulatory decision points and pinch points that contribute to that high risk of delay with large capital projects, quantification of some of those ancillary benefits we were just talking about, and, of course, long-term thinking. Making dams happen takes concerted policy. It's not going to happen on its own in the marketplace.

Thank you very much.

1:20

The Chair: Thank you, Jason. As you've observed, we gave you 15 minutes instead of 10, so lucky you or not.

Dr. Donahue, we'll extend the same favour to you if you need the extra time here. Thank you.

It would be nice, Mr. Switzer, to have a copy of your slide deck. We put the materials on our website, and they're shared. Thank you.

Dr. Donahue: Thank you very much for the invitation. There were a number of topics that I thought it was possible to speak about, ranging from policy to science to a host of other things. What I'm largely going to focus on today is a discussion of water and water supply and, ultimately, the implications of things like climate change to water supply in Alberta, primarily because, if we're talking about hydro, well, necessarily it relies on long-term, multidecadal, stable supplies of water. Unfortunately, Alberta – and I'll attempt to paint a picture for you that explains it – is probably the jurisdiction in Canada that is most susceptible to declining water supplies, especially in the future. It's already occurring, and it's going to likely occur much more dramatically.

People think of Alberta, and they think: well, there's lots of water in the north, and it's fairly dry in the south. The reality is that it's not really because of precipitation. As you can see from this map, the yellow is annual precipitation of about 400 millimetres; light green is 450 millimetres. So there are fairly substantial portions of northern Alberta that have very similar rainfall patterns to southern Alberta. The difference, however, is that southern Alberta, as we all know, is warmer, and there are greater evaporative losses. So the net amount of water that's available or that sort of remains on the ground in rivers, in lakes in the south is much lower than in the north, which helps to explain why the north is so wet. It's also covered in vast wetland complexes, but ultimately they hold the water on the land for longer. It's largely that balance between evaporation losses and precipitation supply, the difference between north and south, that drives the amount of water up north.

If you look at the history of precipitation in Alberta, on the left you see the period 1951 to 1980. That was the map I just showed. Just fast-forward that 20 years to the 30 years between the '70s and the year 2000, and it's already becoming more arid in the north. There's ultimately much less net precipitation arriving in northeastern Alberta. This has already happened. Projections for the future are, as I'll show, for increasing patterns like this.

I'll go through a few little sort of factoids, I guess, on climate-related changes that have been occurring. From 1970 to 2003 in Peace River there were almost 19 fewer days with snow on the ground. That's an 18 per cent decline. There was a third less total winter snowfall. There was more than a foot less maximum snowpack depth, which is a reduction of about a third of the maximum snowpack depth. There were almost three weeks fewer days in the winter where it's less than minus 20 degrees. Ultimately, annual totals have increased by almost two degrees centigrade just in those 30 years.

Water supply is closely tied to precipitation, temperature, evaporation, those sorts of things. What we rely on in terms of predictability of water in this part of the world, as in many temperate systems, is ultimately a big pulse of water release in the spring because of snowmelt, but we're already observing declines in amounts of snowmelt coming off because there are more mid-winter melts, there's less snow itself falling, those sorts of things. We're getting these seasonal shifts as well as absolute reductions in the amount of water in the north.

If you expand this beyond just Peace River – this is a table of Jasper, Slave Lake, High Level, Athabasca, Fort Chipewyan, and Fort McMurray – in all of those places they demonstrate fairly substantial evidence of shifts to warmer, drier climates. The red numbers basically show significant increases in annual temperature, significant decreases in annual precipitation, decreases in annual rain, and decreases in annual snow. In some of them there's no significant change, but almost all of the sites demonstrate one or more of fairly substantial climate warming, climate drying signals, and this is common throughout much of the prairies.

As I said with Peace River, this next slide shows changes in snowpack. Much of northern Alberta has shown pretty substantial changes in the number of days with snow on the ground and the depth of maximum snowpack. For example, max snowpack in Edmonton, Slave Lake, Peace River, High Level, and Fort Chip have all declined by approximately half to two-thirds just in a 30-

year period, a 35-year period, from 1970 to the early 2000s, notwithstanding what we see outside today, of course.

Part of what is going on in Alberta: our rivers rely in large part on glaciated headwaters for where they come from. However, glaciers in the eastern Rockies have been substantially declining in size for much of the last century. As you have seen in the headwaters of these rivers, summer flows in many of the rivers – the Bow, the Athabasca – are made up quite a bit by glacial melt. So what you would anticipate as the glaciers melt is that you'd see pretty substantial declines, potentially, in summer flow. The Bow River at Banff, the summer flow during the last century: glacial melt has comprised between 13 and 56 per cent of summer flow.

If you anticipate dramatic decreases in the amount of water coming off glaciers in summer, then similarly you could anticipate pretty dramatic declines in summer flow in the headwaters. Most of the large glaciers in the eastern slopes of the Rockies at the headwaters of the Bow and the Saskatchewan and the Athabasca have shrunk by about 25 per cent in the last century. Ultimately, the people in the Water Survey of Canada and elsewhere who have been studying some of these glaciers are thinking that the total amount of water has now started to decline coming off these glaciers even though melt has been increasing, and it's simply because the size of the glaciers has hit that tipping point, where they've reduced enough that even though melting is increasing in rate, the amount of water actually coming off is declining. If you think of a small ice cube, no matter how much more quickly you melt it, you're getting less water coming off it.

This is just a picture of the Athabasca Glacier. I imagine many of you have been down the glacier parkway and looked at the interpretive centre, where you can see sort of the perpetual march of the foot of the glacier further up the valley. This just shows the Athabasca Glacier in the early 1900s and then most of a century later and the fact that it has receded by, you know, a couple of kilometres. This is common for many of the glaciers in the eastern Rockies.

One of the things I looked at was the Peace River basin. Of course, it starts in B.C. – there's a substantial part of the basin in B.C. – and then, of course, it goes down to Lake Athabasca. What I did was that I looked at four different sites from the Water Survey of Canada database: Hudson's Hope and Taylor, B.C., in the upper parts and then Peace River and one of the sites in the lower Peace. I looked at the changes in flow as you head from upstream to downstream as well as the contributions of those portions of the catchment to the flow of the river itself.

Total summer flow. As you see, Hudson's Hope is the furthest upstream. As you expect – it's a big river – as you go downstream, total flow increases as you go from Hudson's Hope to Taylor to Peace River to Peace Point, upstream of Lake Athabasca. However, you look at the period from 1971 to 2010, and I chose '71 because that was when the Bennett dam completed filling. After that, you would expect that variation over time isn't related to the dam for summer flow in the Peace. Between '71 and 2010, once you get down to Peace River and Peace Point, total summer flow between May and August has declined by 25 to 30 per cent; upstream, not so much.

I did the same kind of analysis for the Athabasca River, and similar patterns are seen. Total summer flow as you head from Jasper down to Embarras, upstream of Lake Athabasca in the Athabasca, total flow increases. But a change: from the early '70s until the early part of this century, as you head downstream, there's a greater decline in the total amount of flow. By the time you get down to Fort McMurray, basically downstream of Athabasca, it's declining by a quarter to a third, so very similar to what's being seen in the Athabasca.

That little insert: that's actually the furthest upstream, the Sunwapta River, which is a tributary of the Athabasca. It actually demonstrated an increase in flow over those 30-plus years, but it's primarily fed by the Sunwapta glacier. As the data have shown, the increases in glacial melt have made up for that 20 to 25 per cent increase in flow in that river in the summer. But as I said, they're anticipating that that will start to decline. So you sort of see this teeter-totter as you head from the glaciated headwaters down into the lower parts, where you go from glacial-melt-driven increases to lowland reductions in water or decreases in flow.

1:30

If you split the basins and look at the contributions from the different sections of the basin, you see a much more compelling story. Basically, 94 per cent of the Athabasca River basin downstream of Hinton, the large majority of the basin, all of the water coming from the surrounding lands in that portion of the basin: the amount of water coming off that portion of the basin and getting delivered into the river has declined by about half since 1971. Downstream of Hinton all the way to Fort McMurray and Embarras – there is no number there from Embarras because the data aren't complete and the monitoring was cut at some point – what you're seeing is a fairly substantial drying out of the large majority of the Athabasca River basin.

Projections for climate change for this part of the world. This is an integration of all of the different regional models for the prairie region, western Manitoba to Alberta and northern Alberta. As you can see, we're sort of sitting around now where we've already observed increases of one to two degrees from historical averages, which I demonstrated in those tables earlier. Projections for this part of the year by the end of the century are for approximately a six-degree, six-and-a-half-degree increase.

What this represents, basically, is the climate in Fort Smith shifting to the average temperatures in Calgary. When you combine those increases in temperature with amounts of water, as I showed earlier, that are similar in the north to what's already in the south, it's not a real leap to figure out what the possible results are going to be in terms of water. These maps show a number of scenarios put out by Dave Sauchyn and some others in the Prairie Adaptation Research Collaborative out of the University of Regina. It's a collaborative between the universities in Saskatchewan and Alberta as well as the governments and some other institutions in both provinces.

As you move towards the latter part of this century, ultimately the point I want to make is that the amount of semiarid and dry, subhumid land in the prairies and in Alberta increases substantially. I'll point especially to the northeastern part of Alberta. What we're going to be looking at, potentially, is a fairly substantial increase in the amount of land in northern and northeastern Alberta that has approximately the same amount of water that's available in Lethbridge today.

So what are we seeing? Significant warming in the winter and spring will decrease snowpack. It's leading to dramatic declines in spring flows. Less spring snowmelt and more evaporative losses result in lower water in the summer. This can result in more substantial droughts and reduced flow. This ultimately is probably going to affect the benefits that we gain from healthy rivers. If there's a loss in terms of permafrost, there are a lot of other things that will happen: more forest fire losses, reduced capacity to dilute effluents and pollution. In Alberta we largely rely on rivers to whisk away our effluents, and if there's less water, that means concentrations of those pollutants increase or we have to adopt what are generally fairly expensive increases in technological methods to reduce our effluents.

More work out of Dave Sauchyn at the University of Regina. For this part of the world in the last 2,000 years every century other than the twentieth century has had a drought that has lasted at least a decade and as much as four decades. The twentieth century, the century that we've come to think of as normal, has, unusually, the most stable and the wettest climate of the last two millennia in the prairies. So what we think of as normal really isn't all that normal here. If we combine sort of the long-term historical normal with the potential for future climate change, the risks associated with water decreases in this part of the world are fairly substantial.

Much of what I've talked about was put out in a paper that Dave Schindler and I published in 2006, and I gave Mr. Tyrell a copy of it. I e-mailed a copy of it this morning, so you'll have it on your website.

In terms of some of the policy things, in-stream flow needs – there's been some mention of it – refers to the quantity, timing, and quality of water flow that's required to sustain freshwater and estuarine ecosystems and the human livelihoods and well-being that depend upon them. These ecosystems, maintained in a healthy state, provide us with what are largely unrecognized services: clean water, clean air, recreational opportunities, commercial fisheries, value-added opportunities that support wildlife habitat and promote tourism. Studies have shown that healthy aquatic ecosystems ultimately require in-stream flow needs that range from approximately 80 to 92 per cent of natural flows. Among others, a study done by Alberta Environment on the South Saskatchewan River basin has shown this also.

According to the Alberta Utilities Commission, in-stream flow needs data ultimately form the foundation of management frameworks and provide us an opportunity to get a better understanding of what is needed to maintain healthy ecosystems. This results in a better understanding of the capacity for water diversion from river systems and provides, ultimately, a baseline for regulatory agencies to make sound decisions for hydro development.

In terms of water-management frameworks, as it is, there hasn't been an assessment of in-stream flow needs, and there isn't a water-management framework for most of the rivers in Alberta, at least a water framework that has been approved. There's a draft one for the lower Athabasca River. Ultimately, what this means is that no one can really say what the degree of change or disruption in flows will affect or what limits will be needed to sustain all of the benefits – social, environmental, and economic – that we gain from the rivers, the Slave, the Peace.

While run-of-the-river hydro projects may be less environmentally disruptive, they aren't always. They can still represent a substantial disturbance. In B.C. they're dealing with a lot of run-of-the-river projects, and what some of them involve, actually, is a diversion of between 75 and 95 per cent of total water flow. They basically pipe it down a substantial drop in elevation until they run it through turbines and then put it back into the river, so it really represents a substantial diversion of the river. The river, in a way, kind of ceases to exist except at very minimal levels, and then at some point lower downstream it comes back.

On the Slave River, I guess, ultimately, if there were a dam or run-of-the-river things, the greatest potential for impacts would be downstream to members of the Dene Nation, and I know they're very interested in this and should play a major role in any kind of discussions. I would argue that there should be substantial public participation in any discussions, meetings, or decisions, perhaps contrary to what is typically done in terms of interpretation of standing at a lot of the regulatory hearings in Alberta. The demand for direct effects is very limiting in terms of the overall discussion and how decisions are made with these sorts of things.

It's our position, basically, that hydro planning should be done under the framework of the Alberta Land Stewardship Act and therefore sort of demands substantial land-use planning, watershed-management planning, water-management frameworks. I'd say that to really consider the question of hydro development is a little premature before all of those sorts of planning initiatives are pursued. I would emphasize that the purposes of some of Alberta's legislation, like the Environmental Protection and Enhancement Act and the Water Act, emphasize the importance of protection of the environment as an essential part of managing human health and well-being and ecosystems and ultimately sustaining many of the benefits we rely on.

In the Kearl oil sands review decision in 2006 the panel concluded that it's quite likely that water will limit regional development in the lower Athabasca River basin at some point. Given the exceptionally high future potential for large decreases in river flows and water supplies in Alberta I think we need to move away from our assumption that we can pursue projects that are water intensive and water dependent pretty much anywhere we want, any time we want, because I think we're really looking at a new reality going into the future with regard to water supply, and that will be particularly relevant to hydro development.

The Chair: Thank you very much, gentlemen.

Linda Johnson has just joined us online as well, just so everyone is aware.

A lot to talk about. I think we'll start again with the Wildrose caucus with a series of five minutes of questions and answers, and then we'll do the PC caucus. Dr. Brown has one question. Just give me a wave if you'd like to ask a question.

1:40

Mr. Anglin: With regard to baseline data, particularly what you're referring to is the flows of the rivers and the Land Stewardship Act. Where are we right now, in your view, on assessing the necessary data? One of the things that comes to mind is baseline water data, particularly how it regenerates the aquifer, and I'm not just talking rivers. In your assessment, where are we now? Where do we need to be? What is it going to take, in your opinion, before we are where we should be to make this decision that we're going to make, whether it's yea or nay?

Dr. Donahue: In terms of water supply, those stations, for example, on the Peace that I showed are the only ones that have long-term data sets for water supply that go year-round on the Peace. The same with the Athabasca. In the mid-90s there were a lot of cuts to water-supply monitoring of surface water. So where are we? I think we don't have a good enough grasp in terms of what's going on in terms of surface water, and unfortunately we have a much better understanding of surface water, I think, than we do groundwater. There's very little understanding of the interconnections between groundwater and surface water for most of Alberta.

In terms of determining in-stream flows, other than the South Saskatchewan River basin there hasn't been any substantial study of what's needed for in-stream flow needs on any other river in Alberta. Even then, if you look at how the director manages the SSRB in terms of water allocation, on one hand you've got the scientists from Alberta Environment saying that at a very minimum – what they refer to as a desktop method says that if you don't have the monitoring, it should be 75 to 85 per cent of natural flows that are left in the river. Then when it comes to the regulations, you've got an arbitrary sort of statement that basically says that natural flows of 45 per cent should be our goal for maintaining healthy

ecosystems. So you've got a real divergence between the policy and the science even where the science has been done.

In the north we've got very little information. I was at a meeting the other day put on by Alberta Innovates: Energy and Environment Solutions in Calgary on conjunctive management of groundwater and surface water. Unfortunately, we treat groundwater and surface water as distinct entities, and we manage them distinctly. There are different regulations and different bodies that manage them and make decisions about them.

There were a bunch of people from the Netherlands there, and they said that one of the rules they have is that industry is allowed to have proprietary security over their groundwater information, as they do here, but after five years it reverts to public information, and it's all entered into a public database. I think that would go a long way. The energy industry has a vast amount of groundwater information out there, but it's largely proprietary, and it's not available for people to dig into in a way that's useful. There are a lot of problems, anywhere from lack of data, lack of studies, to lack of searchable databases and digital reporting of water.

Mr. Anglin: I read your report back when you first published it in 2006, if I'm not mistaken. In planning for our future, regardless of hydroelectric, although it would play a role if we built the dams, what role would retention dams have for those moments, those decades of so-called drought that we could experience? Does they play a role? Are they something that is feasible?

Dr. Donahue: It's a possibility. I guess it depends on whether you're looking at a way to sort of preserve or mitigate harm to projects that are already out there and decisions we've already made, to kind of protect what we have. I would say that proceeding along a path that says, "Well, we're going to rely on these for our increasing decisions and development in terms of water-intensive industries," I think is a fairly dangerous thing.

For example, in the oil sands most of the projects going forward now are introduced with plans that say that they're planning for off-stream storage that will allow them to shut down withdrawals from the Athabasca River for up to three months.

In the modelling I've done, which I'm still working on writing for publication, I've looked at changes in water supply in northeastern Alberta going forward with three- or six-degree increases in temperature. A six-degree increase in temperature: basically, everything falls off the table. In many of the rivers during the driest of years – I mean, we've got a great variability between wet and dry years now – under a six-degree-centigrade increase, we're looking at up to 100 per cent declines in river flow for the summer. That wasn't the Athabasca and the Peace. That ranged from rivers with catchments of 300 square kilometres to 30,000 square kilometres.

Dr. Brown: A hundred per cent of what?

Dr. Donahue: Flow from May to August.

Mr. Xiao: The flow. The volume, right?

Dr. Donahue: Volume.

The Chair: Okay. That takes us, actually, back to Dr. Brown's question.

Dr. Donahue: Okay. So I would say that off-stream storage may be appropriate in some cases, but if we're going to be adopting really major projects that are really water intensive in areas where we're predicting substantial declines in water supply, it's a fairly risky thing. That's why I've recommended that we kind of get off this continual path of relying on water-intensive economic development anywhere we want, any time we want. If you go to any regulatory hearings, all of the proponents' plans are premised upon analyses of long-term historical averages of water flow. There's no acknowledgement that the amount of water we have is declining.

Dr. Brown: You've got three charts in your slide show which don't mean a lot to me: changes in climate in the Peace River, the recent changes in temperature and in precipitation in central and north Alberta, and the general reductions in duration or maximum depth of winter snowpack. These appear to be single data points for each of the years. Without some statistical explanation of how you're calculating those changes in temperature, the number of days with snow on the ground, it's completely meaningless to me.

Are you comparing, you know, the year that's the beginning of the period to the year at the end? Are you looking at some sort of an amalgam of data points with a trend line? Are you applying five-year periods in the beginning of the 30-year period to the five-year periods at the end? I don't know what you're doing, how you're calculating those data points. So without some explanation of what the statistics are and what the degrees of confidence are in those particular statistical outcomes, I can't understand how you would come up with something like that because, as you know, the difference between weather and climate is that weather is data points over a short period of time and climate is over a longer period of time. What are you comparing here? There's no explanation of what is apples and apples and what's apples and oranges. I mean, I don't know what you're doing here.

Dr. Donahue: As I said, much of that is from our paper that we published in 2006, in which we actually describe the stats. But, in short, those are long-term statistical averages, not, you know, point at the beginning, point at the end, based on analysis of variance at the probability of less than .05 per cent chance, standard approaches. So that is a regressed average change. The data points actually say at the beginning or end. The variance in the individual data points could be higher or lower than that, but that is the average decline, and anything that's presented in red in those tables is statistically significant using that method. The data that are used are from Environment Canada's climate monitoring database, basically. Yes, there's a difference between weather and climate, but ultimately if we use the data that we have and look at long-term trends, it indicates patterns that are going on.

The Chair: Okay. Dr. Brown, do you want us to move to Mr. Xiao for a question then?

1:50

Dr. Brown: Go ahead.

Mr. Xiao: I'd probably just do a follow-up question. Based on the data and the information you're providing here, could you make a comment about the potential for hydro in Alberta? Do you see, based on the data, that in another 30 or 40 years the rivers might dry up?

The Chair: Could I just interrupt here and make sure that we know that we can direct questions to both of the presenters. If you are directing a question just to one presenter, just say who it is.

Mr. Xiao: Yeah. Both of you know you're welcome to make any comments.

If the water flow has been reduced significantly in the last few decades, based on the data here, I just can assume that maybe in three decades or even longer we might not have enough water to support a sizable hydro in Alberta.

Dr. Donahue: I guess, ultimately, three or four decades, as I said, in terms of worst-case scenarios, really dry years, exceptional droughts, based on the magnitude of droughts that we've experienced during our period of monitoring record – that's what my assessments, the kind of future modelling scenarios, were based on.

The changes I'm talking about aren't predicted to be occurring for long terms, and those are average changes. We'll have very wet years. We'll have very dry years. It's also very hard to do climate modelling in mountainous regions. So it's hard to say what is going to happen, but the trends are for reduced water. I guess it would depend on the scale of the project, where it's located, how much is available for evaporative loss, those sorts of things.

I don't know if that answered your question.

Mr. Xiao: Well, you know, the reason that I'm asking that is because I'm a geologist by training, and 50,000 years ago there was 50 kilometre thick ice on top of us, right? When you're talking about global warming, we started that trend 50,000 years ago. So my point is that based on just the data which was collected just several decades ago, through the period, it might not be enough to determine the trend. That's my point.

Dr. Donahue: I accept that. Although I would say that an argument based in geological times – I mean, we don't live in geological times. If you look at the changes that have gone on in our society here since we were first developing in the early part of the 20th century, late part of the 19th, that's the world we live in.

There have been substantial changes in water during that time. What's driving those changes? Well, we've been coming out of the little ice age. Certainly that's contributed to it. I guess I would say that it's a case of looking at what's been happening and assessing kind of the best predictions for what's coming. I'd say that in terms of risk analysis, it's appropriate to look at things that way, more appropriate than, say, taking the long-term average of a river flow and saying: presuming it's going to stay that way, we're good. As a risk management tool that's probably not the best way of doing things.

The Chair: All right. We'll turn this over the NDP caucus. Mr. Bilous.

Mr. Bilous: Thanks. Thank you, gentlemen, both for your presentations. I'll start off, I guess, to Dr. Donahue.

I'm assuming that we'll be coming around to the various caucuses multiple times.

The Chair: Yes. I'd suggest that Mr. Switzer not relax too much. That's right.

Mr. Bilous: Yes. I do have questions for both of you gentlemen. To start off with, Dr. Donahue, has your organization been consulted directly on any specific hydroelectric projects in Alberta or elsewhere? If so, can you describe the involvement you've had?

Dr. Donahue: Not to my knowledge. I've been working with them for two, two and a half years now. I know that before I arrived in 2010, Julia Ko and Joe Obad had made a submission to the Alberta Utilities Commission regarding hydro development although that was largely based on regulatory and sort of public access type issues as well as policy recommendations and those sorts of things but nothing specific to hydro development projects.

Mr. Bilous: Okay. You've touched on it during your presentation, but I was hoping maybe you could elaborate a little bit more. As far as for Water Matters going forward, what are some of the fundamental issues that need to be addressed when we're considering water management from, you know, a hydroelectric development point of view?

Dr. Donahue: Specific to hydro, I'd say that most important, as I sort of emphasized in the talk in the latter part, is the development ultimately of a scientific framework that allows us to appropriately determine in-stream flow needs for the rivers of Alberta. If we don't understand what the sustainable limits are in terms of how much water we take out of rivers, then we're basically doing it in a way that says, "Well, we don't know what the impacts are, but we don't really care," which is, going back to risk analysis, a potentially very dangerous way of proceeding when it comes to something that is entirely reliant on stable long-term water supplies as well as looking at things like maintenance of fisheries, water supplies, First Nations rights, all those sorts of things.

Mr. Bilous: What kind of time frame would you recommend as far as collecting this type of data?

Dr. Donahue: It's hard to say how much time that would take. It would certainly take a much, much greater investment in science provincially, assuming the government was going to do it. We've all witnessed what's been going on over the last few years with regard to monitoring and assessment in the oil sands region. Inappropriate monitoring can cost a lot of money and, ultimately, not provide the answers that you're looking for, as we've seen with a lot of the reviews and critiques of the oil sands monitoring programs, at least with regard to fresh water.

As I said, there was an assessment of in-stream flow needs done for the South Saskatchewan river basin. How long it took them I'm not really sure. There are people in Alberta Environment and Sustainable Resource Development who are experts in assessing in-stream flow needs, but for the large part they're given neither the budgets nor the freedom to actually go out and do it. Instead, we end up with things like the lower Athabasca water management framework, which is more of a negotiated agreement on how much water will be taken out as opposed to a science-based assessment of in-stream flow needs.

Mr. Bilous: Let's say that the dollars were there and the province injected them back into monitoring, let's say it all lined up ideally, how much time would be needed for this type of assessment to take place?

Dr. Donahue: As I said, I'm not sure. It would depend on what data are available. I don't know how much fisheries data sustainable resource development has. I have looked at the long-term river network monitoring program of Alberta Environment for the Peace and Athabasca as well as all of the sites in Alberta. I provided a template for analyzing and interpreting their data for them a couple of years ago.

It was started as a long-term river network monitoring program. For the most part I think it was started in about 2007. There are a number of sites, just a handful of sites, for all the major rivers. I think there are four or five on the Peace, the same number on the Athabasca. There are at most three years of data for each of those sites. They've sampled each of the sites throughout Alberta,

basically one sampling period intensively, and they don't know whether their long-term monitoring program will continue to be funded. The plan was to sample every five years, go through a sampling cycle every five years. If you're looking at getting enough data to understand what changes are going on in the rivers and what's causing them, if you're sampling every five years, looking at a power analysis, you're looking at perhaps 30 or 40 years before you have enough data to figure out what's going on.

This ties into a lot of what's been discussed and what seems to be developing in terms of the new monitoring program and the monitoring commission, or whatever it's called, that is being developed, or they're trying to figure out what's going on. A lot of the same issues that are going on in terms of monitoring assessment in the lower Athabasca could be applied everywhere else.

So how long will it take? It depends on what data are there, and it depends on if those data are appropriate to answering the questions. Monitoring has to be designed in a way that answers the question. You just don't go out willy-nilly and take a bunch of samples.

Mr. Bilous: Thank you.

The Chair: Okay. The Wildrose caucus. Mr. Barnes.

Mr. Barnes: Thank you. To Mr. Switzer, first of all, then to Dr. Donahue. Just to switch gears a bit, I've been hearing lots about how coal production and natural gas production is getting more and more clean or more and more efficient, so I'd like you to touch base on that.

I'm from Cypress-Medicine Hat. The South Saskatchewan flows through Medicine Hat, and just into Saskatchewan we have the Lake Diefenbaker dam and a huge, wonderful reservoir of water for irrigation, electricity, and recreation. It is very, very well used. I'd like one of your opinions on where you may see that going if . . .

2:00

The Chair: Can I interrupt? We are focused on northern Alberta. We need to stay focused on northern Alberta if we're going to conduct this.

Mr. Barnes: Okay. If there's somewhere that that could apply, I would appreciate that.

Then just a thought that ties into that is that, of course, these rivers and a large part of that resource just flow to another jurisdiction if we don't harness it or use it in some way. I'd like your thoughts on that, please.

Mr. Switzer: I'm happy to weigh in on at least a portion of the conversation. I think there were a few questions there. One was around the role of coal and natural gas. I think that coal certainly has been improving. However, based on the work by the IPCC and even our own national reviews of the science, the cuts that would be available in greenhouse gas emissions associated with continued reliance both on coal and on natural gas – even an optimistic scenario suggests a rather dramatic warming.

In the International Energy Agency's golden age of gas report they forecast that in a rosy scenario for natural gas development, while you would see a significant reduction in greenhouse gas emissions in the power supply, that would be offset by an increase in power consumption as well as a growth in overall emissions, that would result in a three and a half degrees Celsius warming scenario. That's not as grave as the six degrees scenario that Dr. Donahue is referring to but still quite significant. Hydro can play a role in the mix and can play a substantial role as a wedge in helping to diminish the net carbon contribution of Alberta's power needs.

Dr. Donahue: In terms of your question about reservoirs and water flowing by as potential ways of capturing the use of water as a resource, I would say that that's certainly the case, and that tends to be the approach that we take. We see water flowing by and think: "What a waste. Dam it." We want to use it. I mean, there's a plan here in Edmonton – or there seems to be a plan – that perhaps we're going to put in a dam and create a lake down in the river valley so that we can have a beach and swim.

I'd say that I would promote a position that says that it's our rivers that are our resource rather than the waters alone. Rivers are more than water. We rely on them for a lot of things. If you look downstream from dams wherever you go, you see dramatically changed hydrographs, the timing and amount of flow. So, yes, we can put in dams. For example, the South Saskatchewan River: if you look at the flow in Saskatoon, the summer flow, May to August, has declined by about 90, 95 per cent in the last century because of a number of things but also substantially contributed to by all of the upstream dams in the Saskatchewan River basin.

So if we're happy with looking at potentially dramatic declines in summer flows, increases in winter flows, losses in evaporative water, and ultimately sacrificing the health of rivers just so we can capture the water without wasting it, that's one approach. But we're subject to interjurisdictional agreements with respect to water sharing, so I guess that as much as we like or don't like the fact that water flows by, we're compelled in that regard.

Site C is alike. I'm guessing it's going to go ahead in northern B.C. I don't know; I'm not privy to the discussions between Alberta and B.C. in that regard, but I'm sure Alberta has been expressing some concern about that. I know people up in the Peace River basin are. I mean, if we're concerned about things that are going on upstream of us in terms of hydro, I think it's reasonable to think that people downstream of us are going to be equally concerned.

The Chair: Mr. Anglin, you had a question?

Mr. Anglin: Yeah. The study that you've done and the projections that you've made: all things being equal and in geological times, even if we have another 200 years of abnormal moisture, it doesn't change your analysis. I mean, we just end up with a couple of hundred years.

What I'm having a hard time getting my head wrapped around is this. It is about the flow of the river, and even if we build a dam and retain water, on your projections I'm not sure how that changes our management. In other words, the way I understand dams is that once you retain so much water, you release so much to make sure you maintain what's called your proper flow, whoever comes up with the study that says: these are the flows that we want to maintain. If you have to, you can actually reduce how much you're holding back to maintain that flow. Now, if I understand that correctly, if that dam is sufficient, then in those arid times, when you would normally have very, very low riverbanks because of the dry season, because of the retention of water during high-water season you can actually raise that in some cases. I'm not saying in all cases. Do you see where I'm going with this? I was wondering if you could comment on that because I see it as a management tool. If I hear you correctly, you're worried about this being overly risky without the baseline data, and I just would like you to comment on that.

Dr. Donahue: That is true. In the Bow, for example, there is increased flow. I mean, it depends on the purpose of the dam. If it's for hydro, generally hydro releases are in the winter. If it's for irrigation, say, or just perhaps storage of water to use later in the summer or something, then it would be released in the summer. Low-flow periods are typically July, August, September. In terms of the summer what's relevant: water temperatures get very warm, fisheries that are used to cold water can be substantially impacted, and algal growth and weed growth can be pretty substantial in declining river flows there. Then winter flow, of course, is increased.

I guess, ultimately, going back to what I said about determining the in-stream flow needs, I think that needs to be a critical part of the planning so that we aren't in a situation where we're looking at modifying the operation of a dam to meet what appears to be or would otherwise be sort of this surprise of: well, we can't operate it the way we planned to because we need to manage it now in a different way to protect the river. I would like to see, basically, an assessment of whether we can protect the river and what's needed to protect the river and then design hydro – run-of-the-river, dams, or whatever – to meet that. If we get into a scenario where we can modify the management of dams to better protect rivers – well, I suppose we can do that; there will be limits to it. Ultimately, I would say that that will reduce the effective economic returns or the economic case of whether or not that investment in that dam was the most effective way to do things.

The Chair: Okay. We'll turn it over to the PC caucus.

Ms Kubinec: Thank you for your presentation today. I found it really interesting. I understand from your website on the Pembina Institute that you're quite enthusiastic about the small hydro developments, the picohydro facilities that have from five kilowatts all the way down to 10 to 25 megawatts, if that would work. Now, in both of your views, what barriers exist today to greater integration of this generation source into the provincial grid? That's the first question. The second one: are there barriers that exist for small hydro that don't exist for wind generation?

Mr. Switzer: Maybe I'll make just a clarifying comment on picohydro. You know, the cost per megawatt is actually fairly high, so the usefulness of picohydro is very much conditional on what you're trying to do with it, where it's situated, and so on. Then, of course, you still run into the same questions around ecosystem impacts of developing that sort of small-scale hydro. So I would say that we're bullish on the potential. The technology has improved significantly, and it has a lower capital hurdle rate, but again the kind of cost per megawatt may not work for wide application. It might be more effective, for example, for a small rural community that needs a power source, electrification of a mining project and so on.

With respect to the kind of competition or comparison of wind to hydro I guess the primary thing with hydro is that provided it's consistent with the set of environmental and social criteria that would result in a kind of broadly acceptable dam – dams are base load. As a result, they provide a very important function in the grid, much like large coal plants or large gas plants, in that they provide that baseline electricity source that we need. Wind, because of its intermittency, isn't able to do that.

Hydro offers a number of unique benefits. In many instances it can be used to firm up the grid so that you can increase your flow through to balance out times when the wind isn't blowing and the sun isn't shining. Similarly, it can be used to store power. By pumping the water up, you can actually increase your ability to store that wind power that's being generated when you don't have the demand on it for times when you do. Of course, that runs into a number of ecological concerns that then have to be addressed as part of your management.

2:10

Dr. Donahue: I think I'll have to defer to the Pembina on those questions just because I have no real knowledge in terms of the economic kind of trade-offs or appropriateness of particular technologies.

Ms Kubinec: Further to that, do you have opinions on wind and the use of it versus hydro?

Dr. Donahue: I would say that my opinions on that would probably be no different than anybody else's. I mean, wind doesn't really have much to do with water. I would say just what I've said about hydro. I think there are certainly significant issues to consider and a lot of planning and studies that I think need to be done before we walk down that path in terms of dramatically expanding hydro capacity in the north.

I guess I would say that I'm a fan of wind where it can work, but I don't know that that provides you much information.

The Chair: Okay. Mr. Cao had a question.

Mr. Cao: Oh, that was fast. Thank you.

Thank you very much for the presentation and sharing your research and your perspective and views. What I'd like to ask both of you is this. Let's just say that I'm a developer. I want to do a dam on the river or hydro generation on a river up north here. Can you tell me what I have to do, like, from your perspective?

Mr. Switzer: There's quite a long and I think deliberate process that has to be followed to get the permit, both securing the buy-in of local stakeholders around the project and obtaining the necessary regulatory approvals. But I guess that in a kind of broader sense, which I think is what you're driving at, what is the set of . . .

Mr. Cao: From your interest, though.

Mr. Switzer: From our interest, I think the kind of mapping out of the availability of the water to meet both the ecosystem needs as well as the needs of affected communities both upstream and downstream would be critical. There are critical habitat questions that come into play any time you're tampering with the hydrological cycle of a river. More broadly, the question of interprovincial issues, interboundary issues, has to be dealt with.

I think that at a high level the World Commission on Dams provides a reasoned set of principles that can be applied to develop a decision process. In the end, the World Commission on Dams didn't result in a statement that some dams are good and some dams are bad although it found evidence of both from an economic and environmental perspective. Instead, it settled on a decision-making process as a way to determine whether you could come to a place in which it made sense to go ahead. I think that same logic can apply to any large-scale or more modest run-of-river types of development.

Dr. Donahue: I mean, it's a broad question, so I'd say that you'll have to seek permits for a lot of things in terms of developments. Footprint disturbance, water licences, all those sorts of things: you'd have to engage someone to do, depending on the scale of your project, environmental impact assessments, socioeconomic assessments, those sorts of things, and then proceed through the

regulatory pathway with the Alberta Utilities Commission. That's in terms of what you would have to do.

From our perspective, part of that, I would say, will involve the environmental impact assessment. Then, I guess to repeat some of what was just said, you'd be looking at demonstrating a case where water supplies in the future will be sufficient to sustain your project for its lifetime without harming the river.

You'd probably have to engage someone to do studies of in-stream flow needs and what's needed downstream and make a case for the degree to which flows would be disrupted, those sorts of things.

The Chair: Okay.

Mr. Bilous.

Mr. Bilous: Thank you. I was going to ask Dr. Donahue really quickly – maybe it's not appropriate for me to ask you if you're able to get this, but you mentioned a reference, the South Saskatchewan River basin report. Would it be possible to get that to this committee?

Dr. Donahue: Sure. I can e-mail it to Mr. Tyrell once I get home. Actually, I've probably got it here.

The Chair: Again, we're focusing on the north. If we opened this up to all the data from the south, we would never be able to absorb it.

Mr. Bilous: Okay.

A couple of questions for Mr. Switzer. Pembina has raised concerns about higher levels of naturally occurring mercury in water resources that accumulate in hydro-power reservoirs. Can you expand on that? Can you tell us more about those concerns?

Mr. Switzer: I regret I wasn't involved in those studies so can't comment on them. It would be very place specific and associated with both the geological conditions of the reservoir as well as, you know, what's being carried downstream in the river.

Dr. Donahue: If you would like, I could comment on that.

Mr. Switzer: Sure. Please.

Dr. Donahue: The basic big picture is that when you create a hydro dam, everyone thinks it's totally green, all that kind of stuff. There are generally documented substantial increases in mercury concentrations, methyl mercury, in fisheries. That's the primary one of interest because in many cases hydro dams – and a lot of this came out of Quebec with La Grande dam projects. They were really promoted as: they're going to be this socioeconomic benefit to First Nations; they'll create great commercial fisheries. Unfortunately, the methyl mercury concentrations in the fish were substantially high enough after the commission of the dam that consumption advisories were put on where, like, pregnant women shouldn't eat them and that kind of thing. So it really affects the value and utility of fisheries.

The increase generally is related to the amount of organic matter that's flooded, especially wetlands. Wetlands are huge repositories of mercury in fairly stable forms. But once it's biogeochemically converted – it's flooded; it becomes anoxic; there's no oxygen, and then certain microbes start to essentially change its form – it becomes biologically available, converts into a methyl form that is bioaccumulated basically. As things consume it, their concentrations increase, and then it biomagnifies. So as you head up a food chain, if you eat fish, well, you collect all the mercury of all of that fish you eat, and at each level of the food chain you get higher and higher levels, which is why big predatory fish, which are usually the ones we eat, have very high concentrations of mercury.

There have been a lot of studies at the experimental lakes area in Ontario in terms of how to modify hydro dams and site selection to minimize mercury increases. Generally, if you flood, say, for example, a rocky basin that has a fairly small surface area – so it's deep as opposed to a broad, shallow, you know, wetland area – you'll have substantially less mercury in the fish and then in the downstream water also. But it's primarily the food chain effects that are the big thing. The concentrations in the water are never dangerous, harmful to anybody. It's just as things magnify through the food chain.

Mr. Bilous: Very interesting. Thanks.

Just a follow-up question for either or both of you gentlemen. How do silt deposits impact the overall lifespan of hydroelectric reservoirs?

Mr. Switzer: Very simply, the faster you get silt deposited, that deposition fills in the reservoir, so you lose, essentially, the volume of water that's driving your power generation. Silting is a very big problem. A significant underestimate of it associated with the Nile dam has significantly reduced the economic return from that dam in addition to the major ecological disaster that it represented from the perspective of the downstream communities or even an economic disaster from the perspective of the agricultural communities that are downstream of the dam. In short, it's a big problem.

Again, it's very much dependent on the river and the characteristics of that river, how much dissolved solid is in the water, how much sediment is being carried downstream, and so on.

2:20

Mr. Bilous: Okay.

The Chair: You've got time for one more question if you'd like.

Mr. Bilous: Will we get back to me before the end of the presentation?

The Chair: I think so, yes.

Mr. Bilous: No. My next line of questions is different.

The Chair: All right. We'll move back to the Wildrose caucus, then.

Mr. Switzer: If I may make one comment, I think the broader concern – and I think that this is something we'd all share – is that it's very easy in general to be in favour of a dam. In the particular instance, though, it becomes much harder, and there it becomes a question of: can you meet all of these different hurdles? Can you balance the various environmental and social consequences? Can you plan for an uncertain climate, and have you appropriately planned for things such as siltation and so on in the design of these things?

The problem with large dams is that they're such a lightning rod that there's a tendency amongst project proponents to overplay the benefit and underplay the potential consequences. So with any process such as this you need to take that dispassionate look at the full life-cycle costs and benefits before making the decision to go ahead or not.

The Chair: Thank you.

Wildrose caucus. Anyone have questions?

Mr. Anglin: Listening to your presentation, clearly, you've laid out concerns, so much so that my colleague here leaned over and said: are they totally opposed to this? Not that I wanted to rat him out or anything.

I want to ask you a question. Given the alternatives – we burn coal; you know that. We have high CO_2 emissions and a number of other things that are related to coal. Where are we with the alternative? We're looking at the development of hydro to assist us not just in that we're going to need electricity but to also take advantage of a different type of generation for electricity. So if we don't adopt this, what are the alternatives? How do we meet our needs?

Dr. Donahue: I guess I'll start maybe with what I consider the no-brainer. I mean, my understanding of coal is that we get approximately 65, 70 per cent of our power from coal in Alberta. If we wanted to cut greenhouse gas from coal production by half, we could simply convert it to natural gas, and that would ultimately, actually, allow Alberta to meet all of its and the country's national greenhouse gas targets.

In terms of going forward from there, if we got into more renewable things in the long term, I think a fairly easy – depends on who you talk to – quick fix that would get us there mid-term would be the phasing out of coal. We didn't leave the Stone Age because we ran out of stones. We left the Stone Age because there were better and more pertinent alternatives.

Mr. Anglin: So you're saying that the alternative to hydro development would be just natural gas development?

Dr. Donahue: No. I'm saying that in terms of hydro – to go back to, you know, "Are these guys totally opposed to it?" – I'm not necessarily opposed to hydro. I just think that there's a lot that needs to be done in terms of assessing the risks associated with it and making sure that things are appropriate and feasible economically and in every other way in the long term before we sort of put the cart before the horse.

Mr. Anglin: Do I still have time?

The Chair: Yes.

Mr. Anglin: I'm going to rephrase my question. I am a proponent of hydroelectricity development in unison or in combination with the development of natural gas generation in a distributive generation model. Why am I wrong?

Mr. Switzer: Sir, you're not wrong. I would say that it's an all-of-the-above strategy. Business of the usual case suggests that there's going to be more hydro developed. There are different ways that that hydro can be developed, both through reconditioning and upgrading of existing dams as well as potentially growing the hydrological base given the tremendous potential that we have here. But there are very specific conditions under which both the regulatory concerns but also the broader social licence concerns can be addressed, and a failure to do that means that hydro won't happen no matter how hard it's pushed.

I think it's important to have a portfolio. I think that the benefits of natural gas have been oversold and that there's still a lot of work to be done to make sure that the rest of the renewable space is developed. I think, more importantly, we also need to think about how to price in efficiency and how to take advantage of the capacity that we already have more efficiently. We're terrible electricity users and energy users generally in this province in terms of our efficiency, in terms of our building standards, in terms of our appliance performance, and so on. We can do a lot better.

With that in mind, I'd say that all of the above does work, but it needs to be approached in a manner that balances those different environmental, social, and long-term economic outcomes.

Mr. Anglin: It'd be safe to say that you're supportive of DSM incorporation.

Mr. Switzer: Okay.

The Chair: You have another minute if you like.

Mr. Anglin: I'm done.

The Chair: You are finished with your questions?

Ms L. Johnson: Madam Chair, I have a question.

The Chair: Linda, we're just moving into the PC questions.

Ms L. Johnson: Okay. If you could just put me on the list.

The Chair: You're actually first on the list.

Ms L. Johnson: Well, thank you. I wanted to pick up on the answer that said: simply convert coal generation to natural gas generation facilities. Are there any jurisdictions, any suppliers that have done that? I thought that I had asked that question of another presenter, and they said that it wasn't easily done. If either of our guests could answer that, I'd really appreciate it.

Mr. Switzer: I wouldn't be qualified to comment on a question of that scale. Certainly, there are individual plants that have begun co-firing with gas and others that have shut down in anticipation of pending carbon legislation.

Dr. Donahue: In terms of a direct answer, I'd have to say that I'm not entirely sure, but I do know that in Alberta back 10, 15 years when the price of natural gas was starting to increase, there were quite a few companies also that converted natural gas generation to coal generation to save money. I would argue that the reverse should be possible. I doubt if anyone has done it on a jurisdiction-wide basis, though.

Ms L. Johnson: Okay. Thank you.

The Chair: Ms Calahasen.

Ms Calahasen: Thank you very much. I've been contemplating the information that you've provided, and I looked at the glaciers in decline. The waters that we get from the glaciers formulate the rivers, right? If we do a hydro project and if the glaciers are declining, would that be a good way to be able to save the water from disappearing from the mountainous areas which serve us as the water source? Any one of you can answer.

Dr. Donahue: I guess it depends on what happens in terms of precipitation in the mountains. I mean, a dam in the mountains isn't going to save water if the water is not there, and the water coming off the glaciers is . . .

Ms Calahasen: Diminishing.

Dr. Donahue: Well, it's stored. It's basically geologically stored water. It's declining. It's like continually taking withdrawals from your bank. Eventually you run out of water. It's going to be a case of what's happening with rainfall and snowfall in the mountains.

Ms Calahasen: But if there's no glacial availability, then how can you get precipitation unless it's from the dams?

Dr. Donahue: It'll still be raining and snowing throughout the year in the mountains, and water will be running off. There will be a spring amount of snowpack just as there is anywhere where there aren't glaciers. If the glaciers reduce to the point of not contributing significantly to river flow anymore, which will likely be quite a while although they've experienced that in Glacier national park south of Alberta, it will just depend on what happens with precipitation. If it rains a lot more because of changes in climate, conceivably the amount of water in the headwaters of the river won't substantially change.

Ms Calahasen: So the watershed impacts can be determined in terms of what can happen and how they exist then, right? The watershed would then come from there, right?

2:30

Dr. Donahue: Well, the watershed already comes from there.

Ms Calahasen: So the watershed comes from there, flows down. You dam it up. You get more water, and therefore the water will then be in a situation where it could help. I'm looking at the shrinking of the waters and the water source. That's our water source, right? The glacial activity is mostly the water source?

Dr. Donahue: Well, for the headwaters.

Ms Calahasen: Yes.

Dr. Donahue: I mean, say, the Peace: if you go to Fort McMurray, the proportion of the flow that comes from the glaciers is very small.

Ms Calahasen: It's not as big as I thought it was supposed to be?

Dr. Donahue: No. It's not like the Athabasca River at Fort McMurray is largely fed by glacial melt or anything.

Ms Calahasen: Oh, okay.

Dr. Donahue: It's only in the very upper reaches – like, if you look at the graph I have of total flow, as you go downstream, it increases dramatically. So, you know, a portion of that flow – in the upper part, the really small bars on the left – will be from glacier melt, but if you look at that as a proportion of the flow down in Fort McMurray, it's relatively small.

Mr. Cao: Just to share some information that I learned, the Bow River flows through Calgary, and then people say that Calgary consumed the water. It's really only diverting it there and putting it out again. It's just like: we drink, and then we discharge, okay? That's something that I always worry about, people saying that water has to be, you know, used, done, finished. That's one part that I'd like to clarify.

My question is this, too. We have the Earth. The water vapour from the ocean and everywhere else, the clouds, running down and becoming ice and whatever, the total water in the world: where does it go? You're scientists researching it. If you look at Alberta alone . . .

The Chair: Mr. Cao, you have to get to your point because I've reprimanded people for talking about southern Alberta.

Mr. Cao: Yes. My point is that when we look at a map of Alberta, we draw it, but the climate, the water, the vapour knows no border, okay? So when you look at the map here, I would like to see that perspective rather than: hey, this is the border we're drawing up. I mean, it'll probably be wet somewhere, and then the water will flow here. So that's sort of my perspective.

Thank you.

Dr. Donahue: Should I respond at all?

The Chair: If you wish, quickly.

Dr. Donahue: Oh, okay. I mean, the water is out there. As the temperature warms, the amount of water in the air increases substantially, and in different regions it'll rain more and snow more. In others it'll get dry. Alberta, unfortunately, is in the rain shadow of the Rockies. As the air masses increase in elevation, it rains and snows more. Unfortunately, that, to a large degree, happens on the other side of the Rockies, and B.C. gets the water. That's ultimately why Alberta tends to be fairly arid, at least relative to other areas. It's not as if the water should be here. I mean, it moves around. It's not constrained to the borders of our province. We're subject to, you know, global atmospheric patterns and gravity, so if rain falls on the other side of the Rockies, it doesn't come here.

The Chair: Okay.

Mr. Bilous.

Mr. Bilous: Okay. Thank you. I'm enjoying how many questions we're all able to ask. This is for Mr. Switzer, and then I have a final, three-part question for Dr. Donahue. Again going back to your organization, the Pembina, it said that large hydro plants can play an important role in providing electricity if guidelines and best practices are applied in their design, their construction, and operation and if local communities are involved in the planning processes. I'm curious to know if you have examples or which examples you would point to from other jurisdictions that follow these best practices.

Mr. Switzer: Sure. Happy to do so although probably better not to speak off the cuff. I could provide a list of case studies, good examples from around the globe, that might be helpful in this context.

Mr. Bilous: That would be wonderful. Now, that means that we're going outside of Alberta, so if the chair is okay with these studies coming to the committee . . .

The Chair: Thank you. Yes, I am.

Mr. Bilous: Then also looking at – and I'm guessing this will be part of it, Mr. Switzer – models of planning and community engagement that have been effective and that we could and should look to, especially when we're looking at being inclusive in our consultation process and specifically with aboriginal communities.

Mr. Switzer: I regret that I don't have that information at hand. However, I mean, it would be a matter of a few days of work to put it together. I'm happy to discuss after how we might do that.

Mr. Bilous: Sure. Whenever that information can come to the committee. I don't think we have tight parameters on how quickly they need to.

The Chair: No, we don't, but we will be engaging with First Nations and Métis communities and, I think, asking them.

I'm a little bit loath to ask our presenters to put two or three days of study into something for our benefit. If, as you're going

through your normal course of work, either one of you identifies material that you think will be useful, that's not focused on southern Alberta only, we'd be happy to look at it. I don't think that asking presenters to do extra work is fair.

Mr. Bilous: No. To clarify, I'm just asking for you to send us what you already have – again, maybe it's not at your fingertips – but not to go out and conduct a new study or report.

Mr. Switzer: That's good.

Mr. Bilous: Then a question for Dr. Donahue: can you describe how, scientifically, minimum ecological flows should be defined in Alberta and how these definitions of necessary minimum flows should impact the decision-making process regarding hydroelectric development?

Dr. Donahue: Okay. Assessments of in-stream flow needs generally account for assessments of fisheries, riparian ecosystems, those being sort of the forests and landscapes on the borders of, say, rivers. Sediment dynamics: I mean, river flow basically determines where sediments go. There are scouring events that effectively clean up fish spawning areas, prevent massive accumulations of sediment, those sorts of things. I'm trying to think; there were some others. I'm thinking specifically of the in-stream flow needs assessment for the South Saskatchewan River basin that was done.

Ultimately, what they do is look at the full suite of benefits that we gain from rivers, and they try to tease apart the relationships between flow and those benefits. For example, say, fisheries: you may see fisheries sustained as flow declines, but at some point it hits sort of a tipping point, a threshold, and then you can see a collapse of fisheries, whether it's because the spawning habitat is now no longer accessible or overwintering habitat, those sorts of things. So in terms of how you define in-stream flow needs, there is very broad scientific literature on how to go about doing that. I actually did submit a brief of a report that we put out earlier this summer to Mr. Tyrell on in-stream flow needs and assessing in-stream flow needs.

In terms of how such an assessment should affect decision-making when it comes to hydro, I'm largely a scientist by background, a bit of a lawyer, so I kind of tend to think in black and white. I'd say that I'm more of a fan of a prescribed approach or regulations that are predictable in the outcomes. If we're going to assess something like in-stream flow needs and we're going to adopt policies or laws like the Water Act that say that we will manage these things in a way that doesn't impair our freshwater ecosystems, well, I think that the best way to do that is to look at the best available estimation of what is needed for maintenance of those freshwater ecosystems and then go apply that.

I mean, certainly, there's discretion that goes into it, weighing pros and cons. There are costs that perhaps we're all willing to make in terms of sacrifices of the health of rivers for economic or social benefits. That's kind of beyond – I think that's ultimately what politicians are for.

What I don't think we should do is redefine what sustainable flows are. I think that by doing so – for example, in the management of the Saskatchewan River basin – ignoring the actual science that says, "These are the in-stream flow needs needed" and saying arbitrarily, "You know what? Forty-five per cent is good," I think that removes the responsibility of decision-makers from basically having to account for the fact that they're ignoring the science and ultimately explaining the decision or the rationale for proceeding despite what the best science advice is.

I mean, science advice is just advice. There are a host of other social discussions and decision-making sort of criteria that go into it. I mean, I could be Spock-like and say, "Yes, it should be science," totally dispassionate, but that's not how the world works.

2:40

The Chair: Thank you.

Mr. Bilous: Thank you. I believe I'm finished.

The Chair: I'm going to exercise an indulgence and ask one question as the chair. It's to Mr. Switzer. Pembina Institute does a lot of work on policy. I'm sure that you're very, very aware of the federal policy on coal. My question to you would be: in your personal opinion, how do you think the federal policy on coal is going to affect this province's choices around hydroelectricity, realizing the potential in the north and our timelines?

Mr. Switzer: Let me preface this first by saying thank you for reminding me not to get too comfortable over here.

The coal policy: I'll speak as an individual and citizen of Alberta and not as a representative of Pembina Institute if I have your leave.

The Chair: Absolutely.

Mr. Switzer: Okay. My perspective, based on my read of the legislation, is that the coal legislation will not be a significant driver for accelerating any dramatic change in the Alberta grid mix. However, there is that 12,000-megawatt gap that I showed in my slide, which I'll make sure that all of you have a copy of when I leave. The question of how that gap will be filled and whether it constitutes solely new generation capacity or whether we're able to shrink the demand by bringing in some of those demand-side management opportunities that we were talking about earlier will ultimately shape what role hydro could play in that mix.

I believe, personally, that there is a role for hydro and that it can be done well. As a province that's taken some encouraging steps around cumulative effects management and begun a slow process towards understanding how to manage competing and multiple resource uses, we have an opportunity to get hydro right. In that context, it may well be that we can do hydro correctly in the north as well subject to the needs and long-term aspirations and rights of the communities in those regions.

The Chair: Thank you.

Just to clarify for everybody's purposes, this is a feasibility evaluation. To both of you: your contribution here is enormous. No one is going into this endeavour or this review with a preconceived outcome. It's very, very helpful for us to hear your opinions on this.

Again, our thanks for making the time to make these presentations and come before us and answer some questions that probably weren't always comfortable. So thank you for that.

With that, I think we will conclude this meeting. I wish everybody a great holiday. Merry Christmas and Happy New Year. Chris Tyrell will be in contact about the logistics of our next meetings, and I look forward to seeing you then.

Ms L. Johnson: All the best, everybody.

The Chair: Oh, we need a motion. Thank you, David. All in favour? Carried.

[The committee adjourned at 2:44 p.m.]

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