Legislative Assembly of Alberta

The 28th Legislature
First Session

Standing Committee on Resource Stewardship

Natural Gas Production Stakeholder Presentations

Wednesday, October 16, 2013
9:31 a.m.

Transcript No. 28-1-28

Legislative Assembly of Alberta
The 28th Legislature
First Session

Standing Committee on Resource Stewardship

Kennedy-Glans, Donna, Calgary-Varsity (PC), Chair
Anglin, Joe, Rimbey-Rocky Mountain House-Sundre (W), Deputy Chair

Allen, Mike, Fort McMurray-Wood Buffalo (Ind)
Barnes, Drew, Cypress-Medicine Hat (W)
Bikman, Gary, Cardston-Taber-Warner (W)
Bilous, Deron, Edmonton-Beverly-Clareview (ND)
Blakeman, Laurie, Edmonton-Centre (AL)
Calahasen, Pearl, Lesser Slave Lake (PC)
Casey, Ron, Banff-Cochrane (PC)
Fenske, Jacquie, Fort Saskatchewan-Vegreville (PC)
Hale, Jason W., Strathmore-Brooks (W)
Johnson, Linda, Calgary-Glenmore (PC)
Khan, Stephen, St. Albert (PC)
Kubinec, Maureen, Barrhead-Morinville-Westlock (PC)
Lemke, Ken, Stony Plain (PC)
Sandhu, Peter, Edmonton-Manning (Ind)
Stier, Pat, Livingstone-Macleod (W)
Swann, Dr. David, Calgary-Mountain View (AL)*
Towle, Kerry, Innisfail-Sylvan Lake (W)**
Webber, Len, Calgary-Foothills (PC)

* substitution for Laurie Blakeman
** substitution for Gary Bikman

Also in Attendance

Cao, Wayne, Calgary-Fort (PC)
Dorward, David, Edmonton-Gold Bar (PC)

Support Staff

W.J. David McNeil	Clerk
Robert H. Reynolds, QC	Law Clerk/Director of Interparliamentary Relations
Shannon Dean	Senior Parliamentary Counsel/ Director of House Services
Philip Massolin	Manager of Research Services
Stephanie LeBlanc	Legal Research Officer
Sarah Leonard	Legal Research Officer
Nancy Zhang	Legislative Research Officer
Nancy Robert	Research Officer
Corinne Dacyshyn	Committee Clerk
Jody Rempel	Committee Clerk
Karen Sawchuk	Committee Clerk
Christopher Tyrell	Committee Clerk
Rhonda Sorensen	Manager of Corporate Communications and Broadcast Services
Jeanette Dotimas	Communications Consultant
Tracey Sales	Communications Consultant
Janet Schwegel	Managing Editor of *Alberta Hansard*

Transcript produced by *Alberta Hansard*

Standing Committee on Resource Stewardship

Participants

9:31 a.m. Wednesday, October 16, 2013

[Ms Kennedy-Glans in the chair]

The Chair: All right, folks. Good morning. I'd like to welcome everyone here. We've got quite a day set, and I'm very, very, grateful as chair to see all of you here. We have a few people on the telephone. Maybe to start, we'll go around the room and introduce ourselves.

You well know that I'm Donna Kennedy-Glans, chair of this committee, MLA for Calgary-Varsity.

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

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

Mr. Webber: Len Webber, MLA, Calgary-Foothills.

Ms Calahasen: Pearl Calahasen, Lesser Slave Lake.

Mr. Khan: Good morning. Stephen Khan, St. Albert.

Mr. Bilous: Good morning. Deron Bilous, MLA, Edmonton-Beverly-Clareview.

Mr. Dorward: David Dorward, MLA for Edmonton-Gold Bar.

Mr. Gray: Jim Gray. I'll be presenting today.

Mr. Hale: Jason Hale, MLA, Strathmore-Brooks.

Mr. Stier: Pat Stier, MLA, Livingstone-Macleod.

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

Ms Zhang: Nancy Zhang, legislative research officer.

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

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

The Chair: Thanks very much.

We also have a couple of people on the phone. Kerry and David, I'll let you introduce yourselves.

Mrs. Towle: Kerry Towle, MLA, Innisfail-Sylvan Lake.

Dr. Swann: Good morning. David Swann, Calgary-Mountain View.

The Chair: Good morning.

Mr. Lalani from Ferus is on the phone as well. Mr. Lalani, are you there?

Mr. Lalani: Yes. Good morning. I'm Sean Lalani. I'm president of Ferus Natural Gas Fuels.

The Chair: Okay. Thank you.

Just to get through some of the formalities before we start on this day. Just to remind you, *Hansard* would like to control the microphones, not us. If you've got a phone, it does sometimes interfere, so if you can slide it under the table. Audio of this committee hearing is being listened to by others, and it's going to be recorded by *Hansard* and is available to anyone who would like to check the record.

To start, we're just going to have to look at the agenda, and I just want someone to move that the agenda for the October 16, 2013, meeting of the Standing Committee on Resource Stewardship be adopted as circulated.

Ms Calahasen: I so move.

The Chair: All in favour? Any objections? Moved.

Oh, you have an objection?

Mr. Dorward: No, it wasn't an objection, Madam Chair, but I would like to note for the record that I'm here for Ron Casey, MLA, who's unable to be here, so I'm substituting today.

The Chair: Thank you very much.

This morning we have two presenters. We've been introduced to both of them, and you've seen their bios.

Mr. Gray's bio is – he's a legend. He's a legend in Alberta. He's a legend in Canada. We're very, very fortunate to have you here in person, and we're grateful that you would drive to Edmonton to present to us. You have a wealth of knowledge that we are really quite fortunate to have access to. For all Albertans, from all Albertans, we say thank you.

We also have Mr. Lalani from Ferus. Again, we are enormously grateful that you would take time out of your day, out of your work, to be able to talk to us. We're hoping that we've done enough homework to be able to ask you very informed questions, and we certainly, certainly, care about the work that you're doing. Again, our hearty thanks to both of you.

What we will be doing is hearing from both presenters. Mr. Gray will start, for 15, 20 minutes, then we'll turn it over to you, Mr. Lalani, for 15 or 20 minutes. Then we'll have questions. We've got quite a bit of time this morning. We have until 11:30, just a time for open questions and to probe deeper and to follow areas of interest for individual MLAs. We'll have a break for lunch from 11:30 to 12:30, and after lunch we will have four panelists. We will conclude at 2:30.

With that, I'd like to turn it over to Mr. Gray. Thank you.

Canada West Foundation

Mr. Gray: Thank you very much, Madam Chairman. I appreciate the opportunity to come up and talk about my favourite subject. I am going to be referring to some slides. I'm a geologist, so I've got to have slides. I've got to have pictures, or I can't talk.

Just by way of background, in 1983 we initiated a company called CNG Fuel Systems that really became the largest company at that point in the conversion of automobiles to natural gas. I went over to the Po Valley in Italy, where a lot of the technology was founded. There was a lot of money spent at that time, and there were 35,000 cars converted across Canada and the U.S. We had research facilities in Detroit. They were dual fuel systems. We had tanks, and we had equipment for service stations, et cetera, et cetera. NOVA was our big partner. Then the oil price collapse of 1986 rendered that initiative uneconomic. While everybody got out every nickel they put into it, the enterprise did not prevail. That really started my interest. I've been in oil and gas exploration and production for over 50 years.

With that as a background, I want to put the economic underpinnings, the foundation, if you will, under this whole business that you're talking about, which is to encourage more use of natural gas, but you have to have a sense of where we're going in a sustainable way. The experience that we've been having in the last five or six or seven years, the astounding emergence, of course, of the shale gas phenomenon: is it sustainable? In other

words, we cannot just react to short-term data. We've got to have some understanding of where we're going in a long way.

In that regard, in this first slide I just make the point to you that there are two definitions you have to keep in mind with respect to supply. One is resources, and that's all the hydrocarbons or minerals or whatever that are known to exist. The reserves are just that portion that can be produced and delivered at a profit. Probably in the order of 5 to 10 per cent, maybe as much as 15 of our known resources today can be produced at a profit. It's that small.

They come in the form of a triangle. I'm not going to spend much time on this, but it's in the material. You can go through it later. This is oil, and as the grade of the oil decreases and in this case gets heavier and heavier, the amount of the oil goes up dramatically. Really, the largest amount of oil that we know to exist is in oil shales in the Green River basin of Colorado and some in Russia and elsewhere, and none of that is economic today. You'll see where our oil sands fit in right where that arrow is.

The important thing to recognize – and this is the one that now starts talking about natural gas – is that we access these lower quality resources and turn them into reserves. It's a function of price and technology, not just price; it's price and technology. You've seen the technology, with horizontal drilling and multistage fracking coming in in the last several years.

Remember that at the top, which was some of the very, very high-grade gas deposits – gas is gas. We're not talking about a change in the constituents. We're talking about the reservoirs of natural gas. You'll see where the high-grade quality gas – it's the gas we produced. I mean, when I started my career, we were getting 8 cents an mcf in B.C. and 13 cents an mcf in Alberta, escalating at a quarter cent per year. Yet we built plants and drilled wells and did all these other things, but it had to be very high-quality gas wells in order to do it.

9:40

But as the technology has evolved and as the price has increased, we've dug down deeper, and you'll see tight sand reservoirs. You'll see where coal-bed methane is. Then in the lower right you'll see shale gas. Below it you'll see both natural gas hydrates and geopressured aquifers. Now, the only two I'm going to talk about a little bit are shale gas and natural gas hydrates. I'm not going to go through this, but you can read it at your leisure. Five or 10 per cent of the resources of gas in the world we believe to be reserves, and that may be a high number. It's technology and price that moves it.

Now, the shale gas revolution. Remember that it started with George Mitchell back in the '80s. I met George, actually, at that time – I wish I had gotten to know him a lot better, I might add – and he was working and trying to establish how to make money out of this gas. Everybody knew the gas was there, but we didn't have the technology to get it out at a profit. He worked away, and we beavered away in the Deep Basin up in the Grande Prairie area and Fort St. John area of B.C. We could see the gas in the rock, but we just didn't have the technology to liberate it at a profit.

This next map, I'll just go through it quickly. You've seen it before. This is where all the shale gas and oil gas, shale oil basins are in North America. You can see that they're very, very widespread in North America. Now, however, something that we have to keep in mind is that only roughly 15 per cent of the world's shale gas is in North America; 85 per cent of it is elsewhere. Eighty-five per cent of the shale gas potential is elsewhere in the world. In fact, there was a recent report in last week's *Globe* about Sir John Browne, the ex-CEO of BP, heading up a big company to exploit the fifteen hundred tcf of shale gas that the geological association of Great Britain has identified in northern England.

Of course, there's the issue of fracking, but we're not here talking about that today. Whether it's Poland, whether it's France, whether it's Australia – China probably has twice as much potential shale gas as the United States does. The reason that North America has moved so quickly isn't the potential. It's because we have the engineers. We have the horsepower. We have the frac sand. We have the modern industry. We have the infrastructure. But that infrastructure now is spreading out around the world, and we're going to see that. We've been the laboratory in North America for shale gas. By the way, in gas hydrates it'll be a different country. But I just want to leave you with this understanding that shale gas is not a North American phenomenon. The vast majority of shale gas is elsewhere in the world.

These are just some quotes from, as I mentioned, John Browne and all the work he's doing in England. I won't dwell on this except to say that it was in the '80s that George Mitchell – and then we got involved in the '90s – desperately tried to turn the corner and go horizontal and started with a couple of fracs.

You've seen this diagram, I'm sure, many times, about the horizontal drilling and multistage fracking. Over 80 per cent of all the wells now are horizontal wells. The multistage fracking is getting up to where we had as much as 40 of those fracs.

The shale gas revolution is a brand new phenomenon. There wasn't any shale gas production in 2005. In 2006 and 2007 it started to build to where now it's 40 per cent of all the gas that we're producing. Now, that is an astounding event, that you could take such a big, huge industry – and that's what technology has done, not so much price as technology, and the technology continues to improve. So when we see this incredible change, that's what creates the opportunity. The question then, of course, is: is it going to continue?

Let me just quickly go to this slide. You'll see the differential between number 2 diesel and natural gas at Henry hub, and you'll see that it started there right around 2009. Shale gas production started in 2007, and by 2009 that differential – and that differential between the red and the blue line is the economic opportunity. That's the economic driver for moving natural gas into automobiles, into locomotives, into power at the expense of coal and various other things. I'm very strongly of the opinion that that differential is going to be sustained.

There's a quote in here from the United States – I forget which agency, but it's involved in here – that the world is awash in natural gas. Many people, and I'm one of those, believe that we are going from coal to heavy hydrocarbons to natural gas before we evolve into new fuels like possibly hydrogen or more nuclear, but that's way off in the future. I believe that natural gas, the cleanest of the hydrocarbons, is going to assume the dominant role in the next 10, 20, 30 years.

Remember that China, many people believe, has got about twice as much shale gas potential. By the way, Shell moved their coal-bed methane department from Dallas or Houston to China in the last year. They've committed to spend a billion dollars a year, which isn't a lot of money in the context of global resources, but they're at a minimum of a billion dollars a year on shale gas in China.

Now, I've been on CN's – and it's close to home for those of you from Edmonton – board of directors for years, and I'm still a director emeritus; I'm too old to be a director. You should know that there are 18,000 railroad locomotives in North America. That's line locomotives. I'm not talking about the little ones that shunt cars around yards. There are roughly 18,000 of these in North America.

There are two of them. There are the only two locomotives that are presently on natural gas. I had the pleasure of being in the cab of that one when they made their inaugural run from Edmonton to Fort McMurray on September 4, 2012. Those two locomotives have been on test for a year. That's an LNG tank in the middle, a 30,000 gallon tank. The tank can take it twice as far as the diesel that those engines can carry.

The big, major railroads now are moving very aggressively on natural gas. By the end of this year there will be something like – and you'll remember that getting this thing off the ground always takes time, but once you get it off the ground, it moves with increased velocity – half a dozen or a dozen brand new tankers, brand new engines. I was at a General Electric high-level conference last month, and they're moving with OEM, original equipment, on natural gas. You'll hear about trucks from Ferus. They're a wonderful company. No, I'm not going to touch trucks.

I will say this. When all these engines – and remember that natural gas is a more powerful fuel and cleaner than gasoline or diesel – start moving, I believe all these engines, all 18,000, eventually will be on natural gas. There are many compelling reasons for that. The main driver is economics, and you saw the slide of the differential. The fuel delivered is far less, and the environmental impacts are far less in terms of CO_2, NOx, and particulates. Then, of course, there's the security of supply. It's our gas. We're not importing oil; it backs out imported oil.

9:50

So those two engines are the only two in North America, and they're running from this city to Fort McMurray and back virtually every day. They're racking up information. They're racking up knowledge. By the way, CN has 1,200 of these engines. CP has 800 of these engines. That's 2,000 out of 18,000. The other 16,000 are owned in the U.S. BNSF is the biggest railroad, and they're moving very, very aggressively in terms of natural gas. Trucks are maybe 15 or 20 times as much diesel opportunity as rail.

Rail has one great advantage, one great thing going for it. CN would only need five or six LNG fuelling stops in the whole of North America to do their whole fleet. I was down at their strategic review meeting a couple of weeks ago, and they're very proud of their activity.

That LNG tank – by the way, none of this is new technology – harks back to the early '90s. They were running diesels on natural gas in the United States in the early '90s, but then the economics turned unfavourable, and they moved away from it. The environment wasn't as important as it is today, and it's come back.

Brand new technology is, of course, very, very high risk, but we run thousands of engines in the natural gas business in Alberta that were basically designed for diesel, but they're being run on natural gas in the compression business, moving gas through pipes and field compression and various other things. I'm just making the point that the railroad business is moving very, very quickly, and it's only six players. It's not a multitude of players. It's just six players.

Tomorrow's opportunity – I just want to mention this in passing – is not shale gas. The first opportunity will be that 85 per cent of shale gas that's outside of the United States, but the big opportunity is in natural gas hydrates. You'll see that those red dots and those orange dots are recovered hydrates, and I'll talk about hydrates in just a moment. They're spread all over the world. You'll see the cluster of dots around Japan. Well, natural gas hydrates are frozen in the subduction zones around the margins of the continents, and they're in the frozen sediments. They're natural gas trapped within the frozen lattice of water. They are enormous. They make the gas shales look like chumps. The biggest source of hydrocarbons in the world is natural gas hydrates, and there's zero production today out of natural gas hydrates.

The next picture. They're fairly close to the surface. I might add, with climate change there's some concern about gas hydrates because any alteration in the temperature of the water could liberate some of this. At any rate, this was recovered from a fish trawler on the west coast of British Columbia. That's what the hydrates kind of look like, and when they put them on the ship, they kind of pop like popcorn because the gas was popping out of them as it warmed up.

This is the important graph, though. All that orange – and this is the organic carbon in the earth – is estimated to be gas hydrates. The light orange or light orangey yellow is all of the recoverable and nonrecoverable coal, oil, and natural gas, so our great oil sands are somewhere in that little slug. You'll see the other elements here, but look at natural gas hydrates. It is enormous.

So what's happening about natural gas hydrates? Remember, in 2006 there was zero shale gas being produced. Six or seven years later it's 40 per cent of our reserves, our production. So don't discount the possibility of natural gas hydrates.

This is the largest research ship in the world. It is a huge Japanese research ship. It is now production-testing gas hydrates south of Tokyo. This is the most sophisticated research ship in the world. It can drill six miles, I think I read, in depth, and they are researching how to produce this. Japan will be to gas hydrates what the United States and Canada have been to shale gas. Remember, Japan started the Second World War over the issue of resource availability, and they have been desperate for centuries to solve their energy problems. They're hostage to other people. So gas hydrates are on the horizon, but these folks are quoted as saying that they believe that in the next 10 to 15 years gas hydrates will be here.

Now, I had a friend of mine ask the Esso research department if they were working on gas hydrates, and they said no. But we weren't working on gas shales either 15 years ago, and it came and blindsided us. I'm just saying that technology is just wonderful, what's happened and how it proceeds, so I envisage this as being the next wave of natural gas, which is going to sustain that differential, that delta between oil and natural gas on a long-term basis.

I've got a couple of minutes left to go. By the way, methyl hydrates could be a new energy revolution, says the professor at MIT. So kind of in summary I would just say that if you believe that the underpinnings of this natural gas revolution are going to be sustainable, then we will see a very substantial industry built up around it. In terms of conversion of trucks I'm sure Ferus will talk about what's happening with garbage trucks in the U.S. – most of them are on natural gas – and what UPS and others are doing. Railroads, power, ships are now being converted. Shell oil is converting one of their ships to LNG. A couple of ferries are being moved. We are just at the front edge of this.

I was on the Emerson commission, and one of our thoughts on the Emerson commission was that we should be, with our great oil sands, the place to go in the world, if you're going to be producing oil sands, for the technology, for transportation, for upgrading. I would just suggest that our government should give some thought to being part of the technology of the use of natural gas. Maybe we're just the Canadarm. We don't need to own the whole research vehicle. But I would be talking to GE, I would be talking to Caterpillar, I would be talking to others about what part of this technology, what part of this value chain we can move to Alberta.

We are known as a producer, but should we be expanding that into the value chain? Should we be pushing that some of that tech-

nology should be done right here in Alberta? I suggest that we should look at that and see if that's not possible.

The Chair: You've thrown down the gauntlet, sir. Thank you. That was amazing.

Before I turn to Mr. Lalani for his presentation, I'm going to allow Mr. Barnes and Ms Johnson to introduce themselves.

I'll start with you, Ms Johnson.

Ms L. Johnson: Thank you. Linda Johnson, MLA for Calgary-Glenmore.

The Chair: Mr. Barnes?

Mr. Barnes: Thank you, Madam Chair. Drew Barnes, MLA, Cypress-Medicine Hat.

The Chair: All right.

We also have Mr. Casey joining us. Would you like to introduce yourself, Mr. Casey?

Mr. Casey: Certainly. Ron Casey, Banff-Cochrane.

The Chair: Thank you.

Okay. Mr. Lalani, we are looking forward to hearing from you, and you're on the phone, so we are listening here attentively. Okay?

10:00

Ferus Natural Gas Fuels

Mr. Lalani: Madam Chair, thank you very much, and thank you very much to the steering committee for the opportunity and for accommodating our scheduling challenges. I don't quite know how I'll follow Mr. Gray, but I certainly will try. We're honoured and esteemed to be presenting to the committee and talking a little bit about what Ferus is doing and how the industry is developing around natural gas fuelling.

My name is Sean Lalani. I'm the president of Ferus Natural Gas Fuels.

Just a little bit of background on Ferus: we're a proud Alberta company, we were initially formed in 2001, and we're a true entrepreneurial success story. We have facilities in many of your constituencies, stretching from northwest Alberta all the way down to the southeast corner of the province. We're very active in Alberta and have expanded throughout North America.

I'm happy to talk to you about our company and some of the things we're doing in terms of enhancing the value of our resources in Alberta and elsewhere. Ferus Natural Gas Fuels provides end-to-end liquefied natural gas and compressed natural gas fuelling services. That includes the production of the product, transportation of the product, storage of the product, and delivery and dispensing of the product, including vaporization, to our customers. We're headquartered in Calgary. We have regional bases in Alberta in Red Deer and Grande Prairie.

We are proud to have supplied the first LNG-fuelled well fracturing jobs in both the U.S. and Canada. That was in Texas and in Alberta, right here at home.

In addition, with our partner, EnCana Corporation, we are fuelling the first modern-day LNG rail pilot by CN Rail, as Mr. Gray has described, in North America, which, incidentally, was located in Alberta.

In addition, we're operating the first LNG-powered tractors in Alberta. Further to that, we've recently introduced into our fleet the first LNG-powered all-field tri-drive tractors in North America, an engineering first.

In November 2012 we announced a partnership with EnCana Corporation to construct an LNG plant in northwest Alberta, which we are currently executing, and I'll talk a little bit more about that.

We are also proud to have very recently signed a major partnership agreement with General Electric corporation and Clean Energy to supply natural gas fuelling solutions in the United States. We're very excited by the opportunities opened up with this partnership and are looking for more opportunities to expand within Canada and will soon be announcing plans to do so.

Finally, we're also board members of the Canadian Natural Gas Vehicle Alliance, and we sit on the Canadian Standards Association's Z276 LNG technical committee.

Just to talk a little bit about our facility, we're constructing our facility in Elmworth, near Grande Prairie, Alberta. Once again, this is in partnership with EnCana Corporation. We expect it to be completed late this year and operational early next year. Once constructed, the plant will be producing 50,000 gallons a day of merchant LNG and will be the first of its kind in Canada. The Elmworth plant will concentrate on fuelling primarily the oil and gas industry but also aiding in piloting other industries such as rail and mining. In the oil and gas industry this includes pressure pumpers, drilling rigs, and tractor-trailers, all significant users of diesel currently. When all goes according to plan, we will be rapidly expanding that plant in multiple phases, ultimately reaching 250,000 gallons per day of production by 2016.

Now, to give you some perspective on our business and on LNG generally, let me take you through the properties of LNG. LNG is 95 per cent methane. It's stored and transported at around minus 160 degrees Celsius. Cooling it to this temperature greatly increases its energy density. It makes it one-600th the volume of standard natural gas, meaning that you can do 600 times more work with a given volume of natural gas.

In terms of safety it has a narrow flammability range in gas phase, 5 to 15 per cent concentration in air. In liquid phase it's incredibly safe and does not have nearly that flammability range. It has a higher ignition temperature than diesel. It's stored at about 15 psi, very low pressure, lower than most car tires.

On the environmental side it has many advantages over diesel. LNG is nontoxic, noncorrosive, and lighter than air, meaning that it dissipates into the atmosphere if leaked or spilled. It emits about 30 per cent fewer greenhouse gases than diesel and 90 per cent fewer particulates.

On the economic side, on an energy-equivalent basis LNG can represent a 30 per cent to 50 per cent cost savings over diesel.

Now to talk a little bit about the challenges with LNG. Mr. Gray did a fantastic job of enumerating the arbitrage opportunity that we have. What this opportunity represents is an opportunity to overcome 100 years of diesel infrastructure that's already been built in North America. We need billions of dollars invested in new facilities, new dispensing equipment, new transportation, engine conversions, and new technology, as Mr. Gray has described.

So if LNG is so great, why isn't everybody using it? The answer comes back to what we call the chicken-and-egg problem. Potential customers are hesitant to invest in new fuel if there is no supply. Converting to natural gas is not cheap. For instance, one of our transport trucks costs an incremental 50 per cent extra to be on LNG as opposed to conventional diesel. That translates to about $90,000 per truck. Converting a drilling rig to use LNG represents about $300,000 in additional upfront costs. Companies hesitate at making these investments if there's no secure source of fuel supply and secure source of savings.

On the supply side a small LNG production facility, like our Elmworth plant at 50,000 gallons a day, can cost upwards of $30 million when you include all of the related infrastructure. Larger facilities can cost anywhere from $50 million to $250 million, depending on capacity. Potential LNG suppliers are unwilling to invest these millions if there are no customers.

Ferus has helped to solve that problem by becoming our own customer. We along with our partner EnCana have committed to converting our own fleets to use LNG and natural gas. This will ensure that a significant portion of our Elmworth facility's LNG is utilized even if there are few initial customers. Having created a secure supply source for LNG in western Canada, we expect that companies who see the environmental and economic benefits of LNG will now be willing to convert, thereby taking up the remaining volumes at Elmworth and allowing us to feed the market. We also see a snowball effect occurring once a significant source of supply is available. We believe that LNG's advantages are manifest and that once customers are able to prudently invest in LNG, they will demand more and more product.

Now, in terms of adding value and how we help Alberta and the resource base, yesterday the price of natural gas in Alberta was in the low 3s per mcf. This sits, obviously, on the low end of historical prices going back 10 years and on the high end of historical prices going back into Mr. Gray's career. However, the delivered price for liquefied natural gas is somewhat difficult to ascertain as the market is still small, but on a diesel-equivalent basis it likely lies somewhere in the neighbourhood of $15 to $25 per mcf, depending on the application.

This adds considerable value to Alberta's natural gas resources. It's also worth noting that this higher value is still extremely competitive with the price of diesel in Alberta. To delve a little more deeply into these numbers, the key costs contained within that price are, firstly, the commodity price; secondly, the cost of liquefaction and the associated investment; thirdly, the transportation of LNG; and finally, the fuel storage and dispensing of that LNG. In addition, through the arbitrage and price difference between diesel and LNG the consumer is required to recoup their investment in the technology. All of these components require considerable investment in Alberta, expanding the scope of the industry's overall economic impact within Alberta.

Now let me break out the key cost components of LNG. As noted, the underlying commodity price for natural gas only accounts for about one-fifth of the delivered price of LNG. In fact, LNG can respond to significant volatility in the underlying price of gas and still remain competitive with diesel. As more natural gas is used for fuel, this has the potential to impact the price of natural gas in Alberta, but as the use of natural gas for fuel is currently a very small portion of total natural gas consumption, this impact should be minimal. It is important to note that there is that significant scope for increases to the price of natural gas before it becomes difficult for LNG to compete with the price of diesel.

10:10

The largest portion of the delivered cost of LNG is liquefaction and the associated infrastructure. Production plants such as our Elmworth facility that actually liquefy the gas make up the majority of the upfront cost of LNG. It requires the expertise of experienced engineers, highly trained construction workers, numerous trades, and numerous operators. Transportation represents a relatively small portion of the cost of LNG but does require investment in trucks, trailers, and drivers.

In contrast to the refining model the LNG model is much more of a localized phenomenon. With LNG, due to its cryogenic nature, you require considerable investment in transport equipment. That transport equipment is oftentimes two to three times the cost of comparable diesel equipment. As a result, LNG carries an effective economic radius within which it is more economical to build a second LNG plant than it is to transport product outside of the radius. That radius oftentimes is 300 to 400 miles radiating out from an LNG facility. If you compare this to diesel, diesel oftentimes is produced in a central location and transported many hundreds, even thousands of miles. With LNG it will become very much a localized, community-specific phenomenon, creating a significant number of jobs, creating a significant amount of economic impact.

Storage and fuel dispensing also represent a significant cost. In order to serve customers, companies such as ours need to invest in specialized equipment, trained drivers, and trained operators. However, those costs can be greatly reduced when LNG is dispensed in a retail setting for on-road transportation. The on-road transportation portion of the industry and the dispensing portion of the industry generally will also require many millions of dollars of investment within the province.

Just to talk a little bit about potential impact on the province of Alberta, projecting forward, we could certainly see a day in the very near future when up to 50 per cent of all diesel consumption in the province is converted to LNG. In 2012 Alberta consumed approximately 6.6 billion litres of diesel. Doing some quick extrapolation, if half of that volume was converted to LNG, it could mean an incremental increase of 120 bcf a year of natural gas consumption within the province, approximately a billion dollars of cost savings for energy consumers, and over $2 billion of capital investment in liquefaction alone in addition to adding approximately 1,200 new jobs. All of this investment uses Alberta natural gas to create Alberta liquefied natural gas, which fuels engines to find and produce more Alberta natural gas. This represents what we like to call the creation of a virtuous cycle of value creation within the province.

While the creation of that economic value within the province is certainly important, we would not be telling a complete story if we did not touch upon the environmental benefits. I've already taken you through some of the general benefits of LNG – safer, fewer emissions, decreased risk of long-term environmental damage – but let me specifically comment on our Elmworth project. The Elmworth project will support oil and gas companies who burn diesel in their ongoing operations and allow them to displace diesel consumption with cleaner burning natural gas.

We've certainly done some work to attempt to quantify the emissions reductions expected from the Elmworth facility. Our assumption is that every gallon of LNG produced replaced an energy-equivalent amount of diesel. As LNG has approximately 30 per cent fewer harmful GHG emissions than diesel, every litre produced reduces diesel greenhouse gas emissions by 30 per cent. At our capacity of 50,000 gallons per day we expect the Elmworth facility alone to deliver approximately 43,000 tonnes of greenhouse gas emission reductions every year. Those emission reductions will increase proportionally as we expand the facility or construct new plants in the province. Incidentally, using those prior numbers, if 50 per cent of diesel use in the province is displaced and converted to natural gas, we would expect over 3 million tonnes of greenhouse gas reductions every year.

Finally, let me talk a little bit about the challenges and how we believe the government and the committee can help in advancing this initiative. To help this industry grow and prosper, I think that there are two or three key things that the Alberta government can do with very little required incremental effort.

Firstly, we recommend that the province strive for regulatory simplicity and certainty. Many of the codes and standards for

LNG and for natural gas, generally in fuelling, are being written as we speak. The creation of the single Alberta Energy Regulator is an excellent step in this direction. We watch with great interest as the regulator takes shape and are optimistic that it will bring greater policy certainty and simplicity.

We also recommend that the province take an active role in communicating the benefits of LNG for fuel use in Alberta. The Alberta government has an unmatched ability to reach all Albertans with its communication/messaging. If it were to use this ability to educate Albertans on the benefits of natural gas for fuelling, it could raise awareness on a scale that could not be matched by individual companies like EnCana, CN Rail, Ferus, and others. As the LNG industry in Alberta is still small, raising awareness is an important aspect of any growth plan.

Finally, we look to the government to support the industry. This support can come in many ways. There may be commitments to utilize natural gas to fuel government fleet vehicles, providing the savings on an operating cost basis to the government while still supporting the industry. It could continue to support innovative funding programs such as the Climate Change and Emissions Management Corporation.

There's also the example of weight exemptions. Our specific LNG tractors operate at a higher weight simply due to the fact that they carry a greater amount of LNG on board to achieve the same transportation distance as diesel. That represents about a 1,500-pound penalty relative to running a diesel tractor. Just to overcome that penalty by providing a weight exemption would provide an incentive to the trucking industry to convert to LNG. Providing an incremental benefit to that, say a 3,000-pound exemption, would provide an enhanced incentive to trucking companies to convert to LNG.

In closing, given the economic and environmental advantages represented by natural gas for fuel, we have high hopes for the industry. Our partners – EnCana Corporation, General Electric, Clean Energy, and others – all have high hopes for the industry. We believe it's in the best interests of Alberta to support this industry as it grows and evolves. We're pleased to be at the forefront of this industry and see great promise to bring greater value to the province's resources.

Thank you very much to the committee for allowing us to talk a little bit about our company and our plans, and we would invite any questions or comments.

The Chair: Thank you, Mr. Lalani. That was excellent. We miss you in person, but you're able to communicate very effectively and compellingly.

I would also like to draw attention to one of our panelists for this afternoon who's joined us, Mr. Winton from Westport Innovations. Thank you very much for arriving early. You're obviously keenly interested in this topic, and we're looking forward to this afternoon's continued discussions.

I'm going to open up the floor now for questions, and we have one question from Dr. Swann on the phone. I'll let Dr. Swann ask his question, and then I'm just going to look for hands. If anybody on the phone has a question, I'll ask for that question after Dr. Swann's questions.

Go ahead, David.

Dr. Swann: Thanks very much. Both presentations were excellent and certainly raised a high level of understanding of the tremendous potential for energy and environmental benefits to Alberta.

Mr. Gray and to some extent Mr. Lalani talked about the carbon reductions and the energy required to extract the gas in total benefit to greenhouse gas emissions. It's very clear that the NOx and SOx and particulates are not present in natural gas, but it's my understanding that the greenhouse gas emissions associated with unconventional gas extraction such as that associated with shale gas and fracking are not very much different from conventional gas. Would either of you like to comment on that? I guess I'm wondering about the differing reports on the benefits associated with, particularly, shale gas extraction, associated with conventional versus unconventional extraction techniques, and how much benefit that is.

10:20

The Chair: Mr. Gray, do you want to start this off?

Mr. Gray: Well, lookit, I think that Ferus would have a better view of the consumption of it and the emissions. I would just say, of course, that when you look at one of these major frac jobs with all the trucks and all the horsepower, over the life of the project I would question very much as to whether – I believe that shale gas would be environmentally more benign than conventional gas.

But when you say conventional gas, that takes in a huge range of gas. Are we talking about tight sands? Are we talking massive, like Ferus's plants at the Elmworth field? We built the Elmworth field and found the Elmworth field. We had wells there that would produce 30 million and 40 million and 50 million cubic feet of gas per day. Of course, on a unit basis that conventional gas would be much cleaner.

Now, coal gas: that's kind of unconventional gas. Tight sand gas is unconventional gas. I'm just making the point that getting apples to apples on that sort of thing is extremely difficult because there isn't a normal definition for conventional gas. It's an economic test, but there isn't a normal definition of what well is a conventional gas well because it's a whole range of wells that fit that category.

I know that doesn't answer the question, David, exactly, but I think it points to the difficulty of having an answer to a question like that.

The Chair: Mr. Lalani, any comments?

Mr. Lalani: You know, Mr. Gray enumerated exactly that the difficulty here is in defining what actually makes a conventional well versus an unconventional well. Certainly, what we know is that there is a greater intensity in terms of extracting the unconventional resource. I think what we strive for is efficiency in minimizing our environmental footprint. That's where I think the real opportunity on the environmental side in terms of adopting greater natural gas into our operations lies, in reducing that environmental footprint, reducing the particulate emissions as a result of moving over to natural gas as a fuel instead of diesel and reducing our environmental footprint from a greenhouse gas emission profile. It represents an opportunity to provide an incremental benefit as opposed to diesel.

To me, the comparison really isn't unconventional wells to conventional wells. It's just extremely difficult to make that comparison given the types of conventional wells you have and the types of unconventional wells you have, but I think the real opportunity here is to reduce our environmental footprint by moving to a cleaner fuel that adds more to our resource economy.

The Chair: Thank you.

I've now got two questions on the list here from Mr. Stier and then Mr. Anglin. Is there anybody on the phone who's got a question? Okay.

Mr. Stier: Good morning. Thanks to both of you. Mr. Gray, I often used to see you downtown. We often passed each other in the +15 system, I believe, in the buildings down there. It's a pleasure to see you once again. Mr. Lalani, we haven't spoken before, but I enjoyed your presentation immensely.

In my past I had witnessed in the early '80s – I think Mr. Gray identified this era – when Alberta Gas Trunk Line, then NOVA, became involved in such an endeavour. I had the privilege of monitoring the installations in their shops of all this equipment necessary to convert to natural gas. They attempted to do that on five-ton trucks down to half-tons and including some of their cars.

One of the difficulties in those days was the limitations of the engineering at that time. You could only have so many gallons of fuel in a tank, and sometimes in a car, as an example, you had to take out the entire back seat to accommodate two or three of these torpedo-sized tanks, if I could use the term, to provide it with enough capacity to have it last for a few days. Similarly, with the larger vehicles and, of course, due to the lack of supply remotely, they would have to put several tanks on every vehicle, and sometimes those five-ton trucks looked like a tanker truck carrying tanks beyond the other equipment they had to carry.

My question after that long preamble is this. Has technology changed much in regard to the capabilities of carrying capacity on vehicles and/or equipment? It was noted here earlier that $90,000 might be needed to convert an average heavy truck, and I suspect a lot of that is tanks and so on. Would there be any work done in the area for more of the smaller vehicles that we commonly see on the road: one-tons, two-tons, three-tons, and even cars? Can you elaborate on that a little bit, please?

Mr. Gray: I was involved in the CNG fuel systems. Bob Blair at NOVA and I were involved in it. It was really entrepreneurial, but, you know, you don't win them all. Our timing was wrong. The point is that that was all CNG. That was all compressed natural gas. There was no LNG at that time. That was all compressed natural gas, and they were all dual-fuel systems. I had a car where you could flip back to gas, and you had a reserve of gasoline. It was all CNG. You're quite right. I mean, the technology back in the '80s – that's 30 years ago. There isn't any technology over 30 years that hasn't dramatically improved. Westport, back here, and others are in the forefront of doing that. I wanted to make that distinction.

Now, one final comment. CN, for instance, is now using CNG in all their intermodal yards for their small trucks moving around. CNG makes a lot of sense, possibly even on rail for the short lines, for short distances. LNG makes total sense for all the long-distance stuff. CNG for local municipal work: I'll talk later about one opportunity I see here in Alberta. I just wanted to make that distinction: CNG, lower volumes, short distances; LNG, of course, for the long-distance stuff.

The Chair: Mr. Lalani, anything else to add to that?

Mr. Lalani: Yeah. I think, just to talk about the physical properties of CNG and LNG and a comparable gallon of fuel or litre of fuel, if you're looking at diesel versus LNG, a litre of LNG has about 60 per cent of the energy content of a litre of diesel, for instance. So you're talking about a lower density relative to diesel, which requires you to carry about 1.6, 1.7 gallons or litres of LNG relative to each gallon or litre of diesel. In the case of CNG it's about half the density of LNG. A CNG gallon or litre, for instance, will carry about 30 per cent of the energy content relative to, say, diesel. It would require you to have three to four litres or gallons of CNG onboard to accomplish the same amount of work as one litre or gallon of diesel. So there are limitations on range.

Now, you can overcome those limitations on range by carrying greater tankage onboard, as you had mentioned, Mr. Stier. The challenge with carrying that extra tankage onboard is the impact that it has on weight. I can speak particularly as it relates to our heavy-duty trucks, our heavy-duty tractors, the tractors that companies such as Bison Transport are introducing into their fleet. The challenge you have is that with that additional weight onboard as a result of the tankage and the additional fuel, you can accomplish the same range, but it requires you to reduce your payload. That comes at an economic price.

Trucking companies are obviously very sensitive to operating costs. They're also very sensitive to revenue impacts. To the extent that I need to carry greater tankage onboard, reduce my freight onboard as a result of the greater weight, that impacts me on a revenue mile basis. I think there are some things that we can do from a government standpoint that would have very little impact in terms of government expenditures but would have significant impact in terms of adoption for heavy-duty engines.

10:30

I think the only other thing to add – and I'm sure Mr. Winton will talk about it this afternoon – is that today Westport is opening a new manufacturing facility in Ontario. We're very proud to be there and are ordering a couple of the first trucks coming off that line. They are dual fuel, CNG-gasoline heavy-duty trucks, F-250s I believe. So the technology has evolved to a point where it's absolutely tremendous. Companies like Westport are to be celebrated and commended for what they're doing in advancing technology.

The Chair: You had a follow-up question?

Mr. Stier: Yes, just a follow-up if I may.

Thank you for your answers. They are very appropriate. I guess if I understand both of you correctly, we're still in a bit of a situation where technology has not addressed the issue that I raised. As a matter of fact, I think you've pointed out, Mr. Lalani, that it is still a major issue and much work needs to be done in regard to this. I recall that at the time I had a large pickup, and I resorted to an eight-foot box to put my propane tank into because I was on propane and gasoline. It is still, therefore, I gather, an issue that we'll be faced with in trying to understand the direction that should be taken with this. If I understand it, there are a lot of tanks still necessary. Is that correct?

The Chair: Are you asking Mr. Lalani?

Mr. Stier: Yeah, Mr. Lalani. Just to clarify, these tanks are still the issue, and you just said that we would have to be compromising capacity on trucks, et cetera, because of that tank allowance, correct?

Mr. Lalani: Yeah. And that relates to the actual physical properties of your liquefied natural gas or your compressed natural gas. There are only so many molecules you can fit into a certain volume of space, so that comes to the physical properties. On the technology side there have been tremendous advancements in terms of storing cryogenic product, for instance, and LNG. So that has enabled us to have fairly standard tanks, and it's starting to drive down the costs of tankage. But the reality is that because of the physical properties of liquefied natural gas or compressed natural gas, in order to achieve the same range, you will require greater tankage.

Mr. Gray's point is valid in that there are different horses for different courses, is the analogy I'd use. CNG will have its applications in what we term return-to-base fleets, so fleets that are very close to their fuelling point that can accommodate frequent fuelling. LNG will have its applications in more of the long-haul fleets, fleets that run the highways, run transcontinental.

In terms of the technology and the facility that Westport is opening today – again, I'll defer to Mr. Winton to talk about this in the afternoon – you know, it really is a fantastic technology. It allows you to minimize your on-board CNG tankage and run on the fly between gasoline and compressed natural gas. So you can experience the benefits of running natural gas but still have the ability to run on gasoline during those periods where you need the extra range. I think that's probably the bridge technology that gets us there.

Mr. Gray: Right. They've been making these tanks for many, many years now out of composite material, wound fibreglass, not just steel tanks, not just aluminum tanks. The technology is driven by that delta on that graph. If you're convinced that that delta, which has been around now for seven or eight years, is going to continue or maybe even get larger, then the amount of money that will be spent around the world in utilizing natural gas – there are going to be 600,000 or 800,000 CNG vehicles in China within the next two to three years. With the amount of money that's going to be poured into this technology – and I'm so proud of what Westport, Ferus, and others are doing in Canada – this is going to be a very competitive, aggressive global business.

Mr. Stier: Thank you very much.

The Chair: I'm imagining a Canadian gas arm here now, not a Canadarm.

I have Mr. Anglin and then Ms Calahasen. If anybody on the phone has a question, let me know pretty quick.

Mr. Anglin: Thank you very much. Thank you for your presentations.

Getting beyond the technology, I've been convinced, I think since the '70s, as I first started to see conversions, that every time the price of oil spiked, there was always a push to look at converting vehicles and a number of other power sources to either natural gas, propane, or one of the technologies that was available. But in the end, eventually it's always economically driven, it's market driven. There's a pricing mechanism that sets the chain into motion.

I'm just curious. No one really talked significantly about international shipping. I know when we deal with ships, the amount of fuel that they use is significant in the price that we deal with in imports and exports. I really appreciate and it's interesting to me the limited amount that we've actually applied to locomotives. I would have thought it was more, and I've really learned something here. The other thing is the actual generation of electricity, which sort of models one of the graphs, I think, that was shown of all the various plants around which actually resemble something called distributive generation.

So what I would ask you to do is: could you elaborate on the market forces that would really sort of compel the advancement? In other words, these investments have to be made at a number of different levels to make the conversion, which will then increase the demand for the industry and start that ball in motion. Looking at our current system today, what are those market forces that would set this in motion? The government can only do so much. It's usually the market that drives it.

Mr. Gray: That's why I tried to take quite a bit of time on the underlying direction of supply and demand and that graph up there that shows that delta. Mr. Lalani mentioned that it's, I think, a 40 to 60 per cent discount of natural gas to diesel. So if that delta persists and people have confidence that it will persist, that will drive the market forces to capitalize on that cleaner, more abundant, cheaper fuel. It's that delta up there, it's that differential that fundamentally drives it. By the way, that doesn't take into account any CO_2 value for displaced CO_2, et cetera.

I think your question is: what will be the market forces that derive this on a sustainable basis? My answer to that would be: it's that differential that has existed since 2010-2011. I for one am of the opinion that it's going to continue. That differential will continue. And it won't be like 1986 where it squeezed off and killed CNG fuel systems, I might add. In other words, I don't think that's going to happen.

Now, you can get other people's opinions on that. But that's why I took the time about how much shale gas is in North America and how much is elsewhere and where gas hydrates and blah, blah, blah, because I think that differential is here for a long time and that will drive the market case for the technology, for the conversions. People have to make these big multi-billion dollar investments with some confidence that this circumstance is going to last for quite a long time.

So the foundations under this house are supply and demand of natural gas. That's the foundation. The house is conversions and capitalizing on it, but the whole business case is based on the supply and demand of natural gas globally. Does that get to the question?

Mr. Anglin: It gets to the question.

Just one follow-up question. Is there a time frame that that differential – looking out in the future, would you say 10 years, 20 years, 30 years? What would be the adequate length of that time frame that would instill the confidence in the market?

10:40

Mr. Gray: Now, remember back in 2006 such wonderful people as Exxon and Shell and the biggest companies in the world had zero value in their business plans for shale gas?

Mr. Anglin: Yes.

Mr. Gray: So that question you've asked is unknowable, what's going to happen 30 and 40 years from now. If that delta continues for the next five or 10 years, it's going to drive billions of dollars of technology. And where does that take us? It lowers the costs of tanks, of conversion. It proliferates the LNG and CNG availability. And yes, as I mentioned, Shell is converting a fairly large ship at this time, and there are some ferries that are using or starting to use LNG.

To try to guess where we'll be in 30 or 40 years – the Emerson commission set a 40-year period – we didn't know 15 years ago where we'd be today, 10 years ago where we'd be today. To try and say where we're going to be in 40 years is really tough except that technology is going to be driven by that delta. I think it's going to take natural gas to very exciting places. But to be able to define that mathematically is very, very difficult. Impossible.

Mr. Anglin: Well, I think you actually answered the question. I wasn't asking you to predict. What I was asking was: how long does that differential have to be maintained to really require that investment? And I think you just answered it when you said that if it stays there for six to 10 years, in your opinion that would cause a significant investment to now come forward.

Mr. Gray: Right. I would ask Westport and Ferus how long this differential has to be in place to embed that kind of technology. I'm quite confident – CN is confident – it's going to continue for the foreseeable future. What's foreseeable? Five to 10 years.

The Chair: Would you like Mr. Lalani to speak to that question?

Mr. Anglin: Oh, absolutely. Yes.

The Chair: It's good. A redirect of the question here from one of our presenters.

Mr. Lalani: Thank you, Mr. Gray. I'm certainly a student of history, and I recall the conversion of the steam locomotive industry to diesel locomotives. We had probably – and Mr. Gray can speak to this better than I can – a period of approximately five to 10 years of early technology development and then just a rapid adoption cycle over the course of seven to 10 years, where diesel locomotives became the norm in North America, and that really drove the trucking industry from a competitive standpoint. It drove all of your other modes of transporting goods and products across North America and, in fact, globally.

You look at a company like Westport, who really had the breakthrough in terms of long-haul trucking. They introduced their 15-litre engine in 2007, so approximately six years ago. We're now seeing second- and third-generation engines being produced, which are more efficient, provide greater gas displacement, and are just a much better technology overall. So I think we're kind of heading into what we see as that second cycle.

I think Mr. Gray is bang on, and certainly I defer to Mr. Gray's experience here. That six- to 10-year time frame sounds just about right in terms of the investment required and the construction of infrastructure. You know, you've got companies like General Electric, Caterpillar, just massive, massive companies who are making this investment in fuelling the North American economy off natural gas as opposed to diesel.

Mr. Gray: Remember, the diesel engine was invented in the '30s. The Second World War was, fundamentally – there were a lot of diesel engines. The railroads were still on coal until the early '50s, mid-50s. So it took them quite a long period of time, and that is shortening dramatically now.

By the way, if all 18,000 of those railroad engines converted to natural gas, it would be about 1.8 bcf per day, almost 2 bcf per day. We produce 13 bcf per day. So it's not inconsequential. It is compared to trucks, but it's not inconsequential.

The Chair: Thank you.

Mr. Lalani: The only other thing to add to that would be competition. So there's the arbitrage, and there's the competition. As we're seeing this accelerate in the rail industry, it causes an acceleration in the long-haul trucking industry.

The Chair: That sounds healthy.

Ms Calahasen.

Ms Calahasen: Thank you very much, Madam Chair. Thank you to both presenters. Mr. Gray, thank you also for all the work that you have done in my communities. You've done exemplary work. Thank you very, very much for that.

I've never met you, Mr. Lalani, but you presented quite interesting, important information for us today.

I have a few questions. My first question has to do with natural gas hydrates. I'm looking at the gas hydrates that are presently in the organic carbon in the Earth as Mr. Gray presented in figure 12. When I look at that, I think – well, you indicated that the natural gas hydrates are in a cryogenic state. Do we have enough knowledge or technology to capture and store the potential of the gas that will be emitted as a result of the environmental change?

Mr. Gray: No. I mean, the environment change you're talking about is warming of the oceans or something like that?

Ms Calahasen: Yes.

Mr. Gray: No, no. This is a massive amount of methane. By the way, it's methane. Whether it comes from shale gas or from carbonate reefs that we've produced here for years or whatever, Elmworth, the Deep Basin, it's all methane. No, there's no way of capturing the gas that comes as a result of climate change. These gas hydrates are in the margins. They exist from about 500 metres down to about 1,000 or 1,500 metres down. They're a great pillow of methane, gas hydrates.

How you produce them is not known at this point. I mean, we have produced gas. Canada drilled a well up in Tuktoyaktuk and produced gas out of gas hydrates. But the Japanese have that ship. They have stated that they expect their first production in 2018-2020 out of gas hydrates. How they produce it is still what they're researching, whether it's going to be like a SAGD thing, where we produce heavy oil out of SAGD, where we circulate a warming fluid, and then when it warms up, we produce the gas, or whether they produce the bottom of the hydrates and let the top of the hydrates be the cap so that it doesn't escape. They don't know.

But let me just repeat. They didn't know anything about shale gas until we had horizontal drilling and multistage fracking, and it dramatically changed things. So there isn't anybody that I know in our industry that will discount hydrates. Very few people will count on it to be a specific percentage at a specific time because we just don't know, but it's a huge opportunity out there.

Ms Calahasen: So there's no research presently occurring to be able to address that specific issue of how, then, you capture that?

Mr. Gray: You mean the naturally releasing . . .

Ms Calahasen: The natural gas, yes.

Mr. Gray: You know, you saw that map of the distribution of these things. They're all over the world. They're all over the world, from the Antarctic to the Arctic and all around. They're very pervasive. They're not just in the Arctic areas. They're right in the Gulf of Mexico. They're right at Japan. They're around Australia. So, no. That was just an aside I was making. That isn't central to the production of methane.

Ms Calahasen: I understand that.

Madam Chair, can I go to another area, talking about a specific issue within my area?

The Chair: Certainly.

Ms Calahasen: What does long-term storage look like for LNG? Specifically, is there any reason to think isolated communities, where most of my communities are, that currently rely on diesel for electricity, could one day move to LNG?

Mr. Gray: I think Mr. Lalani would be best.

Mr. Lalani: Ms Calahasen, thank you for the question. Actually, just recently we mobilized equipment and were on-site at the town of Slave Lake – this was approximately two weeks ago – for a

week and a half providing backup gas supply to the entire town as a result of some maintenance outages that were happening. It in fact is what we're doing today. We're providing backup gas supply. We're providing LNG to power remote communities and certainly are looking to displace diesel with natural gas.

10:50

There's an interesting case study that actually is happening right now in the Yukon. Yukon Energy, the utility up in the Yukon, is converting a number of its old diesel generators over to a natural gas service. The natural gas being utilized to fire those new generators will be liquefied natural gas. In some instances that liquefied natural gas will actually be produced in Alberta and transported up to the Yukon to fire their electricity generation. It has incredible opportunity in terms of introducing, really, a new source of wealth to our more remote communities and our northern communities by reducing their energy costs by that 30 to 50, 60 per cent that both Mr. Gray and I have talked about.

Ms Calahasen: That's a blessing for northern Alberta and isolated communities. Thank you.

The Chair: Thank you.

I have a question myself I'm going to ask, but I'm going to put the folks on the phone on notice if they've got questions after my question. Anybody else here just put your hand up.

One of the tasks of this committee is to actually provide recommendations to the government on areas of study that we pursue. Your guidance, Mr. Lalani, on exactly what the government of Alberta can do was very, very helpful to us. You've identified the value of regulatory certainty and simplicity, the value of communicating, raising awareness of the benefits of LNG use to Albertans, and, thirdly, supporting the industry by putting in place weight exemptions for LNG vehicles. I guess I would ask both of the presenters today for that guidance because that is what we're seeking.

Secondly, as part of that answer if you could give reference to other jurisdictions, sort of cause and effect – my co-chair alluded to market forces. I think we always look to market forces. But what is the catalyst role of government, and how is that manifested in other jurisdictions to move this agenda along or catalyze it a precise point in time, with good results or with bad results?

Mr. Gray: Well, let me start off and then pass the baton. I've often thought that the Calgary-Edmonton corridor, Calgary, Red Deer, Edmonton – and every time I drive it like I did this morning, I'm reminded of this – is one of the most concentrated corridors that we have, away from 401. I'm not talking about 401 in Toronto. I've often thought about whether there should be a very sophisticated, strategic plan for an LNG/CNG corridor, and that would include not just the long-distance trucks but the municipal activities.

Calgary is now running CNG buses, and I was on one just the other day. I just looked at the bus. They're not novel. Other places are doing them. But we could involve the municipal governments. I've talked to the police chief. They've got these kinds of vehicles, not their police cars but their administrative vehicles, the garbage trucks, the buses, the trucks, the cars that are run by all the municipalities. Then we have the long-distance trucking, and then we have commercial trucks and cars and the private cars.

I've wondered about a strategy that encompasses Calgary and Edmonton and Red Deer, that corridor, and having a strategy that pulled in all of the various jurisdictions to come up with a comprehensive plan to show the world how it can be done. It's our gas. It would be our technology. Think not about six or seven stations, but think about a strategy that pulls in everyone in that.

Rick Hanson, our police chief, was very, very interested. Naheed Nenshi was very, very interested. So we have garbage trucks. We have buses. We have these things starting to pop up, but those are kind of tactical things that are popping up. There's no grand strategy. I kind of really kick myself that we didn't come up with this at the Emerson commission, but that was three or four years ago, and things have changed in the last four years.

But I think a comprehensive strategy in that very busy corridor of municipalities, commercial, private activity, right in the heart of Alberta – it's so busy – would be a very, very interesting undertaking by the provincial government, with bringing in the municipalities and all the agencies that respond thereto as partners rather than just going piece by piece and end up somewhere, having somebody think about it strategically.

I don't know this, and I'm not doing this, by the way, not at 80, but I think that we could show how to do it, and I think we could have industry participants like Ferus, like Westport. We could have commercial interests and municipal interests, the provincial government. Even Ottawa might participate. But we need some strategic thinking rather than just cherry-picking the tactical issues.

The Chair: Thank you.

Mr. Lalani: I think Mr. Gray has an outstanding point. I don't think there is any one jurisdiction that has stepped back and really taken a strategic approach to this, and that's the opportunity we have in front of us in terms of Alberta. I can certainly talk to some of the tactical initiatives. When you talk about the tactics of the weight exemption, that's certainly something that they've already introduced in British Columbia, and we've seen adoption by Vedder and other fleets in British Columbia.

The direct results are as a corollary related to the weight exemption and the fact that they can carry as much economic payload with an LNG truck as they can with a conventional diesel truck. Westport is much more ear to the ground on some of those tactics. We've also seen in the United States the Clean Cities coalition, which has a little bit more of that strategic bent to it, where they're strategically investing in things like CNG stations and initiatives to convert municipal fleets over to compressed natural gas, for instance.

As I say, I think what we've seen in North America is more of the tactical initiatives, and Mr. Gray has enumerated the outstanding opportunity we have, which is to take more of that strategic initiative.

The Chair: You'll both be happy to know that this committee is going to hear from Edmonton and Calgary bus transportation. Certainly, that's in our bandwidth of review. This is very, very helpful.

Mr. Gray: I'd just add to that point. We have the buses, and then we have the municipal fleets, and they've got trucks and panel trucks. I made a presentation back in the '80s to the Pentagon. We had the idea when we had CNG fuel systems that if we moved the Pentagon on to natural gas – they provide the transportation for all the politicians between the national airport and the government – it would have been a tremendous thing to do. I say the same thing here. If we had a strategic vision for that corridor, I think it would be a huge impetus, not just here in Alberta but elsewhere in the country, to show that we can do things strategically. Yes, the buses are part of that and all the other things. They're part of that, but nobody's put the top picture together. Nobody has.

The Chair: Thank you.

Dr. Swann: Is there's an opportunity to ask another question?

The Chair: I've got Ms Kubinec next on my list. Dr. Swann, I'll put you next.

Ms Towle, Mr. Barnes, any questions? Okay.

Ms Kubinec.

Ms Kubinec: Thank you. I have to say that I've found this really, really interesting and helpful, so thank you both, Mr. Gray and Mr. Lalani, for the presentations. They're excellent.

I think my questions to them are a bit more technical in nature. One is to Mr. Lalani. Have you found any operational issues as you go through here that you didn't expect? The second question has to do with the long-term storage of LNG in, say, those remote communities that are looking at it, as far as the long-term storage, LNG versus diesel.

Mr. Lalani: Yeah. Firstly, to speak to the operational challenges, we are uniquely positioned in that we were the first fleet to adopt these tractors, for instance, into our fleet. I think Mr. Gray can certainly add something there in terms of the operational challenges that they've had to overcome at CN.

From the trucking aspect, you know, there was certainly a lot we needed to overcome from a training standpoint and from a safety standpoint.

11:00

Now, we've been in the cryogenic industry for 12, now 13 years, and our roots are in the oil and gas services industry, so we have been and are very familiar with methane. We're very familiar with extremely cold products such as LNG. A lot of those safety programs and safety initiatives we had already built. It was already within the lexicon of our staff. People were very well aware of what they were dealing with.

Having said that, as you're looking at other fleets such as Bison and others who are adopting this technology, there is a little bit of that to overcome, the fear of the unknown. We've helped to assist that by educating people, by forming coalitions; for instance, working through the Canadian Natural Gas Vehicle Alliance to educate people, providing them what they need from a training standpoint, helping them with their safety programs, helping them with their emergency response.

Lastly, I would say – and this sounds very tactical – that as you look at our shops and our bases, they've very much been built to deal with equipment that's fuelled by diesel. Quite simply, we've had to make retrofits to our shops, our bases in order to service equipment that's now powered by natural gas, which requires its own specialized methane detection equipment and requires specialized training for our mechanics. There has been a learning curve to overcome, and there's been some operational infrastructure to put in place, but once you've got that infrastructure in place, then it really becomes quite easy to develop that across your entire fleet, which is what we're doing.

Mr. Gray, do you maybe want to speak to CN, or would you like me to deal with the long-term storage?

Mr. Gray: CN, as I mentioned, has been running this, and they purposely ran it all through the winter and the summer. That tender there is 30,000 gallons. By the way, the Elmworth plant that was mentioned is 50,000 gallons at first stage, so that gives you an idea of the volumes we're talking about. They wanted to run from here to Fort McMurray all winter in order to get that winter experience because this is all digitized equipment now, and the technology they used when that tank was first built was just analog equipment. It was very basic equipment. Now they've digitized the whole thing.

One of the challenges – and I've got their report here, and I'm looking at the pages of the issues they had on specific days. They ran about 100 to 150 round trips during that period, every second day or third day. Let me just put it this way. None of the experiences that they had were showstoppers. They were just the normal type of break-in of any type of new equipment. In fact, I asked the question. They've got brand new engines with a new diesel technology that they introduced. There were no more problems with those engines, which, by the way, were built in the early '80s. Those are old engines that they converted to natural gas. There were no more problems with that than there were with the brand new engines when they broke them in.

So in operating these things, basically there's a lot of experience, going back decades, of running these engines on natural gas, and CN has had no showstoppers, none at all. There are little glitches like a valve or a pressure thing. I mean, there are all kinds of tiny little things, but they've got one year's experience now, and now they're aggressively increasing their program after that one year's experience.

Mr. Lalani: We can echo that from the trucking space. There are certainly no showstoppers and, in fact, considerable benefits. Annually we have a presence in many communities in Alberta and northern British Columbia, and we've paraded these LNG-powered units in local towns and parades and have often had comments as to both the reduced noise from running on LNG and the reduced black plumes of smoke that you would see from a conventional diesel tractor, so considerable external benefits and considerable operational benefits for the driver and for the local community.

Ms Kubinec: Just further to the long-term storage.

Mr. Lalani: Yes. On the long-term storage side the technology today has advanced considerably in terms of cryogenic storage from the late 1900s and early 20th century, 21st century. Cryogenic products are now stored in double-walled, vacuum-jacketed storage vessels, which enable you to have storage hold times anywhere from 20 to 30 days and often beyond with very minimal boil-off of your cryogenic product. So to the extent that you have very minimal consumption over an extended time period, you can store that cryogenic product for an extended period of time. With diesel inherently it's in liquid phase at ambient conditions though, you know, with exposure you will have a little bit of gas boil off it. With cryogenic products that containment is that much more important, but you can store it for an extended period of time with very minimal consumption.

Ms Kubinec: Thank you.

The Chair: Thank you. Good questions.

Dr. Swann, you've got some questions, and, Mr. Khan, you're on deck.

Dr. Swann: Yes. I may have missed it, gentlemen, but I'm certainly catching the excitement around transportation opportunities for natural gas. Did I miss that the only way of transporting this product is by pipelines? Is it considered to be a reasonable alternative to transport this liquid natural gas by other means which are just as economic, I guess?

The second question I had. I've heard a lot from you about transportation uses. We burn more coal in this province than the

rest of the country combined for electricity generation, and I wonder: how much has been discussed about converting some of these coal-fired power plants to liquid natural gas?

Mr. Gray: Well, that's a good question because there's been a lot of conversion to natural gas. Ontario is building – what? – 20 or 21 natural gas power stations, and they've shut down their coal facilities. They've got two in the wrong place, I think, and they're not going to build those. But throughout the United States there's been tremendous growth in the power generation coming from natural gas. It's just basic economics – it's just basic economics – because when you put the environmental load onto coal and cleaning up stack gas and sulphur and various other things, natural gas is a preferred fuel. So the answer to that part of the question is: yes, there's been tremendous replacement of coal-powered generation with natural gas.

The Chair: Perhaps, Dr. Swann, I'll mention as well that you are substituting for Ms Blakeman, but we invite you to come back and sit in on any of our committee meetings because we are going to be looking at that question in greater detail as we go forward.

Dr. Swann: Great.

What are the options, then, for transporting liquid natural gas?

Mr. Gray: Well, you can move this stuff by rail, and you can move it by truck. I may have missed by cryogenic pipeline. I don't think that's possible. It may be, but I've never heard of it. But that tanker right there in the picture has 30,000 gallons of LNG and is just like a truck. So you can truck it, and you can rail it, but I haven't heard of pipelining it.

Mr. Lalani: Yeah, you would not pipeline LNG. Your conventional pipeline gas is under pressure, so in some form it is a form of compressed natural gas. Really, the intended target for LNG and CNG would be to transport it through more conventional means, whether it be by truck over the road, by railcar over the rails, or by marine vessel. You know, you've obviously seen the export terminals and the shipping of LNG internationally. Really, the idea here is to bring your natural gas into a more dense state, whether that be compressed natural gas or liquefied natural gas, and then through that compressed state transport it out, away from where your conventional pipelines would allow you to go, and to be able to utilize that natural gas in some application.

11:10

In speaking to the comment about power plants, more of the conventional gas-fired and coal-fired power is actually on the existing pipeline network in North America, so the conversion from coal, for instance, to natural gas has really been happening on the existing pipeline network. It really is hard to compete on a cost basis with pipelined natural gas, with LNG or CNG, simply because of the cost of liquefying or compressing that gas. Where the real opportunity exists is in those remote communities that are running off fuel oil and diesel-powered generation, where we can displace that with natural gas by transporting liquefied or compressed natural gas.

Dr. Swann: Thank you very much.

The Chair: Mr. Khan.

Mr. Khan: Thank you, Madam Chair. I'd like to start, Mr. Gray and Mr. Lalani, by thanking you both for your remarkable presentations. It's a real privilege for this committee to have both of you gentlemen take the time out of your days to come and present to us, so thank you for that. Very exciting presentations.

I'm, you know, referring to figure 8 from your presentation, Mr. Gray, and your belief that the differential between diesel and natural gas is sustainable for the near future, if we want to call it six to 10 years. We won't hold you to those numbers, but that's a good ballpark guess. Then, of course, the fascinating conversation about the potential for gas hydrates, coming to figure 12, with the understanding that from Alberta's perspective, we sit in that quadrant that represents about a third, which then, again, comes to the remarkable opportunities that both Mr. Gray and Mr. Lalani have discussed at length for Alberta in terms of the innovation and the economic gain and real game-changing possibilities for Alberta to become a global leader, which then brings me to my question.

I know I'm asking here for an estimate. I would make an assumption – we're talking about Alberta and those opportunities that we're talking about in being a leader in this space – that there's a window of opportunity here. My question is to Mr. Gray and Mr. Lalani. Again, best guesses, but I would hazard, Mr. Lalani and Mr. Gray, that your guesses are better than your average Joe's.

Mr. Dorward: He's no average Joe.

Mr. Khan: No offence. There's nothing average about you, Mr. Anglin. I was not referencing you in any way, shape, or form.

My question is: to your best guess, what would that window of opportunity be for our province to take advantage of these opportunities?

Mr. Gray: I've thought about that, and it's going to be very, very hard to have that window of opportunity on the production side in terms of, say, hydrates, et cetera. We played a unique role in terms of horizontal drilling. There's no question about that. There are a number of small and intermediate-sized companies in Calgary and in Alberta that are operating around the world. They bring unusual expertise to that and also to the multistage fracking and then all of the various technologies associated with that.

My best guess would be that if we could establish a critical mass here in the Calgary-Edmonton corridor, we would come up with technologies and we would attract people to invest in this province because of that leadership role we would be playing by establishing that corridor and establishing a strategic critical mass involving, as I mentioned, everything from the province to the federal government to the municipalities through a strategic plan in that whole area. I think it's a made-to-order pilot program of what the world is going to look like when natural gas assumes its dominant role, which I believe it will soon. Maybe we can be the go-to place for how you do this. It's kind of exciting to think about that and where that might take us.

Mr. Khan: Absolutely.

Mr. Gray, if I can be pushy – and I completely understand that this is a competitive environment and a competitive world and that that incredible reserve of hydrates is not an opportunity for Alberta and that if we don't jump on this opportunity, there are other parts of the world that will – how much time do we have? What I'm getting at is that I don't believe we have a ton of time here to overanalyze this.

Mr. Gray: Japan is talking about spending billions of dollars. I mean, this is a total game changer for those countries like Japan and Korea and other countries that are energy poor and have dreamed about being energy self-sufficient. It's a cultural thing as

well as an economic and a technical thing with them. So to compete against those types of countries that have that drive is going to be very, very difficult. Furthermore, you know, we don't have gas hydrates. We have maybe a little bit of gas hydrates, but we don't have anything like the concentrations that people do that have the margins of the oceans. But we could show how it's done if you've got the gas.

Mr. Khan: Right. Exactly.

Mr. Gray: I'd really like to see somebody study that strategically with the big picture and try to put all the component pieces together to make it happen in that corridor.

Mr. Khan: Thank you.
I'd be curious to hear from Mr. Lalani as well.

The Chair: Mr. Lalani.

Mr. Lalani: Yes. Thank you very much, Mr. Khan. I won't presume to be able to make a better guess than Mr. Anglin. I think he would probably make a better guess than I would. I think that in terms of the domestic fuelling opportunity and the window of opportunity we have to create somewhat of a centre of excellence in the province of Alberta and create this cluster of innovation and really forward-looking innovation to enable this gas economy, I'd say that that window is closing.

In terms of Alberta as a province, we're somewhat behind the curve, you know. We've seen our neighbours to the west implement regulations, regulatory certainty, driving the adoption of the technology, which thus has driven the economy around that adoption of technology, driven the technology providers and the innovation around the adoption of that technology. I think our opportunity, as Mr. Gray has enumerated, is to really take a strategic vision, whether it be on the Edmonton-Calgary corridor, which I think is a fantastic opportunity for us, whether it's the remote communities and empowering those off gas. I think we've got, as I say, a fantastic opportunity in Alberta to develop and drive the adoption, which will drive the economy around that, and do it with a very strategic view to how we're doing it.

Mr. Khan: Thank you.

The Chair: All right. We have three people on the list here, and we've got a little less than 15 minutes. I think we could probably go into lunch, but we'd better break at 11:30.

Mr. Casey, I'll turn it to you – Mr. Bilous is on the list, but he's not in the room – and Mr. Hale.

Mr. Casey: Okay. Thank you. I certainly echo my fellow committee members here on the value of this presentation. So thank you very much.

We seem to have the technology at least started. We're well under way there, it seems. As far as getting some larger consumers online, that seems to be a work-in-progress. The part that I'm concerned with the most, I guess, is the infrastructure, the network of refuelling stations. Is there a role in government for this?

The reason I ask the question is that what it seems to be right now is that CN is looking at doing something for CN. Larger consumers, whether they're transport companies or whatever, are doing something for their interests. Cities would do the same, in my opinion. Municipalities would build refuelling stations for their vehicles. But if we want to make this something that is broader than that, bigger than just individual companies doing individual things – and I think that's where we're suggesting we need to go with this – then is there a role in government for supporting that infrastructure or even providing that infrastructure, or is it something that the private sector, in fact, in time may step up to the plate and provide?

11:20

Mr. Gray: I'd be interested in Mr. Lalani's comments. Most of the stations are common carrier stations that are being set up between Edmonton and Calgary. I mean, all the trucking companies can use them. I don't think that trucking companies are setting up their LNG facilities for their own use. I think that Shell, EnCana, Ferus, and others are setting up stations for everybody's use. CN haven't talked about building an LNG facility here in Edmonton. They are now buying from Ferus.

The main thing is that these stations, even if there was any support for those inside the municipalities, should be common carrier stations anyway. Anybody should be able to use them, and it's in everybody's self-interests that other people do access these so that the volumes go up and the costs go down. I don't think that very many companies would be building captive LNG facilities for distribution, but Ferus would have a better opinion.

The Chair: Mr. Lalani.

Mr. Lalani: Thank you. The network of fuelling stations: this is an interesting case study if you look at the United States. We've got companies in the United States that are building many hundreds of fuelling stations across the interstate network from coast to coast, companies such as our partner Clean Energy Fuels, companies such as Shell, and other smaller companies that are investing many millions of dollars to preinvest in the infrastructure – and these are public-access stations – which is being driven by, one, the improved trucking technology being provided by companies like Westport and their partners. Secondly, it's being driven by the economic case for the conversion to natural gas and the environmental case for the conversion to natural gas. What that primarily is driving is adoption. I think that if we take a lesson from that, having a clear line of sight to adoption, having a strategic initiative around the adoption of these vehicles will drive private-sector investment.

I think that's what we'll see in Alberta. We've got companies in Alberta who are ready to build a network of fuelling stations, companies like Shell who are already doing it, and other companies that are looking to invest money in the Alberta marketplace.

I think there are three things, really, from a government standpoint that we can do. First, take a strategic vision towards the adoption of natural gas. Secondly, drive that adoption. Look at the fleet vehicles. Look at the opportunity there. I think there's a really compelling economic case when it comes to fleet vehicles, which can go directly to our annual budgets in terms of annual cost savings on fuel. Then, finally, look at the regulations around the construction of these LNG fuelling stations and how we can streamline those regulations and really look at them from the standpoint of constructing many of these LNG stations. Those would be the three things I would encourage.

The Chair: Thank you.
Mr. Hale.

Mr. Hale: Yes. Thank you. Just to build on Mr. Casey's question a bit, when you're talking about building these fuelling stations and the regulations and the private sector doing it, is there much of a cost difference with building the gas stations we see now? You know, there are gas stations everywhere. Has anybody looked at

the cost to switch those? You mentioned the cost of $90,000 to convert a truck and $300,000 to convert a drilling rig. Is there much cost in converting a station or building new stations?

Mr. Lalani: Mr. Hale, maybe I'll try and answer this question.

The Chair: Thank you, Mr. Lalani.

Mr. Lalani: You know, there are a few different technologies that you can use to fuel these on-road trucks. One is what's called a mobile fuelling station. It's on wheels. It's a small tank along with all of the associated equipment you need to fuel these trucks. Westport will be able to expand upon all of this this afternoon. A technology like that: you're probably talking about anywhere from $500,000 to a million dollars for a single fuelling station or unit.

For instance, in Alberta, when we first introduced the LNG power truck into our fleet, there were no fuelling stations. In fact, there were no local supplies of LNG. We were trucking LNG from the United States and from Vancouver in order to run our trucks. At that time we, our partner EnCana and us, actually brought a mobile fuelling station up to Alberta and placed it in our yard primarily because we had no public fuelling options. That meant a greater cost upfront but recognizing that we were going to get longer term benefits as it moved to public retail.

The other thing that we've done with those mobile fuelling stations in terms of seeding the market and allowing the market to grow is that the second fleet to adopt these vehicles in Alberta, Bison Transport, has actually been using that mobile fuelling station in our yard to fuel their fleet as it crosses Red Deer on its way to Calgary and back to Edmonton. Again, we tried to help seed the market and allow more people to adopt the technology.

In terms of your public retail stations what we've seen in the U.S. is what you'd be looking at: expanding the existing truck-stop network that we have in western Canada. Ideally, that would stretch all the way from Edmonton to Vancouver. When you're looking at the expansion of any of those truck stops, the costs vary. It depends on the amount of storage you have on site, the amount of bays you build, but a general estimate would probably be $1 million to $2 million for each public fuelling station that you would build on an existing truck stop. If you're looking at greenfield, it would be some multiple of that, as in a greenfield site where you're building just an LNG station.

The Chair: Thank you.

We're just about at 11:30, so if there are no further questions, I'm going to pause for a lunch break. Guests are very welcome. I have lots of questions still. I know my colleagues will as well. If you'd like to join us for lunch, you're very, very welcome.

I just want to clarify – and this is the lawyer in me coming out. Mr. Casey, you were being substituted by Mr. Dorward, but then when you appeared, you were no longer substituted. You're incapable of being substituted by Mr. Dorward. Just so we have that on the record. Very good to see David join us here.

Mr. Gray, you are a national treasure. I don't know anybody who knows more about gas than you do, and it is an honour to have you here today.

Mr. Gray: Thank you.

The Chair: Mr. Lalani, we look forward to seeing you face to face and are absolutely inspired by your vision of what's possible.

To both of you, thank you. If you have further ideas as this committee pursues the pathway of identifying recommendations for our colleagues in government and our colleagues in the Legislature, please feel free to pipe in any time and correct our course or give us guidance. Our ears are always open.

To my co-chair, I think you will now be referred to as not your average Joe from here on in, so we'll go with that.

We'll break for lunch and see everyone at 12:30.

[The committee adjourned from 11:28 a.m. to 12:37 p.m.]

The Chair: All right, folks. I think we'll start. This afternoon we have until 2:30, and we've got a lot of ground to cover, literally and figuratively.

This afternoon Don Wilson, executive director, Alberta Motor Transport Association, is planning to join us. Trevor Fridfinnson, senior vice-president of Bison Transport, welcome. Mr. Scott Winton, senior director at Westport Innovations, is here this afternoon to present. Happy to have you here. On the phone we will be having Mr. Bob Taylor, manager of LNG business development at Shell Canada.

Before we start, I'm going to ask that we go around the room again and introduce ourselves. If you're substituting for anybody, make note of that, and then I'll go to the phones. Again, my name is Donna Kennedy-Glans. I'm chair, and I'm also the MLA for Calgary-Varsity.

Mr. Khan, I'll turn it over to you to introduce yourself.

Mr. Khan: Hello. Stephen Khan, MLA, St. Albert.

Mr. Bilous: Good afternoon. Deron Bilous, MLA, Edmonton-Beverly-Clareview.

Ms L. Johnson: Hello. Linda Johnson, MLA, Calgary-Glenmore.

Mr. Casey: Ron Casey, MLA, Banff-Cochrane.

Mr. Hale: Jason Hale, MLA, Strathmore-Brooks.

Mr. Stier: Pat Stier, MLA, Livingstone-Macleod.

Ms Fenske: Hi. Jacquie Fenske, Fort Saskatchewan-Vegreville.

Ms Zhang: Nancy Zhang, legislative research officer.

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

Mr. Tyrell: Chris Tyrell, committee clerk.

The Chair: And our not so ordinary Joe.

Mr. Anglin: Not your average Joe Anglin, MLA, Rimbey-Rocky Mountain House-Sundre.

Ms Calahasen: Pearl Calahasen, Lesser Slave Lake.

The Chair: Who is on the phone, please?

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

The Chair: Thank you.

Dr. Swann, are you on the phone? He might be joining us.

Mrs. Towle? Okay.

Mr. Webber is joining us later, and when he does, we'll make note of that.

Hello to Mr. Taylor with Shell. Thank you very much for making it possible to join us here today.

Mr. Taylor: Thank you. Sorry I can't be there.

The Chair: We'll run the format pretty much like we did this morning, 15 to 20 minutes per presenter, and we'll just go through them. We'll start with you, Mr. Fridfinnson. I want to get that pronunciation accurate. If your colleague does come in, we will put him up next, and if not, you'll be followed by Mr. Winton and then by Mr. Taylor.

So we'll have the presentations, and then we will be asking questions later.

Thank you.

Bison Transport

Mr. Fridfinnson: Great. Thank you, Ms Chair. Good afternoon, everyone. Thank you for the opportunity to speak with you today about natural gas and transportation and how that is rolled out. We've got some real-life experience that I think could be of benefit to share with the group, and that's what I intend to do today.

In doing so, I want to describe to you how Bison Transport, a 100 per cent diesel-powered class 8 fleet with domiciled operations in a country with zero public liquid natural gas stations, went from studying and conceptualizing alternative fuels back in 2012 to actually implementing and operating a natural gas fleet that's running 30,000 tractor miles every week powered by liquid natural gas here in Alberta. It sounds dramatic and successful, and to a degree it is, but it's not been without its challenges. I'll talk about those aspects as well as I think it's important for this group to have some perspective on what it takes to get an initiative like this under way.

Just a quick bit about Bison Transport. We're a privately held company headquartered in Winnipeg, Manitoba, with operations across the country. We do transportation services in Canada and the United States. From a local perspective, about 40 per cent of our business activity by volume would be in and out of the province of Alberta, so it's certainly a big and important marketplace for us. We offer a variety of transportation services, truckload being our primary offering, with refrigerated, dry van, and heated service, as well as a number of other offerings.

One particular application that I'd like to highlight is our long combination vehicles, LCVs. I'll try and go easy on the acronyms or at least explain what they are. That's an important part of our operation. About 20 per cent of what we do, or 30 million miles a year, are operated in a twin 53-foot trailer pulled by a single tractor combination. I highlight this particular part of our operations as this is where we chose to implement liquid natural gas into our fleet.

This is the area in which we operate the long combination vehicles primarily. Ontario and Quebec have opened up, and we do have operations there, but the majority of our, as I said, 30 million miles that we run are between the three prairie provinces and within the province of Alberta.

We initiated a pilot project at the start of this year, in January. We selected from the vendors that were offering and determined that we were going with the Peterbilt day cab, powered by a Westport 15-litre GX engine, as our tractor. Interesting to note from an equipment standpoint and from an investment standpoint that this truck comes at about a 75 per cent premium in cost to a comparable diesel tractor. That puts these 15 tractors at over $200,000 each in order to undertake this.

From there we had looked at: where was the right place to do this and take on this particular project? We had considered a number of factors. In British Columbia and Quebec in particular there are incentive programs, which you folks are probably familiar with, that were of consideration in saying: is that a place that would make sense to start a natural gas project? Other considerations that were important to us were: where are our partners going to be? Shell Canada was very determined to be starting to supply the liquid natural gas in Alberta, so that was a driving consideration for us to operate here as well as just the fundamentals of what it takes to operate this kind of vehicle. There are some different considerations that made it more conducive for us to look at Alberta to do this in.

Firstly, you get payback on the equipment by being able to displace the maximum amount of diesel fuel that you can. How do I get more natural gas into applications that were running diesel? For us, in running these long combination vehicle trips between Calgary and Edmonton, we have density in that lane. We run about 30 to 40 of those round trips a day, and to be able to then have that 400-mile round trip be accomplished by a tractor that was carrying natural gas was a good fit for us operationally. The other considerations, of course, were that implementing a project like this requires an intensity in terms of management and ongoing upkeep in terms of how the equipment is performing and how the operation is running. Here we had the infrastructure and the resources to be able to take that on.

So those things in combination and – I'll say it again – as I've pointed out in the previous slide, without any existence of government incentives that were in place for Alberta other than the fact that fuel is not taxed today the same way that diesel is. Beyond that, there was no incentive to do it here. It was operational concerns or opportunities that we saw that made it most viable in our particular case here.

12:45

Our objectives in going forward with this project were, I'll call them, threefold. Economically we felt we wanted to prove out and see if there was a viable business case to be able to convert diesel tractors into natural gas. In doing so, we thought we could help our industry take steps to transform and move to a fuel that was ultimately more sustainable and available. Thirdly, the environmental aspect of it and certainly being conscious of what that could mean to us and to the communities in which we live.

Here's a quick illustration that demonstrates how that actually plays out. If you take a diesel truck and you convert it to a natural gas, one that's pulling a single trailer, it's about a 25 per cent reduction in greenhouse gases. If you take a diesel truck and you say, "I'm going to have it pull two trailers," as we do with the regular LCV configuration, you save about 45 per cent in greenhouse gases. It's a very efficient mode of transport, and that's why we've pursued it to the degree that we have. If you take that same diesel truck and convert it to a liquid natural gas truck, as displayed at the bottom, you get a 58 per cent reduction in greenhouse gases. So there are very significant steps where we see advantage for the public as a whole to doing that.

Our pilot results to date in terms of how the project has gone. As I said, we kicked it off in January of this year. Starting with the fuel economy aspect, it's the predominant factor in terms of how well this fuel and this initiative will actually pay off. I've relayed this to others that I've spoken to over the last few weeks. That's been a challenging aspect of this particular undertaking.

With the fuel economy we had expected about a 10 per cent degradation converting from our best diesel spec that works in this application to go into this natural gas vehicle. In reality we've been more like 17 or 18 per cent degradation in that switch. There are a number of reasons for that, a number of factors to it. I can get into them in the Q and A if that's of interest. I'll just say to note that, you know, we think that it can be improved on, and we recognize that with a first generation of heavy-duty natural gas

tractor there are going to be improvements that are going to be made over time. We've seen that even with other fleets that have undertaken that, that after a break-in period there is improvement. But that's the current state of us operating here in the first nine months.

Related to that, fuel range becomes a consideration. Quick math on natural gas to diesel: you need almost twice as much natural gas fluid on board your tractor in order to get the same energy content as you would from diesel. If you had one gallon of diesel on board, you need 1.7, or call it 2, gallons of natural gas in order to get the same energy content. Having extra tanks or larger tanks on the truck is a requirement. Also just experiencing a reduction in range: how far can you go? That's why you get back to why we chose that application with the 400-mile round trip. Typically a diesel truck could do 700 or 800. We're restricted and by virtue of that need to be very conscious of where we intend to run, how we run, and fuel infrastructure obviously plays a key role in that ongoing.

Maintenance costs and considerations for this project have been more difficult than would have been anticipated. I'll again go back to the fact of, you know, first-generation heavy-duty equipment. We've undergone a lot of technology change in our industry over time for a lot of emission progression that has gone on. Each one of those instances leads to bugs that need to be worked out. This particular initiative is no different. I'll say that our suppliers have been good partners with us in working through those things, but the bottom line is that whereas for a first year for this type of application we'd expect costs to run in the 3 to 4 cents a mile, they're coming in about double that for us in terms of what we're seeing right now.

For some good news – and there is some – from a utilization standpoint, in spite of some of these challenges that we've had to overcome, as I said right off the top, we're running about 30,000 miles a week on these trucks for each of the trailers as comes into play. Call it 60,000 miles a week if you want. We're about to hit the million-mile mark for this group of trucks, actually, in the next couple of weeks. That's 1 million miles that were previously powered by diesel that have been converted to a natural gas application. It's starting small, but as you can see, the results over time can be very meaningful.

From a return on investment standpoint, you know, we had certain targets that we had hoped to hit. Clearly, we're not going to be, given the description that I gave on the first three categories, in a place to meet those initial targets. We do still think that it can be economically viable; it's just going to take a longer time to achieve that than would be optimal.

If I could sum up a message for this group from our perspective in terms of what that means, I think it's a couple of things. Number one, it's not an easy undertaking for an individual business to get out there and make the leap and work through those things, and I'll say that not only for us but also our supply partners that are involved with this undertaking.

Second, it's notable that in Alberta there's been no one else to follow us since getting into this. There are a lot of people waiting and seeing: how is this playing out? When you take the fact that there are going to be some things to work through and some lumps to be taken as early adopters into these pieces, there are people that are absolutely waiting on the sideline to say: well, I'm not sure that's going to be what I'm prepared to do. It's an important consideration to say that if we're going to make a fundamental shift and be able to make some meaningful inroads into this, there's going to have to be a collaboration of, I'll say, all partners involved in this thing.

I think, as other jurisdictions have noted, that there can and could be a place for government, in particular if you look at Alberta – and I'm sure you guys heard about it this morning; I wasn't present for it – the natural gas resource here in this province and what it could mean, what it did mean at one time in terms of revenues that came in, and how those revenues have been completely hollowed out and are a fraction of what they were. A big part of that is price, obviously, but price will be affected by demand, and as principal users of fossil fuels and energy, certainly for the foreseeable future, as transportation is, making an investment in transportation and natural gas – and I classify it that way as opposed to a handout – could be a very viable business argument.

To my next slide, in addition, you know, what other considerations can be brought forward and understood from a public policy standpoint. We've had discussions with various people to this effect already, looking at things with weights and measures. There are some particular nuances, again, related to the fact that you need to carry more natural gas on board. It changes the size and the weight of the truck to a degree, and that can become punitive in certain applications. To be able to look at that and say, "Is there an ability and an engineering case to be made to make allowances there that are going to make this application more, I'll say, competitive or efficient with weights and measures?" I believe that there is. From a tax incentive standpoint that's certainly what we've seen in Quebec. I'll just caution on the opposite end of things. We've also seen in Manitoba the opposite, tax disincentives already coming into place for this fuel. For the life of me I can't understand how you would want to quash something that has so many public-good applications to it. It just doesn't make any sense.

Ms Calahasen: Especially from an NDP government.

Mr. Fridfinnson: Yeah. I'm from Manitoba, and I could go on a tirade about that, but I won't. I've lived in Alberta for seven years now, and I'm fully converted.

Mr. Bilous: We'll convert you back.

Mr. Fridfinnson: Thank you.

Mr. Bilous: So happy to sit beside you.

Mr. Fridfinnson: Yeah. Exactly.

What we've seen in B.C. as well is an even more aggressive approach in terms of trying to stimulate demand and to create a market and, I think, really make the path for the early adopters, the ones that could actually, you know, push us into a place where this could have some more widespread uptake, make that path a little clearer for them. I think that's certainly where we see it.

12:55

In closing, it's going to take a collaborative effort. To this point in Alberta it's been, I'll call it, the equipment manufacturers, the fuel suppliers, and the transporters trying to work feverishly together to make this work. We don't have the momentum that we could have. Is there a place there for government to step in? I would submit that to you guys to decide.

The Chair: Thank you very much.

There's certainly a theme emerging, and just so everyone knows, we didn't put this panel together based on their pre-existing strategy to compel us to a strategy. So it's very interesting to see the commonality of the themes that are emerging today.

We're going to turn it over to Mr. Winton. You had the pleasure of being here this morning, and we look forward to your presentation.

Westport Innovations

Mr. Winton: Thank you, Madam Chair. First off, I would just say how unique it is and how happy I am to be here. I was born and raised and schooled in Alberta, so it's quite interesting to be able to come back and work on the forefront of a new technology, or a technology that's commercializing. I'm really happy to be here.

I sat in a bit this morning on your presentations, and judging from the questions that were asked, I'll try to give you a technical brief. I'll try to give you a little bit of an idea of adoption; there seem to be a lot of questions around that. I'll try to keep the acronyms to a minimum if I can. I'm not sure that I'll be able to complete all those tasks in 15 minutes, so hopefully we'll get to the questions, and hopefully that will come out a little bit.

My current duty assignment with Westport is – I don't get to actually do stuff like this very often. I am responsible for all the commercial relationships to Westport, so with Paccar, Caterpillar, Volvo, all the people who buy product from us. They very rarely let me talk in a public forum; it horrifies lawyers and stock analysts. A typical forward-looking statement: if anything I say does by some coincidence come true, please don't trade our stock on it.

Really, Westport is kind of a western Canadian story. Westport was a spinout of UBC. It was a fellow by the name of Dr. Phil Hill and a bunch of grad students and a couple of late nights and probably a few cases of beer. They came up with a way of making a large diesel engine run on natural gas, on gaseous fuels. Natural gas seems to be the logical fuel that everybody wants to talk about, for all the reasons that we're here. It's abundant; it's cheap. We have done engines on hydrogen, done engines on various exotic combinations of gaseous fuels, but this development has all been happening on the lower mainland in Vancouver.

So, really, where we are is that we sit at the crossroads, or the intersection, between the energy producers, the people who are pulling it out of the ground, and the automotive industry, or the trucks or the pieces of equipment – boats and things – that use our engines. The engines are what burn the natural gas, but of course we aren't able to sell an engine if we don't have a truck to put it in. That's where people like Trevor come into play.

Roughly, when you look at our business, we've grown quite a bit over the last 15 years from kind of R and D to where we have companies now that are in applied technologies, where we do things like valves and different natural gas parts that are needed; to large on-road systems, which would be the engine and tank systems that would go on a class 8 vehicle; to new markets with JVs and alliances with people like Caterpillar, who build large mining equipment, heavy-haul type stuff. Then we get into, because we are a technology company, looking out five, 10 years: what's the next bit of technology that's coming down?

We have some very successful joint ventures in the marketplace. One is with Cummins Engine Company, called CWI, which is a series of engines that are mostly compressed natural gas but go on buses and refuse trucks. There was a question earlier this morning about: you know, why don't all city buses run on natural gas? Well, actually, last year 40 per cent of the new buses that were produced in North America were compressed natural gas.

So it's odd that Alberta with all its natural gas hasn't really jumped on that train just yet. Down in the States, yeah, about 50 per cent of the buses that are going into service use compressed natural gas.

Really, what we're talking about are adoption curves, and I guess the case that I would put to you for you to think about – and it was alluded to a little bit in a couple of the presentations this morning – is to look at how diesel came into the North American marketplace. You know, roughly, diesel engines didn't exist before 1940. They started coming in, and they were such a logical way of moving big, heavy goods that the truck market picked up the diesel engine. Its adoption process to where a hundred per cent of trucks run on diesel now was over the course of maybe 20 years, 25 years.

The next case that I would present is in Europe. Many of us have been to Europe and have driven a diesel vehicle. I think a lot of people come back from Europe and say: you know, I wonder why there are not a lot of diesel cars in North America? I don't know. But in Europe their adoption curve for a diesel vehicle was mostly based on the fact that petrol was so expensive and diesel fuel was a lot cheaper. It's kind of looking like that. Will it get much beyond 50 per cent in the automotive market? Probably not. It's probably at its ceiling.

The next case that I would say is a really interesting one is what we've seen in terms of the adoption rate for natural gas refuse trucks. These are the trucks that kind of wake you up in the morning if you live in the city, and they dump the bins and stuff like that. We've pretty much seen an adoption rate in the last two years of almost a hundred per cent. It's getting very, very close, to the point where people who make these trucks, people like Paccar, Peterbilt, Kenworth, have actually said that in two years they will not produce diesel refuse trucks. Nobody wants them. A compelling case for a number of different reasons – we can get into why they work so well in this application – but that's where we see a huge conversion to natural gas vehicles.

Now, in North America, that marketplace, there are probably 10,000 or 15,000 refuse trucks built in a year compared and contrasted to anywhere between 150,000 to 250,000 class A tractors produced in one year. So it's availability of market and economies of scale.

Just a quick brief on some technology, just a couple of clarity points. All natural gas engines run on compressed natural gas. You cannot make an engine run on liquefied natural gas. The way to think about it is that on a vehicle, on a truck, LNG is a storage mechanism. Because of the energy density you can pack it into a tight place, and you don't have as many cylinders. It's like memory on your computer, okay?

On Trevor's trucks and, you know, the 1,500 trucks that we have running around North America, that LNG is converted to high-pressure natural gas, compressed natural gas, and that's what the engine actually burns. So all engines burn compressed natural gas. The pressure of that gas going into the engine can vary greatly. It can go from 100 psi to 5,000 psi. It really depends on the technology of the engine and how the engine is configured. But the main concept here is that to say that it's an LNG engine or an LNG truck is not quite correct. LNG cannot be used as a combustion fuel, okay?

Westport, as we've commercialized this product and spent a lot of our shareholders' money, ended up making engines. That was not the business plan. It's not the business plan going forward. Westport is the technology in order to make engines burn natural gas. Our business model is one that we work with JVs, with partners, people who produce trucks and engines. We provide the technology; they provide the multibillion-dollar engine plants. It is definitely not in any of my business plans in the near future to build.

In terms of what we do in the Lower Mainland, which has really become a hub in the world for natural gas engine technology, we

develop all the theory and all the patents and all the engineering that goes behind this stuff. We have a lot of partners, people like Caterpillar, people like Ford, people like GE, Toyota, Honda. They have their own patent portfolios, but by far our work with UBC and other research houses – you know, at last count it's somewhere over 800 patents and about 200 inventions as we went down this commercialization path.

1:05

When I started Westport, we were a hundred people, and now we employ 700 people on our campus in Vancouver and another thousand people world-wide. This is a new, budding industry. There is a real lack of engineers, a real lack of cryogenic experts. I think Ferus probably mentioned that this morning. There's quite a development here that needs to happen.

In terms of the combustion technology – if I get too technical, please stop me – basically, if I had to boil it down to one slide, which is what this does, it's either spark-ignited technology or direct-inject compression technology. A diesel engine lights its fuel by squeezing that fuel until it autoignites. That's how a diesel engine works. A gasoline engine uses a spark plug to light the gasoline. In some engines – usually, it comes down to displacement, the size of the truck, and the size of the engine – it makes more sense to use a spark-ignited theory of combustion.

In the heavy applications, probably about 13 to 15 litres and above, direct-inject, diesel-like compression ignition is what you want because that's what gives the horsepower and the torque that the users need to pull the loads. It really comes down to what you're doing with the truck and what the engine is. That's similar to the diesel world. In the diesel-engine world you wouldn't pull 120,000 pounds down the highway with a seven-litre engine or a 10-litre engine, right? You just couldn't do it. So that's the engine side of the business.

On the other side, we have to deliver the fuel to the engine, so quite a bit of energy and engineering activity with cryogenics converts LNG to high-pressure compressed natural gas in order for the engines to use it. There were a few questions around CNG tanks. They're kind of steel cylinders. There's not a lot of technology in those tanks. They're fairly basic in terms of technology. We don't do a lot of work with those. We mostly concentrate on the cryogenic side.

I spoke to this a little bit earlier. When you look at what's going in the marketplace – and I guess this is what I would present to you – natural gas for transportation isn't something that people are thinking about and still thinking: this might be a technology that might work. It is. Over the last three years, when you review all the industry data and the conferences that you attended, all that, it's really become – natural gas is a transportation fuel. What we're talking about is the rate of adoption, right? So I go back to that slide I showed earlier. It's how fast technology will be adopted.

These are some predictions from various thinking groups in North America, people who predict how many trucks will be bought and sold, things like that. What I can tell you but cannot put on a public slide is that a company like Paccar, that produces Peterbilt and Kenworth trucks, sees this graph in 2017 as being 16 per cent of their total truck builds, which is a significant number of trucks.

You can see just some of the market turnover, the number of trucks produced in a year. A fairly good run rate. If you compare and contrast it to the diesel truck adoption curve, which maybe took 20 or 25 years, what we're seeing is an adoption rate that's going to exceed that, and that's based on the economics. It's based only on the economics. The environmental impact, the benefits of running natural gas are factors, but people who buy trucks, as I'm sure Trevor will attest to, have to see a payback on their trucks. They cannot make a business survive on 25 per cent less GHGs. It's just a fact of the matter.

One of our big opportunities going forward, of course, and where the fuel providers and the people who pull the fuel out of the ground would like to see us go is into the space where the equipment is burning the most fuel, right? It makes logical sense to go after the locomotives, the big mining trucks; they burn massive amounts of fuel. The problem with commercialization, when you have to do this based on it all making financial sense, is that from an engine manufacturer's point of view it would take me the same amount of money to figure out how to put natural gas onto a locomotive – and we have those projects in play – as it would for a class 8 truck engine. The market for class 8 trucks is 150,000 to 200,000 trucks a years. If there are more than a thousand locomotives built a year, I'd be surprised. So this is where the market forces come in. We would like to be able to get after these big engines, and we are with the big projects with our partners like Caterpillar and EMD. The reality is that somehow we have to kind of recoup that investment.

Current products. The good news, really, is that these are all the trucks you could actually buy that run on natural gas. There's probably, by a factor of 10, more selection on the diesel side, but there are trucks. There are people that go to work every day, like Bison, who run trucks up and down the road, and they actually make money with it. They've had a lot of challenges, as you would with any new technology, but what that tells me is that – we talked earlier about the foundation – the foundation is there. The model makes sense. Really, again, what we're just talking about is: how fast do you want it to happen, and do you want it to happen in your jurisdiction?

Tank systems for different engines. We also do a series of light-duty products for pickups and other conversions. I guess, you know, there was a question this morning where people were asking or pointing out that over the last 20 years there had been a couple of upticks where everybody thought that natural gas would be a great thing to do. The problem, as you've seen from the Ferus presentation and others, is that in order to do natural gas in a marketplace, there's a great deal of infrastructure that's required.

In the past – this is an observation on my part – what has happened is that everybody has said: "Okay. Let's do natural gas. It's great. It's plentiful. It's cheap. Let's go convert all the taxicabs because there are lots of them." Right? From our perspective it looks that way, but they actually don't burn a lot of fuel. If you're a fuel provider or even if you're a government and you're looking for ways to reduce greenhouse gas, doing all the taxicabs in Edmonton and Calgary is going to get you nothing. You have to get to the big engines. Those are the people who are consuming fuel. So you have to concentrate on what's consuming fuel. That's the only way it works.

You know, the way we look at this business: this is the business that falls out of heavy trucks and big pieces of equipment. It's really nice to have, and it's great if the fuel is available. But the infrastructure and the drive to get natural gas as a transportation fuel will start with the heavy vehicles, and then it will float down to these vehicles if this is going to be a sustainable model.

We had a couple of questions about rail. The larger the engine becomes, it's actually a lot easier to put natural gas on it. I know that sounds kind of weird. But what is a challenge with rail is how to fuel it.

1:15

Right now that configuration that's up there is a working project, but down in the States we couldn't legally sell that product

because LNG in that format on the back of a railcar is not allowed. It's interesting. You have a burning desire by governments to get locomotives to stop burning bunker fuel – they don't burn clean diesel; they burn bunker fuel in a lot of cases – but they are tripping over themselves because the LNG that they're allowed to pull in a tanker car is not allowed when it's used for onboard fuelling to a locomotive. So they're busy trying to change legislation.

These are the commercialization dramas that we face on a day-to-day basis, trying to undo some rules because the rule was created when the technology didn't exist, right? This is probably a centralized theme that this committee could pick up on. There a bunch of things. Weight exemptions are a good idea, right? Whatever the weight exemption is in Alberta, it has evolved over 50 years of the trucking business, right? Why is it that number? What's the math behind that number? An additional 3,000 or 5,000 pounds: actually, the engine is certainly capable of pulling that load.

Game-changing technology drives productivity, expands markets. For Westport it's really about getting these projects, these people who have made the step into natural gas and signed up for all the training and all the additional work that it is to fundamentally change the way you do business; you know, driver training, all of that kind of stuff. Just to get back to normal operations, there's a huge investment, and Westport supports that. We see that as 15 years. We have approximately to date half a billion dollars into this marketplace, and every engine that I sell today in the class 8 space I lose money on. That's a public number. You can see that on our financial statements. So why do we do it? It doesn't make any sense, right? This is what you have to do in a marketplace to do a fundamental change in how vehicles are fuelled.

Hopefully, this slide – I'll just pull it out quickly – will help you understand. There were some questions this morning about when you would use CNG, when you would use LNG. Really, it depends on the size of the engine, what the engine is doing, and how much fuel it's consuming. It all comes down to being able to get range on the truck. At about 13 litres and below in the truck space CNG makes a lot of sense. At 13 litres and above you have to get into LNG just to get that fuel onboard. It's also a good graphic demonstration. You know, if you talk to Sean at Ferus or to the Shell guys, they would like me to concentrate on large marine, up there at the top, right? That's where they see massive diesel fuel being consumed; you know, the heavy equipment up in the oil sands, that kind of stuff. That's one engine. That's a project. It's a great project, and there are projects going on in places like the port of Hamburg in Germany, where they're converting all their tugs to be fuelled on LNG. The crossover point, where Westport kind of started, was in the heavy-duty truck space because that's where there's a big enough market that it actually makes sense.

The fuelling structure, as you can see, is a bit spotty, certainly much more intense down in the States, with companies making quite significant investments. You would think that in Canada it would be easy. We have one road, and conveniently it's called the number 1. The concept of a corridor between Edmonton and Calgary is great, but the one thing that you have to recognize is when a fleet, an end-user, buys a natural gas truck. Trevor bought those trucks to run from Edmonton to Calgary, right? That's where the fuelling is. If he loses that corridor, if his business changes, if he loses a contract, he can't redeploy that truck to anywhere else.

I understand the Alberta perspective, but I would encourage you to work with B.C. and Saskatchewan, your two borders on either side, because that's the way freight moves. On Trevor's slide earlier he showed that all his weight and all his tonnage is moving across the prairies from Winnipeg to Calgary.

If we all work together to look at the transportation corridors and facilitate fuelling and infrastructure on those corridors, then, yeah, there would be a lot more trucks running between Edmonton and Calgary. The people who run that corridor would have some comfort in buying more trucks because they would have more places to deploy them, and they would integrate more into their businesses.

Development opportunities in Alberta: the opportunity is that there is competitiveness for high fuel users. The change that I've seen from the last three or four years, where I would go into a company that made trucks, like Paccar, and they would mildly buy me a coffee and entertain me because they're a little bit worried that there might be something here and they're going to hedge their bet, to now, where there are JVs, joint ventures, and partnerships with Caterpillar: they've all accepted that natural gas as a transportation fuel is here. It's not: "Is it going to be here? Is the technology capable?" It's here. All we're talking about is how fast it's going to displace diesel vehicles.

That's, I guess, the other perspective that I would get you to think about. With the exception of Trevor, I don't think there's anybody else in the room that's bought a class 8 truck. Our perspective is buying cars, right? We buy cars for noneconomic reasons. We buy cars to get to and from work. We usually buy them because they look nice or they appeal to us in some other way. But it's not a capital model. A person buys a truck because that truck has to go to work. The concept is that in North America – Canada, Alberta – there is only so much work for a truck to do. That work is going to get divided up between diesel trucks and natural gas trucks.

Every time we produce a natural gas truck, what should happen is that an old diesel truck goes away, gets taken out of the stock. That's really what's going on here. Incrementally the equipment providers – Paccar is not going to sell more trucks because there are natural gas trucks, so they're a little bit indifferent, right? "If he doesn't buy a natural gas truck, he'll buy a diesel truck." Maybe he will from Paccar but not from someone else. You know, relying on equipment manufacturers to push natural gas as a transportation fuel is not going to happen. They respond to what the market tells them they want to buy, so we have to create that pull. That's really what this whole conversation is about: how do we create that pull?

Interesting to me, being an Alberta boy, is what I would call public liquefaction or private liquefaction. One of the big challenges down in the States is that all the liquefaction was created as peak shavers as part of their national energy policy back in the '60s and '70s. That's why LNG was created, as a way of storing conventional natural gas and then vaporizing it in the heating season to ensure that everybody had heat for their homes.

That's actually what's tripping them up right now. They have all this natural gas, and they have all this liquefaction, but they have in their national energy policy a thing that says that they can only sell 10 per cent of that liquefaction into the public market space, so it's a real challenge for the fuel providers. They can go to a peak shaver, to an LNG facility, and say: I want to buy a load of LNG. If they have capacity and if they are within that 10 per cent, they'll sell them a load, but they will not guarantee them that they will sell them a load next week. So how do you operate a fuel stop if you can't guarantee that you can get the stock? Yet we have all the stuff in the media that says that natural gas is spewing out of the ground. That's actually the bottleneck.

1:25

In Alberta, with two major LNG liquefaction terminals, people are making huge, huge investments – Ferus, Shell, EnCana, those guys – in infrastructure. These are millions and millions and millions of dollars to stand up one of these plants. Oddly enough, there are other projects being launched, but there are actually shovels in the ground in Alberta, and that's the dichotomy. You know, you have all the raw components. You have the base stock. You have people who are willing to stand up LNG facilities. It's a no-brainer.

You know, we want to talk about areas that we should be considering. That's been the theme of the discussion. Weight allowances are a good way to do it. One of the things that we see and what I would caution you against is some of the programs down in the States – and we were actively participating in them – programs like down in L.A. with the port program, where all the drayage trucks were being converted to natural gas and stuff like that. These types of programs in a public space become quite onerous, right? There are transparency issues, and you want to make sure that nobody cheats the system, and they take years and years to bring to fruition.

What happens in a commercial environment is that as soon as you guys start talking about maybe giving money to decrease capital allowance or buying into trucks, how many people are going to buy trucks at that point, right? Usually what happens with governmental programs is that it takes two or three years to run through all the processes that you have. The processes are good. It's just not where the market is right now. If you want to slow it down, that would be a great way to do it.

The better way to do it is to look at things that help the operators, the people who buy these trucks, make money with the trucks. They shouldn't be penalized because the current technology says that in order to contain liquefied natural gas, I have to put it in a double-walled, stainless steel, very thick tank. That's base metal. It's really expensive. I can't take any costs out of that. No matter how many are built, I can't take cost out of that, right? Why should they be penalized? They have to take payload off their trucks to run natural gas trucks. Very simple. It goes back to the concept of: do the weight limits that we have make sense? If you wanted to push alternative fuels into transportation, if you have an alternative fuel vehicle, you get a 5,000-pound weight exemption. It's pretty easy. You're not hurting anybody. You're not dipping into taxpayer funds. The challenge really is: can the roads take it? I would lobby that they could, right?

Ms L. Johnson: Can the roads take it? That's the question.

Mr. Winton: You're going to get a lot of people that say that the roads can't take it.

Fuel and road tax allowance. We see different ways of accounting for fuel, incremental costs of the vehicle. Traditionally, before, that's how some people have attacked it.

Fuelling infrastructure availability: that's, you know, at the heart of some of the discussions that we've had.

The Chair: Excuse me. I could listen to you all day, but I think we're going to have to keep the pace going here so we can hear from Shell.

Mr. Winton: Sorry. Sure. I think I'm just about done.

The Chair: We have lots of questions, too. I hope you're not trying to pre-empt all our questions.

Mr. Winton: No. I think that's a logical place to stop, anyway.

The Chair: When I'm in British Columbia, UBC claims that you are from British Columbia, so we will correct them. It's great to have you here.

Mr. Winton: I have an Alberta birth certificate if that helps.

The Chair: Mr. Taylor from Shell, we'll turn it over to you for a presentation.

Mr. Taylor: Thank you. Can you hear me clearly?

The Chair: Yes, we can.

Shell Canada

Mr. Taylor: Great. I've got just a few slides here to go through, and I'll talk through probably some of the similar themes. Just on the first slide, the front page there, it's more of a photo, and that's a photo, actually, of a Bison truck at the Calgary Shell Flying J site fuelling up on LNG. That is happening every single day here in our city and in Calgary and in our province. That's something we're pretty proud of, and obviously what we're talking about here is: how do we make that expand out a little bit more and go wider?

I should have moved to slide 2. Slide 2 is the downstream LNG markets. Now, I think some of these items were touched on by Scott from Westport, but I'd just like to go through this. These are really the key markets where Shell believes LNG has a great opportunity of making significant inroads. It is a heavy-duty focus – and I think in the Westport presentation they really outlined well why that is – which is trucking, rail, marine, and remote power and heating.

There is the potential to lower greenhouse gas, sulphur, and particulate emissions in these sectors. The potential differs by sector due to the technology, but we do believe there's a benefit in each sector. What I would say is that each sector has technology issues and operational challenges compared to the current operations, which are diesel, and I think some of these for the on-road sector were outlined well by Trevor Fridfinnson from Bison earlier. I guess my message is that it's not a foregone conclusion that LNG or natural gas will be successful in taking hold in these markets. These challenges and operational changes provide risk for the end-user, so there needs to be enough payout to make that worth while. That's obviously where we're trying to come in to make a product like natural gas available on the market.

But if you look at what natural gas requires, there's a fairly significant amount of investment not just in these end-use pieces of equipment but throughout the supply chain. All of that investment really comes on the back of the value spread between oil and natural gas right now. There is an opportunity here, but there's also a bunch of investment that has to be recovered. I think one of the things that people need to recall is that the customers here operate today in low-margin businesses, where they need to be very competitive and manage their business closely to be successful, and that doesn't change with natural gas. We hope that natural gas gives them a competitive advantage, but we recognize that there's a lot of challenges to overcome to make that happen.

The other technical complexity is that you're moving from a liquid that can really stay in its natural state indefinitely. Yeah, diesel has some impacts from cold weather, but for the most part it is not a problem, how long you leave diesel in the tank. It's fairly simple to operate and to transfer from tank to tank. Natural gas becomes very challenging to move around. Again, Westport described how, when we talk about CNG or LNG, they're really different ways to make natural gas transportable and storable so

that it can be used in mobile applications. Even though things like oil and gas drilling rigs are not necessarily mobile, they are in the traditional sense, where they're not going to be in that spot indefinitely. They're going to move after a period of months.

All of those challenges exist. That's where Shell sees ourselves having expertise in being able to overcome some of those challenges. But there's also a role that government can make to help end-customers see some of the economic benefits of this not eaten away by some of the peculiar aspects of using natural gas in their business that do exist.

1:35

To go back over it, you know, if you have heavy on-road trucking, for Alberta as a whole there's a big opportunity there, but that opportunity is realized one truck at a time through a number of trucking companies. If you look at the sophistication of a fleet like Bison, they're at the top of the list. The number of trucking companies that don't have that sophistication is much, much more numerous throughout western Canada, so that's where it becomes a challenge. How do we help those fleets and make it so that those fleets can afford to move this?

When we look at the off-road, big, heavy-haul mining trucks, there's a great opportunity there. It's certainly something in our own business that we're looking at because we feel there's an economic benefit as well as an environmental benefit in that. There's already a rail test going on in the province, and I think Scott from Westport outlined some of the challenges in the rail technology.

One of the photos here is actually of a barge that's called *Greenstream*. That's not, obviously, a barge operating in Alberta. That is operating on the Rhine River today in Germany. That's technology that Shell has helped to develop and make that supply chain available so that we can fuel the barge and make all of that execute in a way that will work for the customer.

Finally, there's an oil and gas drilling rig in the photo. Shell has had a rig going. Unfortunately, the nature of the drilling activity in Alberta is such that it's moved around now three times, from in the near foothills here up to the Peace block and now is on its way back to the foothills. But we have had a rig operating on LNG for about two quarters of this year. So it can be done. There are just some opportunities here.

Where can the government help? I think our message would be very consistent with the messages you've heard, and that's really looking at: how do we not penalize customers who want to step into this space? The weight challenges that Westport outlined have a real economic impact because it reduces payload.

Trevor Fridfinnson made the comment that they are the only fleet in Alberta running. We've actually contracted with other fleets. In fact, one fleet basically decided not to proceed with LNG-powered trucks on the basis of the economic penalty that they would incur from the weight challenge. Not being able to offset the additional weight of the LNG tanks actually hurt the margin. Again, they're in a low-margin business, so that little bit of margin makes a big enough impact on their economic case. That is, in fact, how they basically decided to defer their decision to go forward. We hope that that's not a permanent deferral and that we can make some changes there, but that is a concrete example where a fleet had made the decision and, based on this penalty, have backed away.

The other comment on fuel taxes is that it's not taxed right now. Again, as customers are going forward and trying to calculate the economic benefits of this, some certainty of what that picture looks like in the future would be helpful to them.

Finally, consistent codes and standards. I guess, you know, the weight allocation falls into that, where B.C. has a weight allowance of 1,500 kilograms and Alberta doesn't. As you drive across the Trans-Canada, that will come into play if more fleets move to LNG or natural gas as a source of fuel. Consistent codes and standards are also important in some of the high-horsepower uses. We talked about rail and mining trucks as well. That's something that we look at around: what are the standards for fuelling and for how these fuel cars and tender cars are treated?

That's really my look at where government can help. If I look at the next two pages, these are just a few examples of concrete steps that Shell has made. We've made significant investment in this area. We're not sitting back and waiting for governments to do anything. We're not waiting for subsidies. What we are doing is going forward and making big investments in this. We believe that from a customer standpoint using natural gas, whether it's on-road vehicles, mining vehicles, or rail, there's a lot of derisking that can help, and that's where the government can play a part.

I think I'll hold my comments there, and let us proceed to questions if that works.

The Chair: Thank you very much, Mr. Taylor. I have to note, in particular, that Shell is just getting to the end of its third quarter, and you have a window of time where you are not allowed to talk publicly. We're really glad that we squeezed this in just before that window shut. Thank you for doing this. I really appreciate it.

Mr. Taylor: Thanks for having me.

The Chair: It looks like we have a trio of early adopters here.

I'm sure lots of you have questions, so I'm going to open up the floor to questions. Mr. Bilous, I'm going to start with you, then Ms Johnson. So catch my eye if you have a question.

Mr. Bilous: Sure. I'm hoping that you gents will have the answer. This is probably directed at Trevor. I'm assuming that you would know better than the others because it's about transport and roads. This was touched on in the presentations, but I'm curious to know the weight of current diesel trucks or how much they're weighing in tandem with our road capacity or the capacity for, let's say, highway 2 to handle, again, LNG trucks. We talked about the fact that they weigh much more than diesel trucks. So I'm curious to know: what is the potential capacity for our highways to handle LNG trucking?

Mr. Fridfinnson: If you're asking, "How much weight can the roads themselves bear?" you know, I don't know if I'm the expert opinion on that. We've had meetings with Alberta Transportation, and we've outlined the case in a lot of detail, and that could be provided to this group if it was appropriate.

But I think the notion is that the weight standards are round numbers that have been in place for a long, long time, and we all know that there's been progress in every aspect of our society, including the engineering that's involved with road building. We say that for the fractional per cent that we are asking for for consideration to move a new technology into place – we're talking, really, about a 5 per cent weight differential of the tractor to be worked into current allowances. To say, you know, that that could be enough to make a difference to the point that it affects tonnage haul, that's absolutely real in there.

Also, there's an impact for us on the structure of the unit and how you can actually make the most aerodynamic piece of equipment. In our example, because the tanks are longer and the truck is heavier, we actually have to stretch out the trailer away from the tractor, which is the most aerodynamic fit, and we create a gap. If you look at one of our LNG trucks going down highway 2, it's about a five and a half foot gap where there should be two

feet, a foot and a half for the most aerodynamic. So we've got an extra drag being created there. We're burning more fuel. It's cleaner fuel, but we're burning more fuel than we ultimately should if we could make that configuration optimal.

So we've outlined it on both standpoints, from a payload capacity and from a set-up capacity: can we get some consideration there?

Mr. Bilous: Okay. Thanks.

The Chair: Ms Johnson, you're next on the list and then Ms Fenske. If there are people on the phone after Ms Johnson, I will call on you to see if you've got any questions.

Ms Johnson.

Ms L. Johnson: Thank you. Thank you very much to all the presenters. It's a fascinating business, and we've learned a lot today. I want to take the approach from the inventory of truck drivers and owner-operators. The comment was made that it's a 75 per cent premium, $200,000 to buy one of these tractors. The industry is facing a shortage of drivers. If we make the equipment more expensive, how are you going to get drivers in? So I guess I'm coming to: what percentage of your fleet is owner-operators versus Bison drivers, and will moving forward on this initiative impact the number of drivers we have available to us?

1:45

Mr. Fridfinnson: I think they're probably unrelated. I think that if a fleet does an appropriate job of uptake – and I think there was reference made to it by both Bob and Scott. I didn't get into it in a lot of detail other than to call the process to implement a new technology into your fleet as critical and as involved as this one is – there is a lot, and some onus of that does come on the driver. You have to have a comprehensive, all-in approach to say: I'm going to train these guys, I'm going to support these guys, and I'm going to make sure that their ability to earn an income is not affected by a change in technology that comes down the pike. We've worked very hard on that, and we've spent out of pocket to make sure that when we have had, you know, I'd call it extra time to train, extra time for fuelling, or an inordinate amount of downtime related to their tractor because of this new technology, we're making these guys whole. That's our approach to the business so that it doesn't create a disincentive.

Optimally – and we really believe that this is starting to happen – it can be an attraction to say that you're part of something that is transforming an industry, that you're involved with a company and an initiative that is trying to make things better. We try to look at it from a positive light. Really, it's just day-to-day implementation and support to do that.

Ms L. Johnson: Okay. Thank you.

Mr. Winton: I'd like to comment on that from an industry perspective. Trevor is bang on in terms of education of the fleet. There are some nuances about a natural gas truck. From a driver perspective natural gas engines are quieter. That's why in refuse trucks, despite all the clanging they're making, the engines are actually quieter. So there's an appeal there in an urban setting.

When it comes to drivers, one of the things that we've noticed is that in order to get the payback and the truck to give the best fuel economy, we have to educate the drivers. Drivers get used to shifting the truck based on what they hear. The diesel trucks are louder. The revs sound louder, so when they get in a natural gas truck, they actually overshift the trucks. So there's a little bit of getting them to look at the tachometer until they get used to the sound. There's that.

Fundamentally, natural gas trucks are not going to change what's going on in the North American marketplace when it comes to trucking. Twenty years ago when I kind of started in this business and my hair was not grey, you know, trucking was a 50-50 split, owner-operators versus large companies. The owner-operators, because of efficiency – in order to make money in this very, very low-margin business, you have to be very efficient, and that means capital utilization. Owner-operators just cannot use their trucks in an efficient manner. There's still a ways to go.

I think there's still a lot of efficiency in terms of utilization that can – you know, we're not at an aircraft model yet, where they're always turning the engines, but it's getting better. Hours of service have played a big part in that. But that's trucking industry stuff that is really not driven by the type of engine technology or the way it's fuelled. Really, hours of service have driven – I think drivers' lives in North America have gotten better because the hours of service have forced the companies to rejig, and they go to more satellite-type operations where drivers are home at night. There are fewer and fewer drivers sleeping in the back of cabs these days.

Ms L. Johnson: It's something to consider as the policy discussion proceeds. Thank you.

The Chair: Thank you.

Okay. On the phone are Dr. Swann, Mrs. Towle, Mr. Barnes. I think Mr. Webber might be there.

Mr. Barnes: Madam Chair, I have a quick question, please.

The Chair: Go ahead.

Mr. Barnes: Thank you. To any of the presenters, I'm just wondering: where is the United States at with this? I remember reading some time ago that they were looking at adding – I think they only had, like, 1,500 liquefied natural gas stations now, and they were looking at adding to that. And, of course, the potential to haul more than just on our main highways in Alberta: if somebody could address that, I'd appreciate it.

Mr. Winton: Right at the present moment in our class 8 fleet there are somewhere in the neighbourhood of 1,500 units running in the United States in various operations, kind of scattered. They tend to be clustered around fuelling. Usually what happens in this process, just like it happened with Bison in Calgary, is that there is a triggering deal or a certain quantity of trucks that drives people like Shell to put in a fuel station and create this infrastructure approach. Once that's in, then you can actually get people buying one and two trucks, but someone has to take the big leap in order to make some of the numbers make sense. So about 1,500 class 8s are running in the United States. There are about 30,000 mostly nine-litre engines, some 12-litre engines, running in the United States, and those would primarily be in refuse trucks and city buses and utility vehicles and things like that.

The rollout of natural gas along the highway corridors. There have been massive amounts of money invested by people like Clean Energy and Shell and some other companies to the point where they've actually got stations stood up and those stations don't have fuel in them yet because they don't have the baseload of trucks yet. So there's this constant – it's kind of like watching my dog chase her tail all the time, right? You know, trucks go in, but it's very hard to talk to someone who's going to buy trucks if they can't look out their window and see a fuelling station, right?

The fuellers say: "We'll build you a station if you buy the trucks." So we're at that kind of argument.

Mr. Barnes: Okay. Thank you.

The Chair: Mr. Taylor, do you have a comment that you want to add to that?

Mr. Taylor: I think Scott hit it. There are certainly a number of stations that have been built over the past two years in the United States and a number that have been announced to be built. Really, it's looking at a similar plan to what we have in Canada: how do we cover off the main truck routes in the country?

I guess the one thing I didn't mention is that for us in Canada it extends into – we also have a project in Ontario, so we also will be looking at expanding into the truck routes in Ontario which, you know, are centred around the 401 route.

The Chair: Thank you.

Mr. Fridfinnson: I'll maybe just add a comment from my perspective on the U.S. piece. From an infrastructure role or standpoint for fuelling, you know, call it five years ahead, it's very interesting to note, as Scott does, the number of stations that are built without customers to reach them. There's been a continual dialogue about incentivizing from a federal level the uptake of the natural gas technology. What you can attribute it to having not been in place in a meaningful way yet could be a number of things. They're preoccupied with a lot of different issues that don't seem to be moving anywhere. But there certainly has been more, I think, specific talk about: how do they incent it? And the market is telling. When I connect with colleagues that run big fleets in the U.S. – it being so narrow of a margin and there being those pains to implement, there's an expectation that there needs to be something else to help actually put it over the top and make it a go case for them.

The Chair: Thank you.

On my list right now I've got Ms Fenske, Mr. Stier. Dr. Massolin, you had a question that you wanted to clarify, and we're going to give you space to do that. Ms Calahasen is on the list. Anybody else on the phone want to be on the list?

Mr. Cao: Wayne Cao.

The Chair: Okay. Thank you, Wayne.

We'll go ahead with Ms Fenske. Thank you.

Ms Fenske: Thank you. I think, Scott, the one slide that you gave us with respect to the North American on-road heavy-duty incentives: certainly, in the southern United States there seems to be a lot of tax credits for purchasing natural gas vehicles.

Mr. Winton: Presently most of those states are broke.

1:55

Ms Fenske: Well, I don't know. Texas goes to its own tune, doesn't it?

Trevor, to you. When you were talking, you were going over your pilot results to date, and one of the things you mentioned was the 17 per cent degradation. You sort of opened yourself to the question that you would be willing to maybe expand on that but that wasn't the time. I was wondering: what is the typical break-in period for a truck? So whether or not this pilot project, as far as how long it's going to go, meets that. What were some of those degradation factors in this first generation pilot that made it so high, from 10 to 17 per cent?

Mr. Fridfinnson: There are a few factors that I'll outline. To the first question – what's the typical break-in period for a modern truck? – today on a diesel truck it's minimal. Call it 30,000 kilometres, that type of thing. There was a comment made by a colleague of mine who is running natural gas trucks in Quebec that their break-in period for this particular type of truck – and they're running the same Peterbilt-Westport combo that we are – is 200,000 kilometres before they saw a stepped jump up in fuel economy.

You know, this is, again, first generation technology, and we are taking this first generation, which is a hybrid combination of a Peterbilt tractor and a Westport engine, and putting those components together in the only format by which we could really purchase the truck. We're going to pit that against our best performing diesel truck that has been spec'd out year after year to get the optimum in aerodynamics, in engine performance, in transmission parameters, all of that, and say: "Okay. Now beat this truck." That's why I mention, you know, what I call a 10 per cent factor on the outside.

We're also talking about a different engine size. Typically we'll run a 13-litre in this application. There is no 13-litre natural gas truck. It's 15, or you have no option to put it into this application. Those things come into play. Again, the early adoption factor is to say: do you do it now, or do you wait? Do you wait for somebody else to do it so that you get enough groundswell to say that now the manufacturers have cause to then develop that perfect and precise engine for you? In the meantime the early adopter will pay the price.

We chose to be leaders in this. It fits with the core values of our business to be innovative and driven towards pushing things forward. The reality is, as I've said and Bob mentioned, that they're close to bagging followers, but they're not there yet. Part of it is because of the realities of it. If I was an individual owner-operator: no chance. If I was a small fleet and there is a lot of disincentive or risk in doing this and if I'm a fleet that's not prepared to invest the time of people like me and many others to actually go after this, I can't go either.

That's, again, just some of the flavour of what it actually takes to get it under way.

Mr. Winton: To add a little bit more colour to that and give you an example, in the diesel world there's been in recent history, in 2007 and 2010, major, major shifts in terms of the emission output of the truck. The last one, in 2010, required what's called a DPF, or diesel particulate filter, and an SCR, which is the adding of urea to the exhaust stream, to go onto the truck. These cost probably somewhere between $15,000 to $20,000. They are maintenance nightmares for fleets, and the kicker of it is that while the tailpipe emission of a diesel truck might be cleaner when you measure it, you're burning more fuel to do it. How does that make sense, right?

You know, it was the right thing to do because it drove the industry. The EPA picked the tailpipe emission coming out of that stack, and they drove the industry to that. As a consequence, it wasn't an engineered solution. It was: "Oh, my God. What are we going to do? Let's put it on." It has inflicted so much pain on trucking operations in North America that it's incredible. But that's new technology, right?

It's getting refined. It's getting better. But I'd still say that – Trevor, in your diesel fleet you probably have huge issues with SCRs and DPFs, right?

Mr. Fridfinnson: Yeah. That's what I made mention of before. Every leap in technology comes with a price. Those ones are the ones that are enforced upon us. You know, it's the double-edged side of regulation. There are some that we want and need, and there are others that are, you know, impressed upon us. It is for the greater good, and we accept that. It's just that it was done in such a way that it flows right down to the end-user, and we end up dealing with the consequences of it. Here's a step where industry is trying to be proactive and do something that is collectively better, and we're taking on those penalties knowingly. We're just trying to mitigate them and to say: how can we smooth them out so that it actually does run the proper course without a bunch of victims in the path?

Ms Fenske: And just one other question.

The Chair: I will have to make it fairly quick. I've got six people lined up here.

Ms Fenske: Okay. In our reading material – and it hasn't come up in the presentation that I'm aware of – we received some information that in the cold weather the natural gas is not as effective. Does weather have anything to do with this? Maybe it can be answered at another time, but it certainly is a question that I had when I read that.

Mr. Winton: My guess is that in your reading material there is a misconception that happens a lot in this industry as natural gas gets stood up. A lot of people relate natural gas to propane. Propane and natural gas are completely different fuels. There's a lot of moisture in propane. It's not a great fuel for an engine. In fact, it's a horrible fuel for an engine. It does not burn well in an engine. So cold weather operations, because of its high moisture content, are actually quite – yeah, it was not a great vehicle fuel.

For CNG there is really no difference between running a CNG tractor and a diesel tractor. All the same things that you would do for cold operations you would do on the CNG tractor. You would probably have some kind of supplemental block heater or engine coolant heater or something like that.

The Chair: Actually, I'm going to play a little bit here, Mr. Stier, if you'll bear with me. Dr. Massolin's question is exactly on the heels of that question, so I'll change the order here a bit.

Dr. Massolin: Thank you, Madam Chair. I appreciate that. My question has to do with the issue of safety. It's a point of clarification. This committee heard that CNG especially is potentially not the safest fuel to use in school buses or transit buses because if it's involved in an accident, that fuel is highly flammable. But as we were talking about at lunch, Mr. Winton, that may not be actually the case. I was wondering if you could clarify that for the committee right now.

Thank you.

Mr. Winton: Sure. Yeah. There has been in North America a lot of propane school buses and things like that. Again, propane is a different fuel. It's heavier than natural gas, so it tends to fall to the floor, and it collects. Any time you have any fuel collecting, especially a gaseous fuel, and you add air to it, it eventually gets to a point where it can combust. The fact that it's collecting will enhance that.

CNG is lighter than air, so in an accident format it will go up. It wants to go up. CNG only becomes dangerous if you contain it; i.e., in a roof or something like that. I guess what I would suggest is that, you know, most of us have natural gas in our homes to cook with – right? – and we've all been conditioned from a very young age that if you smell gas, get out and open the windows, that kind of stuff, because the CNG is going to be contained by the roof of the house. So in an accident format in transportation CNG will go up. It is very, very hard to light off compressed natural gas. It takes a very, very specific fuel-to-air mixture.

Why the gasoline that's in our cars is so volatile is because you can have a little bit of air and a little bit of gasoline, and it will light off in a heartbeat. CNG, you know, is probably one of the safer fuels, actually. I think that if we applied the same standard that we are just starting to think about for CNG and everybody is concerned about it, if we actually thought about it and applied it to the gasoline that's in our cars, we would be horrified, and nobody would have a gasoline car.

2:05

The Chair: I was just starting to feel better.

Mr. Stier.

Mr. Stier: Yes. Thank you. Some of what I was going to cover has been covered a little bit, but I wanted to drill down a little deeper if I could. I noted that in some of the slides you had, you referred to dual fuel, particularly for international markets and so on, and you haven't mentioned dual fuel for here. I suspect that there are a couple of things that happen with dual fuel, that you lose efficiency and, second of all, that you also have extra weight for extra tanks so that one offsets the other. I would like to some degree to have some sort of a response on that one.

Secondly, in my old days of propane, as I may have mentioned earlier in this meeting and perhaps to you, Scott, at lunch, we used to see added longevity of engine capability. Does CNG provide longer lifespans for engines? There might be some savings there despite the fact that you have to size up the engines to still get power. Could you speak to that as well, please?

Thank you.

Mr. Winton: Okay.

The Chair: Could I just interject? I want to make sure that we lean hard on our Shell representative as well here. So if there are any questions there you want to answer, have at it. You should give him first go once in a while.

Mr. Winton: Bob, do you want to talk about engines?

Mr. Taylor: Actually, I'll let Scott handle the CNG question.

Mr. Winton: I thought you might.

A couple of terms that you might run into. Dual fuel usually means that two fuels are used in the combustion. As I was outlining earlier, when natural gas is mixed with intake air and then introduced into the cylinder, that would be considered a dual-fuel engine.

We chose not to bring that technology into North America – we do use it in Europe in some small passenger car applications – just because of the emission standards for trucks for the market that we believe needs to germinate and because of all the reasons that we talked about, how this market will become viable over the long term.

What we were concerned about is people trying to put dual-fuel technology onto heavy-duty trucks. In our eyes that's a bit of a safety concern. With vehicles – small vehicles, small engines – trying to put on a dual-fuel system, you know, the worst you kind of do is that you might damage the vehicle, damage the engine, even kill the engine. The problem with class 8 trucks – well, it's

not a problem but their very nature. Class 8 trucks have so much power and torque behind them that when you push them beyond their parameters, they don't just stop. If you overload a vehicle and you try to go up a hill and you've overweighted it or whatever, the engine just stops, right? A class 8 vehicle, with the torque and the horsepower that we're talking about, rips itself apart, and that usually involves spinning drivetrains and all sorts of nasty stuff going on and very heavy, heavy pieces of steel flying around.

You know, part of the stewardship of trying to develop natural gas in this industry is that in its infancy we kind of have to protect people from their own goodwill, right? Some people are very attracted to taking an old diesel truck or a diesel truck that's maybe two or three years old and trying to kind of hog a natural gas system onto it. In our minds, it's a safety issue. At the end of the day, at the very minimum this is 80,000 pounds going down the highway at 70 miles an hour, and that's a big concern for us.

The other term that you might run into is bifuel. For our light-duty Ford pickups – the 250s, 350s, et cetera – we do what's called a bifuel engine. The engine will run on compressed natural gas, or it will run on gasoline, so that alleviates some of the concerns of range as fuel stations are coming up.

In terms of your maintenance question on the longevity of engines, yes, natural gas does burn cleaner. Where we first started, like, in Australia, where it was very compelling to do natural gas engines and they put a lot of miles on and they treat their trucks quite rough, when we tear apart a million-mile engine and compare and contrast it to a diesel engine, there is less wear in the cylinders, there is less wear in the bottom end, and that kind of stuff. At this point, with the number of engines in the marketplace, I don't think it would be statistically appropriate for me to say: yeah, they're a much better engine at the million-mile mark. But, yeah, we would argue that they are cleaner.

Mr. Fridfinnson: And the interesting contrast to that is that our service intervals on these engines, as prescribed by Westport, are actually significantly less than they are for our diesel trucks, which means that we're servicing the trucks more often. Although it may be burning cleaner, the requirement – again, we are in first-generation technology here – is that there's a lesser requirement. It's one of those early-adopter costs that has to be taken into consideration. We're at 25,000-kilometre intervals for this truck whereas we're up to 80,000 on our diesels.

Mr. Winton: The worst thing that I could do to Trevor is break him down in between Calgary and Edmonton. So if I extend my service intervals – as an engine manufacturer you close it in because you want to cover all the bases. It's new technology, as Trevor outlined. They're servicing the trucks more, but we want to do that in a prescribed manner because for trucking it's the unpredictable events that get you into trouble.

Mr. Stier: Thank you very much, Madam Chair. That covers it for me.

The Chair: Great. On my list I have Ms Calahasen, Mr. Cao, Mr. Casey, and Mr. Anglin, and we've got about 15 minutes.

Ms Calahasen: It's okay. I'm fine because he asked one of my questions.

The Chair: All right. Mr. Cao.

Mr. Cao: Well, thank you very much for the opportunity to listen to the industry. I missed the first part. Sorry. I was busy with a meeting here, in Calgary that is, in case you wanted to know. I have a question regarding the initiative. The industry has an interest or incentive by itself to move into the natural gas, CNG. Is that because you have the regulation pushing you or you saw some opportunity for business improvement or a good rate of return and all of that?

The Chair: Maybe we'll let Shell answer that. I think we know the answer, but it would be nice to hear it again.

Mr. Taylor: For Shell, the reason we're getting involved is that we are a big fuel producer, and we see this as another opportunity to be an innovative company in an area where we have also a lot of natural gas production. We think that there are a lot of positives that come out of here. As I mentioned, for our own use we're looking at how we use natural gas in a lot of our own operations, and as a fuel provider it's natural for us to then extend that to our customers.

You know, if I look at the different sectors of the economy that I talked about, only the marine sector really has any kind of pending regulations where I think this is where using LNG is actually a positive to help them. It's not really something that pushes them to it, but LNG just becomes an attractive fuel in that sector because it actually enables marine fleets to meet pending legislation or pending changes in regulation. I don't believe that's the case for any of the other sectors.

The Chair: Thank you. That's useful.

Gentlemen, any other comments?

Mr. Fridfinnson: I think I covered it in my presentation, but I'll touch on it quickly. Our motivation was not from a regulatory standpoint. It was from a business improvement standpoint, and we believed that there could be an economic viability proven out with converting to natural gas. We felt it was a progressive thing for our company and our industry and an environmentally responsible thing to be doing. So all three of those. People aren't paid by environmentally positive outcomes, but we thought there was a case to be made.

It's since been proven to be I'll call it more challenging than we would have hoped for. We're still committed to the path and going down it. Part of the reason to be here is just to relay our experience to you folks, who are ultimately going to have some say, either by doing nothing or by doing something, in promoting it.

2:15

Mr. Cao: Can I just have a supplemental? Probably in my experience years ago we talked about biofuel, you know, the methanol and all of that. We got hyped up about that, and then we got in there. I was wondering: is there any sort of competition in here if we go to this LNG? The other one is methanol. Any thoughts around that?

Mr. Fridfinnson: I'll defer to Bob.

Mr. Taylor: I'll just answer that relative to diesel uses and heavy-duty uses. We're really looking at, you know, biodiesel, where in a climate like most of Canada and particularly in Alberta, you know, B5 is really your blend, whereas in applications for using LNG, you can get pretty high replacement. Being a lower carbon-intensive fuel, that can bring a benefit as well. Certainly, we look at LNG as part of our overall fuel portfolio, and it does have a benefit of reducing the overall carbon footprint of our fuel portfolio.

I really can't comment on methanol specifically, so I apologize for that.

Mr. Cao: No problem.

The Chair: Okay. Thank you, Wayne.

Mr. Cao: Thank you.

Mr. Casey: I think I had virtually the same question as Mr. Cao, but I'm still struggling with the economic benefit of this. The basic question that Mr. Cao put was: well, why are you in the business? If we're in the business for greenhouse gas reduction, I can rationalize that. I understand that, and I understand our role as government in that. But it seems that if we go back to Mr. Gray's presentation this morning about the differential between the price of diesel and the price of natural gas and that this is somewhat the right time right now, he was suggesting that there was an economic benefit. I think it would have been good to have had his presentation maybe after your on-the-ground experience.

Nevertheless, that differential is absolutely critical to the expansion of this industry. If that differential is not going to be maintained, either you're gambling big time on it increasing, or if it decreases, it's going to require more incentive from government to make this happen. Then you have a market that is totally based on government incentive rather than market, which is a fragile place for anyone to be.

I guess my question would be: why are we in this business of natural gas and transportation at the basic level? If it's economic, I can understand that, but I haven't heard a lot today to tell me that it was economics. Greenhouse gas: well, we burn twice as much fuel, so, yeah, it's less. Nevertheless, the cost and the extra equipment: again, all that has a carbon footprint, as does the reduced payload over time. I'm curious about why.

Mr. Winton: Bob, do you want talk about the delta between diesel and how they've disconnected from natural gas, the market perspective?

Mr. Taylor: I think I'll actually address that by just going back to the fact that there is an opportunity right now that's economic and at the same time is environmental. I can't think of another example of a fuel. We used the example of biofuels. Well, that was driven by environmental but not driven by economic, so LNG is a bit unique in that. I think you have both benefits. I think what we've outlined here is that in the initial start-up phase there are a lot of challenges that go with that, but fundamentally it's an economic driver.

Mr. Fridfinnson: If I can weigh in from our standpoint, I think it's a great question. We asked ourselves the exact same thing in terms of whether or not it made sense to go about it. We certainly feel that ultimately there is an economic opportunity here from everything that we know and that we've learned about natural gas. Part of this was, you know, understanding that commodity risk now and saying: it's talked about that there's a hundred-year supply, and it's ever-present. It's not that long ago that somebody was on my doorstep trying to get me to lock into $10 or $12 gas, that that was going to be a great deal.

We understand the dynamic nature of these things. All business elements have risk to them, but in looking at it thoroughly, you say that with the technological advancements and with the supplies and resources that are both known and forecasted, that commodity is going to be available certainly beyond the lifespan of any given piece of equipment that's going to consume it and from all aspects well beyond that. So we say that the commodity is going to be there. Can it be used, and can it actually displace a commodity that's under let's call it more pressure, more pressure to find continuing supply and viable supply and clean supply and all that?

That was our aspect of it. I think it really boils down to a classic case of when you have something where there's that early adopter price that's got to be paid to get to a level of efficient operation that ultimately can transform an industry, is there a role to be played that can help that early adopter angle? I think we convinced ourselves of that. We convinced ourselves on a small scale – and 15 trucks out of our entire fleet for us is a small scale, but it's an important scale – to say: "You know what? It's a reasonable risk to undertake." We hope and look to see that our knowledge and experience with this would turn into a competitive advantage ultimately. That remains to be seen.

Mr. Casey: Thank you.

Mr. Winton: I guess I would add that there's lots of literature, and maybe it's something that the committee wants to investigate. The decoupling of the price of a barrel of oil and natural gas happened a few years ago, and there's lots of literature to understand why it will never be coupled again. So there's some reading there that can be done. I think that probably the game changer is the United States. With fracking and new drilling technology it's classic supply and demand 101, right? "I have a big supply of natural gas" – you know, in fact, in some cases it's spewing out of the ground – "and I don't have a marketplace for it." That price is going to go down.

As Trevor mentioned, the proven reserves are what's out there for natural gas in North America. From a United States perspective, every barrel of oil that they displace with natural gas, which is domestically produced, fundamentally changes their balance of trade. From an economic point of view, that's what's in it for them. The economics might be a little bit different in Canada. There's oil and natural gas. When I grew up in Calgary, most of the gaseous stuff was flared off. I grew up in an era of flare stacks.

Mr. Fridfinnson: Yeah. To bring it back to Alberta – and I tried to make the point in my presentation – I think it's not a case where this is a handout scenario. I think there's a business case to be made for the province given the extent of the reserves here and the amount of money that is derived from them or, I'll say, was derived from them. I don't have the figures handy. You guys are probably better schooled than am I. At the peak, maybe in 2007, there was $5 billion or $6 billion in natural gas royalties coming into the province of Alberta. It's at – what? – $1 billion now for last year. You know, sitting on that supply, to be able to help stimulate and create a market when there is that direct a link of payback is, I think, a compelling case to be understood and looked at.

The Chair: Thank you, gentlemen. That's a really wonderful way to roll this up.

Mr. Anglin, you've got a question, and then I think we're going to have to conclude.

2:25

Mr. Anglin: I'll be quick. I apologize that I had to step out on a number of other issues. If you answered the question, just tell me so, and I'll read the answer in the transcripts.

Very early on in your presentations someone mentioned – I wrote it down because it threw me off – in speaking about the

technology of the motors, the engines, that the compression was as high as 3,000 psi. Did I hear that correctly?

Mr. Winton: No, not compression. The compression of an HPDI LNG-fuelled engine is the same as a diesel engine. It's about 17 to 1. The fuel pressure is 5,000 psi.

Mr. Anglin: Okay. You gave me my answer. Thank you. I couldn't imagine a motor having 3,000 psi.

Mr. Winton: Neither could I.

Mr. Anglin: He's laughing over there. I wrote that down. I couldn't believe it.

Mr. Winton: But if they did have that compression, we could probably make natural gas autocombust.

Mr. Anglin: I think so. I was trying to think of how the metallurgy would work with that, never mind blowing the motor.

Mr. Stier: I'd love to have that in my truck.

Mr. Anglin: I know you would.

The Chair: All right. Well, I'm glad we got that cleared up.

I want to thank all three of you on behalf of this committee. This is a huge commitment of time on your part. I'm sure you had to prepare and think about what kind of questions politicians are going to ask you. Please do not think that this has ended. We're not going to hound you, but if you have ideas, comments, if you observe what's going on in our committee – and we'll be meeting for several months yet to go through some other questions – feel free to get a hold of our clerk and let us know what you think. This is an alive process, and our job is to make recommendations to the Legislature and our colleagues. We're in a good spot to be able to weigh some questions that wouldn't normally be weighed in a political environment. Again, our thanks to each of you.

I'm going to finish up with a little bit of housekeeping here. Does anybody have any research requests for Dr. Massolin?

Ms L. Johnson: Could we have a briefing note from the Department of Transportation on the weight allowances, please?

The Chair: Sure. Good idea. A briefing note from Transportation on weight allowances.

Dr. Massolin: Yes. Sure.

The Chair: Okay. Perfect.

All right. I also want to flag for you Williams Energy. We're doing the field trip on December 6. That's the date. You need to let our clerk know your coverall size – I know; I used to wear coveralls on the farm – and your shoe size so we can have that ready.

Our next meeting is next Wednesday, the 23rd, from 10 till noon in the same place. We're going to talk about LNG export. We had on our list that we were going to ask Shell, Chevron, Idemitsu, and TransCanada to talk about LNG exports. We understand that Shell cannot present because of your British rules that you comply with, so we're going to ask Chevron to come. We've also reached out to Idemitsu, and TransCanada is a go. It's very, very difficult for our clerk to organize this, with people, you know, moving dates and not being totally committed sometimes. I'm going to ask that on the stakeholder list we also include any other LNG exporter from Canada, potential or somebody with an export permit, and any other company besides Idemitsu – Mitsubishi, for example – who is an Asian partner in an LNG project, either as a buyer or as a partner, so that we can get that point of view.

Would somebody like to move a motion to adjourn this meeting?

Ms Calahasen: I will. I opened it.

The Chair: You're bookending us here, Ms Calahasen.

Ms Calahasen: I'm a bookend, yeah.

The Chair: All in favour? Any objections? The motion is carried. Thank you very much.

[The committee adjourned at 2:29 p.m.]

Published under the Authority of the Speaker
of the Legislative Assembly of Alberta