



JOHN BROADHURST, VICE PRESIDENT/SHELL CANADA

Date and place of birth (if available): Kimberly, British Columbia

Date and place of interview:

Name of interviewer: Peter McKenzie-Brown

Name of videographer: Peter Tombrowski

Full names (spelled out) of all others present:

Consent form signed: Yes

Transcript reviewed by subject:

Interview Duration: 1 hour, 15 minutes

Initials of Interviewer: PMB

Last name of subject: BROADHURST

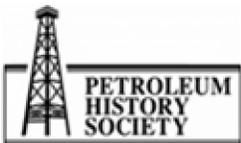
PMB: We are talking to John Broadhurst who is a vice-president with Shell Canada; the second person at Shell that we have spoken to. And, his primary involvement has been with the mining side of oil sands. With me is Peter Tombrowski, our videographer. Can you tell us where and when you were born and specifically date and place? Where you went to school, spouse and kids? So, names of spouse and children and just that basic information, please.

BROADHURST: Sure. So, I was born in Kimberly, B.C. which is a good mining town and I never thought I would be working with mining. But, that of course turned out to be false. That was in October of 1958. So, that's going back a little bit.

PMB: And, the date please?

BROADHURST: October 10th.

PMB: October 10th of 1958.



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BROADHURST: Yes. So, it was my mother's Thanksgiving turkey. So, I don't think I've ever lived that one down. Today, of course, I live in Calgary. I am married. My wife is Bev. And, I've got two kids: John and Kimberly, both actually living in BC. So, they went back and I went to Alberta.

PMB: How old are they?

BROADHURST: 24 and 20.

PMB: Are they in school? Well, you told me that your son is studying...

BROADHURST: Yes. That is right. So, my son is studying history at Simon Fraser. And, my daughter is taking nursing at UBC Okanagan.

PMB: Okay, good. Next question, just tell us a little bit about your career. How long and when did you begin? What did you do before you joined Shell? What have you done since?

BROADHURST: So, I've been Shell since I graduated from UBC. So, my entire career has been with Shell. And, it's coming up on 32 years in May of this year. And, really just a broad range of background. I started out in the conventional exploration and production part of the business. So, working on the sour gas side of the business, working at places like the Jumping Pound Gas Plant, just outside of Calgary. And, from an engineering point of view, I looked after a number of the small northern oil and gas fields. So, I got an opportunity to see the broad range of the conventional business.

I then had an opportunity to actually go to Vancouver in the manufacturing side of the business. So, working in the refinery, the Shellburne Refinery and part of the role was also shutting down and converting that refinery to a finishing terminal. So, that was our west coast refinery. And, of course, as you know in the 1990s the industry generally was going through a period of rationalization of older, smaller refineries. So, that is what we did there. So, that was kind of interesting. And, I came back to Calgary and looked after the development side for our Caroline Gas Facility and our Jumping Pound Gas Facility. And, shortly after that I got pulled in to working on the oil sands side of the business. And, I find it pretty exciting and I have never left.

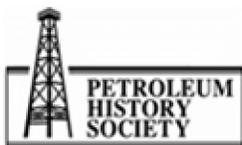
PMB: What year would that have been?

BROADHURST: That was in 1996 that I came into the oil sands side of the business.

PMB: Okay, so 17 years. That has been your baby. And, that has been a pretty exciting period.

BROADHURST: It has been. It has been.

PMB: The question is what led to your personal involvement in the oil sands? And, of course, it was just your career move as well as what Shell was doing in terms of development?



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BROADHURST: Yes, exactly right. We had gone through a period with Shell of really driving the business to a higher level of operation excellence. And, part of that was to go through and rationalize a number of the existing properties that we had. So, we went through and sold a number of properties in the early 1990s.

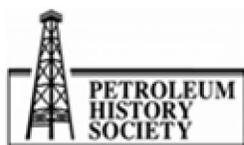
PMB: Are we talking about oil sands properties here?

BROADHURST: No, conventional oil and gas. And, so we came out of our focus period on operational excellence as a very strong and very profitable company. And, when you're in that position what you need to think about next is how are you going to grow the business? How are you going to add additional reserves and create some additional shareholder value? And, really our biggest asset at that time and we'd held it since the 1950s -- well, actually two assets that we'd held since the 1950s. One was the Lease 13, mineable oil sands lease and the other was our Peace River Lease where we had a smaller demonstration size of project, so the Peace River Complex. So, in late 1995 we really asked ourselves the question, "So, now what?" And, we did a strategic review of the mineable oil sands lease. We were able to understand what had changed since the last time we'd looked at advancing an opportunity which was through our participation in the oil sands project in the late 1970s. And, there had been changes.

The introduction to the industry of large scale truck/shovel at Suncor that brought down the operating costs on the mining side. And, we saw that there was some potential for a profitable development; potential, not a guarantee. So, there was a very small team. There was about six of us that were pulled together in early 1996, under a fellow by the name of Neil Camarta's leadership. And, I think you are talking to Neil. And, he's a one of a kind character and a real driver and has a real knack for being able to see how to create value. And, we did. So, we've gone from six of us back in 1996 to several thousand people that are all part of our mineable oil sands business.

PMB: Now, as I recall in 1996 oil prices were kind of in the tank. They were fairly crappy. I know that at one point, there in 1998 I think it was, they were like \$10.00 or \$12.00 or something at one point. And, so it was an interesting intuitive bet because prices were so bad. And, I do not know whether you recall the Economist issue, which basically said that in 1998, oil prices would drop to \$5.00 and they would remain there for many years. And, essentially the day that magazine hit the newsstands, prices started to go up and they really didn't turn around. But, my question is this: how did you think you could make money in such a low price environment?

BROADHURST: So, then the first thing to recognize is that predicting oil prices is very challenging. And, as many people are predicting oil would go to \$5.00 or an equal amount of people that predicted that it would go to \$100.00. So, guess who was right or at least for now. So, we do try and take a long-term view. Shell is very much into looking at scenarios and that is one of our key claims to fame is that we do take a long-term view. And, we do look at the world from a scenario perspective, because we know that there is no guarantee for how it will turn out. And, at that point in time we had a reasonable expectation that the upside was going to exist for us. We had a reasonable belief that we would be able to continue to, especially in that depressed environment,



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manage cost to the point where we could have something that could be economic. But, it was a big strategic bet for Shell. And, I am very happy and I would like to think that our shareholders are very happy that we took that decision.

PMB: Now, the story of the trucks and shovels. There are a lot of sort of conflicting stories around that. I think most people give Suncor a lot of credit for it. I have heard that Syncrude had actually begun the process, but were mostly using it for moving overburden. Do you have any feel for how that originated? Who should get credit for what in the use of trucks and shovels?

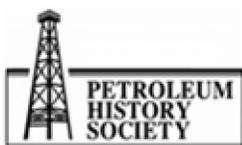
BROADHURST: The one thing we know having been back in the business, back in the industry now for a few years is that both Syncrude and Suncor were incredible pioneers. And, I suspect when it comes to innovations like truck and shovel both of them had a hand in it. And, if it is not truck and shovel, it is extraction process technology; really those two companies were the pioneers. They are the ones that took the bloody noses for all of us to be able to advance developing this resource now.

PMB: Could you make the argument that by using the bucket-wheels and the draglines, that that was maybe an error in the first place? You were using basically technology that had been developed for the European coal mining industry. And, of course, soft coal is way different from the oil sands in the middle of winter.

BROADHURST: Well, I think all of us are way smarter about what has happened in the past. And, for Suncor, for GCOS they had to start somewhere. And, what was out there and what was available was knowledge around German brown coal conventional mining techniques. And, they made it work. And, depending upon what the oil price would have been, that technology could have been quite viable for some time. There are even views out there today, some of my colleagues and other mining companies' views about the fact that they think there is even a place for dragline/bucket-wheel technology in the oil sands today, because truck and shovels are getting expensive and having its own issues associated with it.

So, when you are doing development work you make the decisions in front of you with the best information that you've got. And, both Syncrude and Suncor I think, they led the way. They had a technology that worked. And, it's always a question of, "Can you get better?" We know as an industry today, for example, on the environmental front that we can get better and we need to get better which is why we've set up consortiums like COSIA for example. So, you do the best you can with the information you have and you make it work. That is the one thing I know about our industry is that it is very adaptive at making whatever choices they've made work for them.

PMB: Thank you very much for that. That's quite interesting. Now, I've done a little research on this, of course and Shell originally applied to construct 100,000 barrel a day in-situ plant in the 1960s. They didn't get approval for that and I cannot remember why. And then, applied for the pilot project again in 1972 and in 1977 it began work on an experimental plant capable of producing 3,500 barrels a day. This is the Peace River In-Situ Project. Now, I understand you were not in it? I



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understand that you were not involved in that line of business? I suspect you've talked to different people about that? Can you give me any information about that Peace River Project?

BROADHURST: So, I have had accountability since 2009 for the in-situ side of our business. As you may know, we're working to advance a large scale expansion project called Carmon Creek. There is a Carmon Creek development. So, I can give you reasonable perspective on the history since the late 1970s when we did the original Peace River In-Situ Project and then followed that up with the PREP, Peace River Expansion Project which was in the mid-1980s. And, Carmon Creek of course, is going to take the production levels in the nearer term assuming that we take that investment decision to somewhere in the order of 80,000 barrels per day. But, as far as going back to the 1960s, that part I just don't have the history.

PMB: And, there is some of that material in the Glenbow Archives.

BROADHURST: I should go have a look at it...

PMB: It does already exist. So, continue with what you can tell us about the in-situ projects?

BROADHURST: So, Shell has had since the 1950s these large bitumen lease-holdings. The Lease 13 that we talked about and we have many more leases now.

PMB: How big is Lease 13?

BROADHURST: Lease 13 in terms of size?

PMB: Area wise?

BROADHURST: Or, barrels?

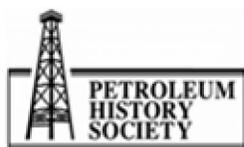
PMB: Well, both actually would be great?

BROADHURST: It's probably 10 kilometres by 5 kilometres. And, barrels it is probably somewhere in the range of 5 billion barrels recoverable, something like that. This is why the oil sands is such a national treasure. This is a huge, huge resource for Alberta and for Canada.

PMB: So, that's the first one and then Lease 13 is mineable?

BROADHURST: Right. So, on the east side is Lease 13 and that is mineable. On the west side of the Province if you just go due west as the crow flies, that is where we also have a large scale 9 billion barrels in place. Maybe 3.5 to 4 recoverable and that is too deep to mine. So, that's where we look at in-situ production and the principle means of developing in-situ production is using steam to essentially soften and mobilize the bitumen.

PMB: That is in the Peace River area?



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BROADHURST: That is the Peace River area. And so, we got both those leases in the 1950s. And, we were able to after a couple of attempts at trying to come up with a mineable development that we could support, were able to get the Athabasca Oil Sands Project moving. And, on the Peace River In-Situ side, that has been a real labour in technology development. So, we started out in 1979 with the intent of testing different technologies. And, we expanded that with the PREP or Peace River Expansion Project into the 1980s. Again, with the view that we would use that development to learn about how to optimize the production; through that whole period we've probably tested out ten plus different development schemes. We have over a thousand wells that are in place.

So, that's probably, I'm happy to say, one of the most well understood resources that we have in the portfolio. And, so from subsurface risk perspective, it's very well understood. And, that's why we're comfortable looking to advance an opportunity for the Carmon Creek Project at this time. There are a lot of people who have done a lot of learning for us through those decades.

PMB: The one project, the mineable project if I recall, is something that somebody at Shell acquired in the 1950s?

BROADHURST: Right.

PMB: And, of course, nobody seems to remember who or why?

BROADHURST: No. The guy that would have the closest chance of doing that is Keith Firmin, who I think you've talked to already.

PMB: Okay, fair enough.

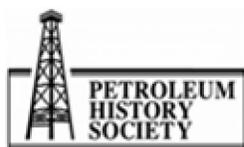
BROADHURST: Keith was the keeper of the leasing. Even when we weren't developing, Keith would dutifully go each year and make sure everything was locked and things were taken care of.

PMB: So, is his background, was he originally a land man?

BROADHURST: Keith is actually a mining engineer.

PMB: Now, those were the two, sort of, heritage leases that you had. You have a lot more now. Can you tell us a little bit about that?

BROADHURST: Yes. So, on the mineable oil sands side we acquired back in the 1990s, some leases from Amerada Hess. So, that the main ones are Leases 88 and 89, which are just due north of Lease 13 and really an extension of the ore body where we have our Jackpine Mine. So, we acquired those leases in about 1997 if I remember right. And, that was really just to make sure that we had a risk management plan in the event from at least a ten year point of view, we weren't able to maintain our rights to Lease 13. And then, through the 2000s there was actually a bit of a gold rush on oil sands lease and so we acquired at that point in time, a number of leases on the west side of the Athabasca River principally through Crown Land sales. There was one very nice lease that we acquired as part



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of the Amerada Hess package and that is Lease 9. And, that is also on the west side of the Athabasca. So, if you look at our current regulatory applications that we have in the system, the Jackpine Mine expansion is growing from the Jackpine Mine into those Leases: 88, 89 on the east side of the Athabasca River. And, the Pierre River Mine development is really starting from that central point at Lease 9. And then, we'd look to in future, grow north to take advantage of those leases. So, that's the mineable side in terms of what we've done. So, the one acquisition through Amerada and other than a few kind of lease boundaries swaps, mainly through Crown Land sales. In the Peace River area, we've had the lease holdings since the 1950s. And, the key thing that we've done there hasn't been a Crown Lease acquisition, but we did a corporate acquisition of the company called Blackrock.

PMB: Oh, Blackrock. I remember. Okay?

BROADHURST: So, that was in the mid-2000s. And, what came with Blackrock was some additional lease holding in the area mainly to the east of the main Peace River block. And, that is where we've been advancing our cold production. So, that's essentially bitumen that you can produce without having to add steam or solvent or some other way to mobilize the oil.

PMB: So, you have a much lighter form of bitumen?

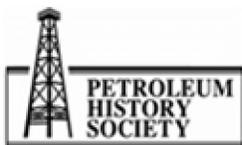
BROADHURST: Well, it's not that it's a lighter form of bitumen. You don't get very high recovery and so you need to come in later and have additional recovery techniques applied to it. But, cold production can be quite nice in terms of a smaller scale reasonably profitable type of development, because it's effectively frothy oil. And, because it is gassy it will produce for a period of time and then it will become more like normal bitumen and then you have to do something different to produce it. But, if you think about all of the work that we put into getting a conventional in-situ barrel, whether it's through a kind of horizontal well SAGD type of production or whether it's through a vertical well type of production. If you compare that cold production where you just have to put oil in a pump, it's quite good for us from a development point of view. But, you don't get a lot of volume.

PMB: Let me ask you a question: Blackrock. I'm trying to remember whether that was one word or two?

BROADHURST: One word.

PMB: Now, somebody told me a few years ago that I think she said that Shell had something in the order of potentially 30 billion barrels of recoverable bitumen. Is that overstating the case?

BROADHURST: I think it would depend what you're including in the scope. So, the piece that we didn't talk about is the piece in the middle. So, one of things that Shell did in the 1990s is they acquired a very significant lease-holding in the carbonates, between the mineable oil sands and the in-situ oil sands to the west, so the Peace River. So, in the Grosmont area we have a very significant lease-holding of the carbonates. And, that's more of a technology play. There a couple companies



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out there today like OSUM and Laricina that are doing some really interesting work with what I would call more conventional production techniques. Shell has been looking at a range of techniques, but one of the techniques that we've been doing development work on in the field as we speak in our first technical de-risking pilot is we actually put electrical heaters subsurface. And, heat the bitumen up with electricity. So, that bit in the middle at Grosmont has a significant hydro-carbon resource potential. And, it would be quite a range of recoverable bitumen depending on the assumptions you make. So, suffice it to say we've got a huge opportunity here in Alberta with our bitumen resources.

PMB: Can you explain how the carbonates are different from the sands? And, what kinds of technologies might you use there?

BROADHURST: So, if you think about the carbonates compared to the sands, it's just that it's a tighter rock. And, so you're needing to rely -- if you think about oil shale, it would be closer to an oil shale than it would be to a carbonate sand. And, so different techniques that you need to look at depending upon the structure, there will be natural fractures and kind of vuginess you can take advantage of, so you can take advantage of that. But, it's quite a different formation. And, therefore quite a different subsurface analysis in terms of how do you design your production scheme.

PMB: And, vugs are essentially little holes in the rock that the oil or bitumen has seeped into?

BROADHURST: Right.

PMB: The more of them, of course, the heavier you are because that is a pure source of bitumen?

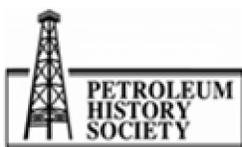
BROADHURST: Right, depending upon the design, yes.

PMB: Well, you've described all of these projects quite well. You've kind of already done the Peace River Expansion Project which now, according to my notes, in 1985 it received approval to increase capacity to 10,500 barrels today. In 2006, it submitted a regulatory application for an additional 80,000 barrel per day thermal expansion project. Where does that stand? I think you've told me that, but you've told me so much I can't keep it all in my mind.

BROADHURST: We actually did apply for Carmon Creek development in the mid-2000s. What we found was the more work we did, the more we refined the development plan. And, in 2008 what we determined was it had changed enough that we should actually, rather than continuing to update our application, we should actually pull the application and resubmit. So, that is what we did. In 2009, we resubmitted the Carmon Creek application and it's for two phases of 40,000 barrels per day average production.

PMB: Sorry, 40,000 for each phase?

BROADHURST: That's correct. So, 80,000 in total for the regulatory submission and that's just in the regulatory process. We're hopeful that we'll get a positive response in terms of that application.



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And then, of course we'll need to finish the engineering work and take an investment decision on whether or not to proceed with that.

PMB: What would be the capital costs, maybe capital and operating? How have you worked that out so far?

BROADHURST: So, the one thing you know about Shell is we don't disclose our capital costs or operating costs. Sorry, I can't help you there.

PMB: I thought I'd get you at a weak moment.

BROADHURST: No, sorry. I'm well-trained.

PMB: Okay. Now, you've told me a little bit about this already, but you're using both cold and thermal recovery in these projects. Can you explain to me how some work, what you call cold production and why others require thermal? And, I guess another question that I would have is whether you've tried using any solvents?

BROADHURST: Right. So, for the bitumen, it all ultimately needs some sort of assistance for what would be an acceptable recovery for the bitumen. Cold recovery, the most you get is somewhere between 5% and 8 % which is just not acceptable for the owners of the resource, the people of Alberta. But, cold is a step that you can take where you can go in and if the particular reservoir is amenable to cold production and it's only a very small portion that is, then it can be a good profitable way to get some bitumen recovery.

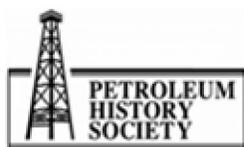
As I'd indicated before, you have to go back after and do something else to get the ultimate recovery that you want to get which should be targeting somewhere kind of north of 40% to 50% for a thermal type of process. So, think of cold as an advanced guard. It's something that you can go in and do, get 5% recovery without having to put a lot of equipment and energy into it. But then, for the bulk of the resource that you want to access you're going to have to do something to support the bitumen production. Thermal has been the conventional way in industry. There is more and more of a move to add solvent as a way to essentially reduce the viscosity and therefore reduce the amount of energy that you have to put into the recovery. But, it has its own particular design nuances. We haven't done it yet, although that's one of the things that we will be testing at Peace River.

PMB: You will at some point be testing the use of solvents?

BROADHURST: You bet.

PMB: A lot of the companies now seem to be drawing those same conclusions.

BROADHURST: Absolutely.



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PMB: A few years ago you had the most interesting project. I remember reading about it in Oil Week or Oil Sands Review or something. And, this was a technology which used electrical heaters underground to convert the heavy oil into a lighter crude oil. It was almost as though it was refining. The idea, I think, was to almost refine the bitumen underground and then draw it out?

BROADHURST: Right. So, that's what we're talking about with the Grosmont carbonates. One of the nice features of using an electric heater to mobilize the bitumen is depending upon how far you want to take the process you can kind of dial up or dial down the energy input. So, you could make bitumen. You could make bitumen that has had some cracking so that it has got a viscosity that allows it to be pipeline transportable. Or, you could take it all the way to an upgraded product and leave the reject carbon underground. So, that is that whole suite of technology that Shell has been working on.

PMB: Have you issued any reports on that, that you'd be willing to talk about?

BROADHURST: Publicly, I don't think that we've issued a lot of information on it. As I've indicated, we're just in the field right now with our first technical de-risking pilot plant. We've done a lot of work in our research center down in Houston. And, we've even used the heaters subsurface at our test facility in Gazmer. That is all good and important to supporting the technology development. We know an awful lot about it and how it will perform. And, of course, that all feeds all the detailed simulation models that Shell is particularly good at developing. But, you always want to go and test it in the field, with the real live reservoir and see what happens. So, that's what we're doing right now.

PMB: Wow. That is a really interesting technology. Any idea when the tests might be completed?

BROADHURST: Well, this particular test that we're doing is one of a series of activities that we'll undertake. So, this one will be done within the next 18 month to 24 months.

PMB: In my notes I said that you've paid \$465 Million for oil sands in the Grosmont. And, I think those were the carbonates. Is that correct?

BROADHURST: Yeah, I cannot recall the exact number. But, it was a significant purchase.

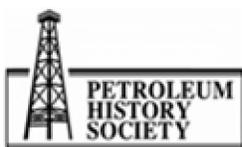
PMB: Now, I'm trying to recall, didn't you basically have somebody, a numbered company bid on those properties and then you go them that way?

BROADHURST: Yeah, that's pretty typical.

PMB: Were those carbonates or were they oil sands?

BROADHURST: No, those are carbonates.

PMB: Those were the carbonates?



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BROADHURST: That is the Grosmont.

PMB: Okay, fair enough. Now, here is something that I find really interesting. Around 1979, I'm trying to remember whether I have this right or not, before the National Energy Program? No, you were not involved in that. So, skip that thought. Well, let me go back to that period, when Imperial said, 'Well, we're going to develop this Cold Lake Project and we're going to have an upgrader and refinery associated with it and it's going to cost,' I forget what the price was, \$2 Billion or \$2.5 Billion or something like that. And then, of course, came the National Energy Program and then they scraped that whole idea and just started developing Cold Lake in little pieces, in slow motion. But, it seems to me and help me out, if I understand this: what you have in effect done and I think Suncor had done the same thing, is to create this network where you have oil sands, mineable bitumen going to the Scotford Refinery and then in-situ, stuff going up to an upgrader at the refinery.

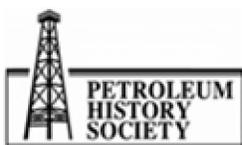
So, in effect, it seems to me that what you have done with the use of pipelines and having different pieces of technology in different places, created totally integrated system of oil sands upgraders and refineries in north, I think it is mostly in northeastern Alberta. Would that be a fair description?

BROADHURST: If you kind of step back and look at it, the market is a wonderful thing, because it always kind of sorts things out. And, the market acts over time and so there will be decisions that fit for where the market is and what infrastructure exists at a given point in time when you're making investment decisions. So, it's not like you can pull out the recipe book for, 'I'm developing bitumen, therefore I need to have one of these, one of these.' It doesn't work that way. You have to actually -- it is a very creative process in terms of doing development work. And, you have to look at kind of what you have at the time. At the end of the day, hydrocarbon is only useful to us if we can get them to be a good finished product.

So, it's either going to be a fuel product like diesel or gasoline or jet fuel. Or, it's going to be some derivative downstream that is getting into the chemical side of the business. And, somebody is going to build the hardware to get you from bitumen to that. The question is, 'Do you need to or can somebody else do it or do they have it already.' And, that's what you need to think through as a company. And, of course, the industry will have a certain level of capacity for doing upgrading for transporting material and so forth. And, you have to take that into account for us. We have at one point in time, been in a participant in the Alsands Project which was supposed to start up...

PMB: That is the one I was trying to remember. And, that was in the 70s and early 80s.

BROADHURST: Right. So, that was kind of '79-ish. And, we actually shut down the Alsands Project in 1981. Now, that is exactly the same year that we took the investment decision for the Scotford Refinery, which is the first and only 100% synthetic crude oil producing refinery. They were intended to be a match set: produce the synthetic crude oil, had the refinery to process it. Given the economic circumstances at the time, the mine to produce the synthetic bitumen didn't make sense. But, there was ample supply of synthetic crude oil from Syncrude and Suncor. So, the



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refinery made sense. So, the refinery was built. Then when we were looking at revisiting again, in the mid-1990s, is it time now for a mineable development. What we did, what any developer would do is you look at what is in your portfolio. We had the refinery and so we thought about how we could best integrate the output from an upgrader into the refinery. And, that needed to be approximate. So, then you had to figure about how do you transport bitumen 590 kilometres to the upgrader. And then, that drives the process you have to have in place for the upstream. So, there was a very creative process. And, you have to, in each and every case, look at what are the circumstances that you find yourself in, what assets do you have, what assets do other people have and then you build out your options to take advantage of that.

PMB: So, what pieces of hardware are now in place in the Shell world?

BROADHURST: So, for us we're thankful that we've got two large mines as part of our Albian Sands operation. So, Shell Albian Sands has the original Muskeg River Mine which we started up in 2002. And, it's also got the Jackpine Mine which is on the eastern part of the lease which we started up in 2006. So, we have two mines. We have a significant lease-holding portfolio. We've got a pipeline infrastructure through our third party commercial partners, inter-pipeline fund. Between that mine and the Scotford Upgrader with a diluent return line as part of that pipeline system. And, we have at Scotford a large upgrading complex that effectively matches our production. We also have the integration with the refineries so that the refinery is taking 100 % of its feed, predominantly from our existing upgrader. And then, of course, you go to market from there with your crude oil products. So, the thing that we've always been most proud of is that for Albertans we've been able to provide a mine to pump solutions. So, if we go all the way from mineable bitumen to gas that is going into your pump, into your car, jet fuel that is going in the planes you're flying on; all in Alberta. We're the only guys who do that.

PMB: That's probably in the world, isn't it?

BROADHURST: Well, there will be other places where people have refining assets that approximate to their production. But, for us in Alberta with our bitumen resources, we're the only operator that goes all the way from mine face to the tank of your car in Alberta.

PMB: Even Suncor? Suncor doesn't have any gas stations here, do they?

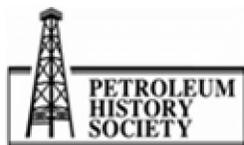
BROADHURST: Refineries.

PMB: No, I'm sorry. I'm talking about gas service stations. I know that they have a fleet of them in Ontario?

BROADHURST: Right.

PMB: But, not here in Alberta?

BROADHURST: Right.



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PMB: And, some I think in Colorado?

BROADHURST: Yes.

PMB: You've given me a lot of background on the Muskeg River and the Athabasca Oil Sands Project. Is there anything you want to add on that?

BROADHURST: I think the one thing that I wanted to make sure that we talked about as part of this discussion as more of an industry point. And, that is how far the industry has come in terms of recognizing the importance of their social licence and also recognizing the importance of driving for a higher level of performance in a number of the key environmental areas. And, I don't know if everyone knows how unprecedented that is.

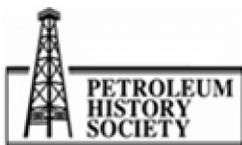
PMB: I would love you talk about that. A really important idea, if you would talk about that please, that would be great?

BROADHURST: I'd be happy to. So, we have a national treasure here in Alberta with the oil sands. And, hopefully people recognize that it's a significant resource. It's a significant resource that the world needs. When we look at the growing expectations for demand globally for hydro-carbons still and the potential supply sources; to be clear, from Shell's perspective we very much feel that there has to be a portfolio approach to the energy on a global basis going forward. Even with terrific supplies like the oil sands in Alberta, we're going to be very stressed on a global level to provide conventional supplies of hydro-carbons. So, we need renewables. We need natural gases as a lower carbon intensity bridging option for an overall reduction in carbon intensity. All this stuff is critically important, but the oil sands is still very much required as part of the solution to the world's problem. And, the one thing I think the industry has recognized and the Government of Alberta has been incredibly proactive on is the requirement to improve our performance. Our customers, our global customers expect us to keep that.

We do many, many things to operate in a safe environmentally responsible manner, but we can do better. And, the areas that we've really been focusing on as industry and as government have been areas like tailings, like land and reclamation, like water use and greenhouse gas of course. The industry has done very good work, I think, in the past through consortiums like CONRAD. But, that work has been fairly limited to what I would call pre-commercial fundamentals research; very good work done there through things like their tailings group and their land group. As an industry, we have come together over the last number of years through I think very innovative consortium like the Oil Sands Tailings Consortium that many of us were involved in establishing. Where you have open sharing of information among all of the mining companies on tailings, again, unprecedented in terms of an approach for industry.

PMB: This is essentially sharing of technology?

BROADHURST: Right.



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PMB: And, ways to deal with the tailings?

BROADHURST: Exactly.

PMB: So, you're not sharing technologies that are competitive?

BROADHURST: No.

PMB: But, things that work at the other end when you're trying to clean up the environment?

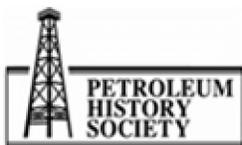
BROADHURST: We're very, very particular about the fact that we are strong competitors. And, of course, you have to have that. But, tailings is an area and the others areas I've mentioned are areas of environmental performance. And, everyone wants us to do better there and collaboration is very much accepted within that frame. So, the Oil Sands Tailings Consortium was a new model for us. How you could come together and share tailings information openly with no IP barriers, no money having to change hands. And, it's all about getting our people working together to drive the next solution.

We also had through the leadership of companies like Suncor, Total, Nexen, Conoco and others, established the Oil Sands Leadership Initiative which was more in-situ companies focused on improvement in the environmental priority areas. And, most recently the establishment of Canada's Oil Sands Innovation Alliance or COSIA has been trying to pull that all together. And, COSIA's standing up, it's one year since we had announced its establishment. 12 CEOs stood up at that time and publicly committed to improving our environmental performances in industry.

Since that point in time, two additional companies have joined. So, there are 14 in COSIA. And, it's now up and running and people are focused on putting plans together or doing the work that's necessary to drive that change in performance. It is the largest industry consortium in the world. And, I think we may be underestimate what we've actually achieved in being able to get 14 companies to the place where we can collaborate in those four significant areas of environmental improvement. And, that's why for example, you've seen us recently winding down CONRAD and winding down OSLI. Now, we've kind of ported the environmental projects over to COSIA and that's where we've set up the organization structure with the strength and capacity to make sure that we can advance those four priority items. So, it's a pretty amazing thing that the industry has done.

PMB: You talked about all of these tremendous environmental initiatives. I've been following them fairly closely. But, you didn't really define the social licence to operate?

BROADHURST: So, social licence to operate is really for us. Ensuring that when we're developing the resource that we're doing it in a way that obviously the regulators and the stakeholders more generally, and in particular for us in Alberta, our Aboriginal neighbors. That when we're developing it we're doing the things that we commit to do in terms of environmental performance, working with the communities and providing value from a social perspective that that group of people are comfortable and supportive with how we're doing our developments. So, really a social licence is to



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develop in a way that our broad stakeholders feel that we're doing it properly and feel that they can support it.

PMB: Let me see whether I can add another aspect to that. Since the province or the people of the province own the resource and there are certain Aboriginal rights that are involved there. And, there are various other stakeholders. In order for you, Shell to have authority, to have a licence to develop a public asset you have to make everybody happy. And, that is in effect, is the social licence to operate. Would that be fair?

BROADHURST: Yes. I think it's an issue of trying to get something that is going to be acceptable to everyone. No one will always be 100% happy with everything. There are some stakeholders that would be happiest if we didn't develop at all. So, it's finding something that the vast majority see as a reasonable, sound, solid way to develop the resource.

PMB: And then, negotiator on that, the orbiter on that is basically the ERCB...

BROADHURST: It would be the regulator.

PMB: The regulator makes the decisions on that.

BROADHURST: So, for mining developments of course as you know, they are big enough and complex enough that we almost always have a joint review panel when we're doing the regulatory reviews. So, that's a combination of federal and provincial regulators that come together in joint process.

PMB: Good. Okay, that's excellent. I think it was in the late 1990s, so it was during your period. Or, the early 2000s, the Paraffinic Froth Treatment Process was developed. You've used it in your Athabasca Oil Sands Project. And, Imperial is now using it at its Kearl development. Can you talk a little bit about that and why that's so significant?

BROADHURST: Sure. So, first off back to CONRAD; CONRAD was a place where some fundamentals work was done in this area. In fact, it was Syncrude that contributed the early day fundamental work on Paraffinic Froth Treatment. And, it's an important process because what it does is it allows you to make bitumen that is very clean and pipeline-able. The difference, if you look at the conventional technologies that were used with Syncrude and Suncor in the past, was they used a Naphthenic Process.

The Naphthenic Process, you are essentially using mechanical separation. So, you dilute the bitumen that has still some clays and some water. You dilute it and then you use different mechanisms physically separating the material from the bitumen. And, you get something that is clean enough to go into a coker, but not clean enough to go into a pipeline. And, so the Paraffinic Froth Treatment was, if you think back to the way I described our development it was absolutely essential. Because, not only did we need a product that was clean enough to put into a pipeline, but we needed a product that was going to be clean enough to put into a catalytic upgrading process, not a coking



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process. So, because we at Scotford had a hydrogen based complex we wanted to have a catalytic hydrogen based upgrading process. So, the Paraffinic Froth Treatment was an absolutely essential component of our upstream process to make the whole thing work. And so, we developed the technology actually in parallel with advancing the project. And, it had to work, because everything needed to rely on that very plain bitumen product. Similarly, our colleagues over at Kearl they were able to take the same fundamentals work that had been provided by Syncrude through CONRAD. And, they developed a Paraffinic Froth Treatment Process mainly to, in their case get a product that was clean enough to go into the pipeline system. So, slightly different driver for them than us, but same basic point that you needed to have something that was cleaner than the legacy Naphthenic Processes; so a very, very critical technology and it's the technology that unlocks the ability to move mineable bitumen to market.

PMB: Just so I understand this, what it effectively does is to leave some of the really gunky parts of the bitumen, right? You basically just take it right back to the mine?

BROADHURST: Yes.

PMB: When you reclaim the mine, you just bury it?

BROADHURST: I just put it out with the tailings. It's benign. So, it just goes out with the tailings.

PMB: It's benign in the sense that...

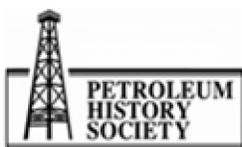
BROADHURST: Environmentally.

PMB: Is it really?

BROADHURST: Yes. So, it just goes back into the pit mixed in with the sand and the clay. But, essentially what you're doing is you're taking some of the heaviest asphaltine material and it's polarized and it just grabs all the free water and the clays that are with it and drops it out. And, you get a beautifully clean bitumen product at the end of it.

PMB: Good. It sounds good. The reorganization by Royal Dutch Shell and I was out of the country when this happened. So, excuse me if I'm sounding as if I'm speaking for a level of my ignorance. What I've heard from a number of people since coming back is that a lot of the decision making ability was taken away from Calgary and basically sent back to The Hague and London. Is there any truth to that? No, I want to put that another way. I want to give you an easy way out. To what extent is that true?

BROADHURST: So, first off I think that that's not really a good characterization of the situation. So, what we were able to do by becoming fully part of the Royal Dutch Shell family is we were able to really capitalize on the technical capability that the group has and the processes that the group can bring. If you take safety, for example, the group is Shell, Royal Dutch Shell. So, the group is one of the world leaders when it comes to safety; ourselves and our colleagues at Exxon, for example.



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We're able to tap into an even more meaningful way to group expertise, group processes. We are part of Royal Dutch Shell and so some of the reporting functions do go outside of Canada. If you think of it, some of the functional areas like finance and so forth. The decision making for what we do in our businesses here in Canada is very much with the line as it always has been. Actually, for us the way that the role that Shell divides up, we're actually part of upstream America. And, so our connection is through to Houston. So, it's very much a north/south connection as opposed to a connection into The Hague. It's the upstream international that works into that.

PMB: Of course, you're right.

BROADHURST: So, I was Shell Canada for many, many years. And, of course, we were a big company or felt like a big company, but a small company compared to Royal Dutch Shell. It has its pluses and minuses. But, certainly my experience has been that being fully part of the group family has been nothing but an advantage to use here in Canada. If you look at what we're doing in Canada, Shell's activity in Canada between the heavy oil business and the exploration that we're doing and the unconventional oil and gas development we're doing, Shell is putting a huge amount of money into this country. And, I'm not sure that Shell Canada for the size that it was would have had the capability to do what group is able to do in Canada. So, as a Canadian I'm pretty darn happy that we have the group and that they like Canada.

PMB: So, in effect, I mean you've kind of turned me over to that point of view. But, let me just clarify this: Shell Canada used to be traded on the Toronto...

BROADHURST: Yes.

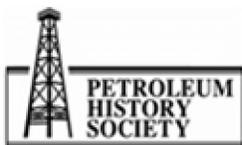
PMB: ... and I think on the New York Stock Exchange. And, so now it doesn't trade anywhere? Is that correct?

BROADHURST: That's correct.

PMB: So, that would be maybe the major change when that reorganization took place. Would that be correct?

BROADHURST: You're absolutely correct. We had our own Shell Canada shareholders and as a result, our own governance. We had to manage our affairs in Canada in the interest of the Shell Canada shareholders. Royal Dutch Shell had its own shareholders and it needed to manage its affairs in the interest of those shareholders. Now, with the minority shareholders in Shell Canada bought out, it is effectively the D-listed and we are truly part of the group as an operating entity. So, as a Canadian and as a long-time Shell Canada person I'm pretty darn happy with the fact that we're part of the family.

PMB: Now, I'm just writing an article about fracking, the technologies. The new technologies that are based on fracking are making all kinds of gas, the gas shale. Our shale gas has created these surpluses of low cost oil. And, increasingly it's bringing new light oil, making new light oil supplies



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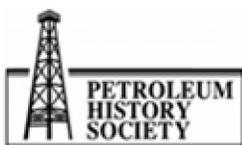
available in the North American market. And, the impression that I get as an interested observer is that these changes are fairly revolutionary. To what extent do you see them influencing your own operations? To what extent are they making, for example, traditional/conventional/natural gas economic? To what extent are they basically making the North American demand for crude oil supply less? How are they affecting the economics of the petroleum industry?

BROADHURST: Right, so you bundled up about six or seven questions in there. And, I can't really speak to economics, but I can give you a couple perspectives on it. So, things have really changed quite fundamentally. Who would have guessed that the US had the potential to be energy self-sufficient? That would not have been on anybody's list of potential things. So, it just speaks to the innovation within the industry. From the heavy oil perspective, lots of gas and low cost gas is a good thing, because one of the things we have is a feedstock for our processes whether it's thermal or mining is we need some energy. So, the ability to access that feedstock at a lower cost for heavy oil operators is going to be helpful.

The other thing for heavy oil operators is that the emergence of additional light oil supplies is something that you need to keep an eye on from a synthetic crude oil perspective. So, that light oil is going to compete with the upgraded synthetic crude oil. And, so that means you have to think about what is going to happen with that pricing, what's going to happen with bitumen pricing and what are the economics for upgrading going to look like in the short, medium and longer terms. So, those are the kind of impacts that I think industry needs to reflect upon and think about in terms of how they plan for it. As far as gas for North America, well gas is a wonderful transition fuel because it is a lower carbon intensity fuel than other supplies. So, that's good. And, I think that companies are very creative in looking at how they can take advantage of that additional supply. I know that Shell, for example, in Canada was looking at an LNG potential opportunity. And, that's all good in terms of creating additional opportunities. And, we've got the technology and the capability to do that.

PMB: Now, just at the moment a very controversial question in a lot of places is the Keystone XL Pipeline which will take basically bitumen to the Gulf Coast for refining there and possibly for marketing to the rest of the world. I think there is a consensus that it probably will go ahead. How concerned are you about that and to what extent do you expect pipeline expansion to be a critical issue in the next, can we say 10 years, 15 years? There is a discussion right now about whether the Transmountain Pipeline will be expanded going out to the Port of Vancouver.

BROADHURST: Right. So, I guess there are a couple things. The first thing is that as an industry, we do need ways to evacuate our product to market. And, certainly the Government of Alberta and the Government of Canada recognize that and have been quite active in discussing and exploring options for moving product to the west, getting to the world market; moving product to the east, getting to the world market. And, my personal opinion as a Canadian is that that's really important. Having basic business fundamentals would suggest that if you only have one customer that is probably not in your best interests. The US, however, is a large and consistent customer for us and for the industry. And, more pipeline access to that market, they have the upgrading capacity. It's either going to be our bitumen or it's going to be bitumen from Venezuela or other countries. I



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personally think that Canadian supply is important and viable supply for US energy security. There is a lot of obviously politics around pipelines these days. It will all find its way through, I'm sure. And, for the industry and for government in Canada, it's about making sure that we're advancing enough options that we have some place to move depending upon what the outcomes are in some of these regulatory approvals.

PMB: All of the bitumen that we're sending south is really creating significant differentials with other oil prices, global prices. And, yet what I hear you talking about specifically is being a supplier to the US for their energy security. And, it seems to me that an equally big issue for us as Canadians is to be getting global prices for our product. Now, I know that if it gets to the Gulf Coast you do get the international price, but any other concerns about pricing?

BROADHURST: I hear what you've just described is just the reflection of the fact that you've got stranded product and that's reflected in the price. And, that ultimately will get resolved when there is additional evacuation capacity and pipelines are a very safe, very environmentally responsible way to transport the bitumen. So, we just have to make sure that we're getting that message out. It kind of comes back as well to the issue of social licence. Part of what will make our customers, what will make governments and other countries want to approve pipelines and buy our product is going to be if they feel that the Canadian heavy oil industry is on a global scale, a responsible developer; the most responsible developer. And, I think that's why we felt that our initiatives around things like COSIA are so important. Because, we are responsible and we can do better and we're intent on doing that. We just hope that that message is going to get picked up by the people that really should be supporting our industry.

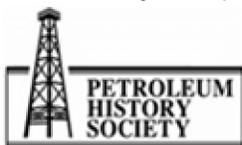
PMB: The concern about the oil sands being dirty oil, a lot of CO2 emissions and therefore global warming and those deep concerns: your view? Are they likely to be resolved in some short period of time?

BROADHURST: Well, it depends how you define short. So, if you take CO2 and you take global warming, from a Shell point of view, we're long past participating in any debate of is global warming a real threat. We accept that risk and we accept the fact that it needs to have a reference to mitigate it, which is why we've been adding more gas to our portfolio. It is why we have been and continue to be active in renewables. And, it's why we've been doing things in the heavy oil said of the business like advancing our QUEST project. So, it's a real issue. It's certainly a real issue for back to social licence, many, many of our stakeholders and we think that it's appropriate and necessary to take action. QUEST is the biggest near term activity that we're undertaking as Shell in that space, although, we do many, many things to...

PMB: QUEST; that is the Carbon Sequestration Project?

BROADHURST: Carbon Capture and Sequestration Project that we're building at our Scotford Upgrader.

PMB: Can you explain how that will work, please?



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BROADHURST: Sure. With the Scotford Upgrader, it is a hydrogen based upgrading process as we've discussed. And, so you do get a very concentrated stream of CO₂ that essentially comes out of the hydrogen manufacturing unit or the HMUs. So, it's very well suited for being able to capture in a relatively cost effective manner, concentrate the CO₂. But, then it's an issue of compressing it and pipelining it for subsurface disposition. The other big part of that project and the key learning beyond the process that we want to be able to provide to the government, to industry, to the world is how do you actually manage the subsurface disposition. And, so there is a lot of science that goes into how we inject the CO₂ and how we put the monitoring, measurement and verification plans in place so that we can give our stakeholders and the government the confidence that when we put it there, it's going to stay there. So, it's a big undertaking and it's intended to really provide a platform from which we can collectively learn how to do and how to improve carbon capture and storage.

PMB: Now, in effect you will be pumping the CO₂, the carbon dioxide down a deep hole and into, if I remember, it's the saline, salt water aquifer.

BROADHURST: Yes.

PMB: And, what will it become? Will it become some kind of carbonic acid or something down there?

BROADHURST: So, it will essentially be dissolved into the water and be trapped. So, there is no exposure at all for any organisms or any risk.

PMB: Now, who are the partners in QUEST?

BROADHURST: So, we've got both levels of government that have provided a level of funding to support QUEST. And, as well just to be clear, our Athabasca Oil Sands Project is a joint venture where Shell is the operator with 60% of the interest, Chevron is 20% and Marathon is 20%. So, our partnership: Shell, Chevron and Marathon along with both levels of government who have provided a level of funding to support QUEST.

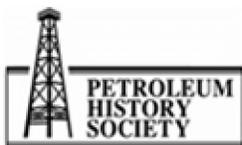
PMB: Okay, good. I didn't even expect to ask that question. I'd forgotten about it.

BROADHURST: Don't forget QUEST. This is a good thing.

PMB: QUEST is great. Okay, I'm going to ask you. Here's your chance to say and do whatever you want. What have we missed that you really would like to put on the record?

BROADHURST: So, I took advantage of the opportunity to talk to you about social licence and what I think is important with the work we're doing in industry. So, that was my one key thing that I wanted to ensure that we covered beyond the discussions around Shell's interest.

PMB: So, we're done?



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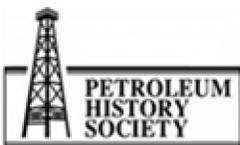


BROADHURST: We're done.

PMB: Thank you very much for a very fun interview.

BROADHURST: Thanks guys. That was fun.

[END OF RECORDING]



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