SIMON GITTINS

Date and place of birth (if available): Manchester, England; 1963

Date and place of interview:

Name of interviewer: Peter McKenzie-Brown

Name of videographer: Ty Reynolds

Full names (spelled out) of all others present:

Consent form signed: Yes

Transcript reviewed by subject:

Interview Duration: 1 hour, 34 minutes

Initials of Interviewer: PMB

Last name of subject: GITTINS

PMB: So, I am talking to Simon Gittins. Simon at Cenovus and has pretty much been involved in the oil sands business right from the beginning of his career. But, why don't we go before your career. Where were you born? When were you born? High school and just take us right up through university, please, Simon.

GITTINS: Sure. I was actually born in England in Manchester in 1963. I came to Canada in 1981. My father was an engineer too and he came over to work for Montreal Engineering at the time, Monenco. So, I was 18 at the time. I went to high school in Okotoks. Actually, my parents moved to Okotoks. ~~So,~~ I finished high school in Okotoks then went to the University of Calgary, took an engineering degree; ~~chemical~~ mechanical engineering. I graduated in 1987.

PMB: What did your father do with Monenco? Okotoks, sounds as though it almost guarantees some oil industry related work?

GITTI~~E~~NS: He was designing high pressure steam piping. So, he worked on power stations and some oil sands projects and that sort of thing.

PMB: So, it really does go back quite a bit. Power stations, but also I suppose gas projects and that whole gambit of things. So, you're a second generation petroleum engineer. Good for you. You went to the University of Calgary, got a degree in ~~chemical~~ mechanical engineering and that was in what year?

GITTINS: I graduated in 1987.

PMB: 1987, okay. So, where did you begin working? I've got your full resume here, so I kind of know this. But, what I find interesting is that you actually started with oil sands, you started with AOSTRA.

GITTINS: Right. Well, 1987 was tough times. There weren't a lot of jobs available. I think only ten out of a 100 in my graduating class had a job right away.

PMB: That was a period right after the oil price collapsed in 1986, wasn't it?

GITTINS: Right, yes. So, I actually worked construction for the City after I graduated for the first little while. Then, it was in March of 1988 when I first started with AOSTRA. At the time, they had a program where they would hire new graduates and then give a contract just to get them started. I got hired into that program. So, that's how I wound up working at AOSTRA.

PMB: I am sorry. I missed part of it. Were you in Edmonton working for AOSTRA or in Calgary?

GITTINS: Actually, no I was in Calgary. I started working in Calgary. They had a large office in Calgary and a smaller office in Edmonton, but most of us were in Calgary.

PMB: Were you involved with the shaft and tunnel project at all?

GITTINS: It had been drilled. They drilled the shaft and finished the tunneling when I came on board. But, they hadn't yet started up the Phase A of the UTF project.

PMB: They hadn't drilled the first two horizontal wells or holes?

GITTINS: Right. The initial phase of the UTF was three well~~s~~ pairs; three short well~~s~~ pairs that were ~~found~~ placed close together. So, I think they were in the process of drilling them right around that time, anyway. I joined before they had actually started those ones.

PMB: So, you spent a lot of time with that. I noticed from your resume that you were kind of in there from 1988 to 1993. So, from the beginning and that is from the well pairs and then into the period at least when different companies were paying to be part of the research.

GITTINS: Right.

PMB: Can you tell me anything about that? The part where the well pairs were drilled, I know pretty well. But, I'm quite interested in the period after that?

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GITTINS: I ~~sort of~~ wasn't that involved on the management side at the time. I was a junior engineer. I actually started at AOSTRA working on economics. They had some economic software that I was assigned to update and use to do some economic evaluations. So, when I finished that, it was probably for about six months. So, towards the end of 1988 I got assigned to the UTF project working for Neil Edmunds. ~~So,~~ I was learning a lot. AOSTRA wasn't just ~~on~~ the UTF project, they were financing a whole spectrum of different projects at the time so~~. So,~~ I got exposed to all of that, but was directly assigned to work on the UTF project.

PMB: What did your program tell you the economics were like when you did calculation? Or, let me ask this question: Were you calculating the economics of the UTF project?

GITTINS: I was calculating the economics of all of the projects that AOSTRA had invested in and~~. So, it was~~ comparing them. And, UTF as I recall was one of the better ones. But, at the time, ~~you~~ we ha~~ve~~d price forecasts that escalated, so looking forward with~~at~~ the escalating price forecasts things looked pretty good. ~~But,~~That was at the time, it didn't make sense based on the current prices. It was the way we were doing the evaluations, we had to use a price forecast.

PMB: So, what were the other projects that AOSTRA funded? I was at Gulf at the beginning of the AOSTRA period and I know that they funded some of our project I think at Surmount and a couple of others. But, could you talk to me about the economics and what the system was for AOSTRA funding?

GITTINS: The system was essentially, AOSTRA would put up half the money as long as the company that was sponsoring the project put up the other half. And, in return all of the operating data from the project would go to AOSTRA. ~~So,~~ I ~~sort of~~ was on the inside for all these projects. I got to see all the information. It wasn't made public necessarily, but it was ~~sort of~~ filed away at AOSTRA. ~~So, t~~They had access to all of the detailed operating reports on each of these projects. There were lots of them. I don't have a good memory of all of them. But, they were covering off steam floods and cyclic steam projects and combustion projects. There was a whole range from oil sands plus heavy oil, even on the heavy oil side, not just steam based projects, but ~~lots of anti-water coning;~~ all kinds of things. Anti-water coning, I remember that was one of the more successful ones.

PMB: So, you're preventing the water from coning up and basically killing the well?

GITTINS: Right. So, that was ~~more~~ primarily heavy oil production type technology. ~~So, it~~They covered oil sands and heavy oil; all the different methods of recovery.

PMB: What I understand is that from one of the people I interviewed, Eddy Isaacs, is that AOSTRA ended up with all the patents that came out of that period, from the funding. And, they haven't been very successful in making those patents available.

GITTINS: Yeah, I'm not too familiar with that side of things. I know, particularly on the UTF project, the main one that arose out of that was the steam circulation start-up for SAGD. As I understand it, there have been some companies that have bought the licence to that technology. But, not everybody uses that technique to start it up. ~~So, t~~They never really had a SAGD patent. Dr. Butler had that patent or I suppose, Esso at the time would have had the patent that Dr. Butler had invented. But, that one is expired now, so there is no real patent on that that is available anymore.

PMB: Next week I am going to interviewing one of the guys that was the signatories on the original patent. There were three guys who filed that patent and one of course was Butler. There were a couple of others: Bruce, I've forgotten his name. It's in my iPhone. To remember things, I just refer back to this. So, let's go back up from there. The UTF and the work that AOSTRA did in those early days were really transformational. It changed everything. Could you give me your perspective on why and how that is?

GITTINS: At the time~~, like~~ most of the oil companies were backing off the heavy oil and the bitumen research, just because of the times and the low prices. ~~So,~~ Esso I think previously had~~they'd~~ done a test of a similar technology. It was using vertical injection wells. ~~So, t~~They ~~sort of~~ originally pioneered the concept. I believe it had worked quite well. But, Roger Butler had always envisioned it with horizontal injection wells. As I recall at the time, there wasn't really the technology to drill horizontal injection wells from the surface. So, the whole concept of the UTF was that ~~well,~~ we could not drill them from the surface, but~~so~~ on the mining technology side we could drill them if we were to build a mine and go underneath.

So, it was huge investment to actually build this mine. The cost of the mine itself was far more than the wells. But, it was necessary to do it, in order to be able to drill pairs of horizontal wells the way that Dr. Butler had ~~sort of~~ imagined working best. ~~So, i~~It was a huge risk that none of the oil companies were willing to take. But, I guess AOSTRA, I cannot remember exactly who was leading it at the time, but they managed to get the government to commit to spending that money and then taking that step of putting the mine in the ground. On the basis that if it was successful then all the oil companies would be able to join in and fund it~~, so~~ after the fact. So, by removing all of the risk to the oil companies, they were able to get things off the ground. As it worked out, the project went very well and eventually they did get, I think 13 oil companies that actually participated in the end.

PMB: In the end those 13 companies each had to put in a million dollars in if I recall?

GITTINS: I believe that's right.

PMB: That money was used for the B stage of the project.

GITTINS: Right.

PMB: The B Phase, was it around 1989 for ten years, something like that?

GITTINS: It was something like that. I don't think the wells were drilled in 1989. I think it was a little bit later than that, when it started up anyway.

PMB: The first two wells were drilled in 1987, I'm pretty sure.

GITTINS: The A wells.

PMB: That was the A and the B Phase...

GITTINS: B Phase, it was around that time. I can't remember the exact dates. But, again it was three well pairs. It was on a much wider spacing and much longer well pairs. So, it was on more of a commercial scale wells was the concept with the Phase B. It was right around that time, late 80s/early 90s.

PMB: If I recall correctly, there was a fair amount of experimentation that went on in the shafts and tunnels in that project and it went on for quite a number of years. It didn't just stop, I think with the Phase B.

GITTINS: You're right. There was a lot of experimentation. There were three wells pairs, but there were dozens of vertical observation wells put in to measure movement of the ground. The full geomechanical effects that ~~did~~ still ~~sort of have~~ are a unique data set. ~~t~~To date, ~~. N~~no one has ever gone back and done anything like that s. ~~S~~o, we still refer back to a lot of that -- a lot of the papers that came out of the U of A. I think the main geomechanical experts were Rick Chalaturnyk who is still at the U of A actually. We still work with him. And, Don Scott; I think it was Don Scott and Rick Chalaturnyk were the two at the U of A that were ~~sort of~~ organizing that whole geomechanical testing program. One of the main reasons they did it was because of the mine. There was a lot of concern that by heating up the ground with this mine only 15 metres below while you were doing it. You would have thermal expansion. You would have lots of geomechanical effects. So, there were concerns about the integrity of the mine.

~~So, t~~They put in a lot of wells, a lot of measurements to actually measure the movement of the earth and the stresses and strains that were being caused. ~~So, i~~It is a fantastic set of data that will never be repeated. I learned a lot as well. A lot of things that did not go exactly as expected. It turned out the mine was fine. But, there was a lot of movement in the ground. We're ~~sort of~~ seeing it today, we see ~~sort of~~ surface heave and lots of things. Well failures are fairly common due to these geomechanical effects that we still refer back to our original data set to find what has happened.

PMB: What was your impression of Roger Butler? I didn't get involved with researching the oil sands until about three years ago. So, obviously he was gone. So, I never had a chance to meet him?

GITTINS: I met him, but I didn't know him well. He had moved on to the U of C, I think by the time I got started in the industry. I saw him speak many times and I met him, but I didn't know him well.

PMB: I spoke to somebody a couple weeks ago who had been his boss and this guy worked for Imperial. And, he said, "You know, Roger told me about this idea." And, he said he was like the typical mad scientist with the English accent and the hair that was all flopping around and he said, "Roger told me about this idea and I told him he was crazy. And, I said it would never, ever work." I guess the other thing that he said that I thought was so kind is he said that, "You would like Roger Butler to be your children's grandfather." And, I thought that was kind of a nice commentary.

GITTINS: Right.

PMB: In your career, you shifted around from company to company for a number of years before joining what is now Cenovus about ten years ago.

GITTINS: Actually, no. I only moved once.

PMB: All of these companies were all bought up?

GITTINS: Well, I was at AOSTRA. Towards the end they had a leave of absence program. So, I took a leave of absence and actually went to work for Neil Edmunds who had left AOSTRA previously and set up a consulting~~ant~~ company called Clearwater Engineering.

PMB: That was Neil Edmunds' company?

GITTINS: That was Neil Edmunds' consulting company, yeah. It was called Clearwater Engineering. So, I went and worked for him for I think it was four or five months. And, then CS Resources bought his company. So, he went to CS Resources and I went back to AOSTRA. And, I think it was about a year later -- the reason Neil had gone to CS Resources is because they were planning to do a heavy oil SAGD project. So, Neil went there to find one for them and to get it set up and to staff up and then to make it happen. So, it was about a year later I think that Neil called me back in and I went to work for CS Resources. And, then CS Resources got bought by Pan Canadian and then Pan Canadian merged with AEC to form Encana. And, then Encana split off Cenovus. So, I haven't really moved at all since I started at CS in 1994. It is the only move I really made.

PMB: So, you did a brief stint with Clearwater Engineering. Basically, you've just been -- okay, that clarifies this quite a bit. I am trying to think of an intelligent way to lead into this group. You were right there at the beginning of SAGD. Did you have any contact by the way with Peter Lougheed?

GITTINS: No.

PMB: Okay. Of course, it was his genius to create the original AOSTRA. And, the concept being we need to find a way to produce the other 80% of the oil sands; the stuff that can't be mined. Now, can you talk about the significance of the SAGD process?

GITTINS: Yeah, yeah. Well, I mean it's essentially the process for the McMurray these days. Now, there has been obviously CSS in the Clearwater formation, which ~~[?]~~ Imperial has been doing very successfully and there has been some steam flooding done in the Bluesky, that is Peace River which Shell has been doing for many years with varying degrees of success. But, within ~~in~~ the McMurray the only process that has really proven to be economic has been SAGD. Because, it's a gravity based process. I mean the driving force for the production is just gravity. So, you need a very high permeability clean formation for it to work well. ~~So, t~~The McMurray is just ideal for SAGD. And, then I believe virtually everybody who is recovering oil in-situ out of McMurray is doing it with SAGD.

PMB: But, Cenovus -- what is now Cenovus, so Pan-Canadian and Encana, Cenovus; they really were the pioneers in this in terms of making a commercial project. Is that correct?

GITTINS: Yes, I would say so. CS Resources I think technically had~~ve~~ the first commercial project, ~~but~~ the first commercial twin horizontal well SAGD. But~~Like,~~ even before that ~~something~~ a company called Scepter, who were eventually bought by CNRL were doing a form of SAGD with vertical injection wells at~~. So,~~ T~~t~~angle~~-~~flags. T~~So, t~~hey were doing well in a heavy oil field in I believe it was Saskatchewan, just across the border. ~~So,~~ CS Resources wanted to do a similar thing; heavy oil SAGD. It's not called the McMurray, it is called the Dina Cummings. It's basically the same formation, but it's called something different when you get into the heavy oil belt. But, it's the same idea. It's a very nice, clean high permeability sand.

~~So,~~ CS Resources did their project at a place called Senlac. ~~So, t~~They started up in 1996 with three well pairs at~~nd~~ Senlac which~~. So, that~~ was a 5,000 barrel a day project, but it was commercial for the heavy oil. It wasn't the same scale as some of the big SAGD projects today. But, it was designed not just as an experiment; it was designed to make money. So, that was I think the first commercial twin well SAGD project. Around that same time, AEC was piloting twin horizontal wells SAGD at Foster Creek. So, I think then AEC then would have the first commercial project in the oil sands. With the Foster Creek one when they expanded the pilot to the initial phase at Foster Creek. So, that would have been in the late 90s, early 2000s possibly when they started up that Foster Creek project, which I think was the first commercial oil sands twin well SAGD project.

PMB: Now, so what has happened over the last let's say ten years, especially since those pioneering projects began to develop? Well, a couple of things happened. One of them is because of the war in Iraq and for other reasons. Oil prices moved up quite sharply and actually reaching $150.00 I think in 2008 just before everything crashed. So, all of that took place and the outcome of it was that basically SAGD oil projects just proliferated like crazy and became wildly profitable. Is that a fair comment?

GITTINS: Well, it's certainly a fair comment that they proliferated and they certainly have the potential to be wildly profitable. But, the price is so volatile that I'm not sure that you could say that they've been continuously highly profitable. There have been periods in the last ten years where the price of bitumen in particular at~~,~~ the well-head has dropped to below zero. So, periods like that, things haven't been as profitable. But, it's generally been fairly short fluctuations in the price and on the whole the projects are making good money.

PMB: Did I hear you say that at the well-head the price was below zero?

GITTINS: Yes.

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PMB: You had to actually pay somebody to take the bitumen?

GITTINS: Well, basically you were spending more to buy the diluent to blend in order to ship it to the market, tha~~e~~n you actually got out of it for the oil at the other end. So, effectively your net back was negative at the well-head.

PMB: Okay. One of the things that Neil Edmunds, one of the comments he made to me which surprised me quite a bit was he said once you've got the project going, the cost of producing bitumen is really low. There is a lot of available. Once you've got the thing started, the operating costs are quite small. Even if there is a tremendous discrepancy between world prices or west Texas intermediate prices and the price of bitumen, it can still be pretty profitable?

GITTINS: Right. That's true. On an operating basis, once you've got the thing built then it becomes -- the operating costs are as low as $10.00 a barrel these days. It's perhaps $10.00 to $15.00 depending on the steam/oil ratio. So, that's definitely profitable. But, the price you need to justify building another phase of facilities. Like, that's a big, big component of the cost is actually the cost of building these water treating and steam generating facilities. And, so that's sort of the hurdle. When the prices we~~a~~re low, ~~like~~ that's why the expansion stopped is because you cannot then justify spending a huge amount of money on building another facility.

PMB: Of course, once you've got it built then your major operating cost is natural gas?

GITTINS: Well, depending on the price~~kind~~. I think labour is probably the biggest cost right now. The whole water treating facility, operating that water treating facility is a very significant cost. Right now, because the price of gas is low,~~. Like,~~ the fuel/gas component is not that high. As an example, it takes about .4 MCF of natural gas to create a barrel of steam. Our projects are 2 to 2.5 steam/oil ratio range. So, at 2.5 steam/oil ratio we are using 1 MCF of gas per barrel of oil we're producing. So, with gas price being $3.00 or less than $3.00, ~~so~~ it's only $3.00 out of the $10.00 that is going on gas. The gas price c~~w~~ould have doubled and it would get up to $6.00 out of $13.00~~---~~

PMB: So, the other major expenses are labour and essentially water processing.

GITTINS: There are a lot of chemicals, a lot of labour. There are~~is~~ well work over costs. There are a lot of other components to it and the other biggest one and single one would be the labour.

PMB: Okay, fair enough. One of the things and I cannot find this in your resume just at the moment, but when I was reviewing it I noticed that you had some involvement in Shell's Peace River project?

GITTINS: Right.

PMB: Now, I've been trying like crazy to get somebody to find somebody who could speak to me about that. I did find one person from Shell. He's a vice-president there and he did a really good job of talking to me about it. But, he didn't have the technical background that you might have. Could you tell me as much as you can about the Shell project, which one it was and what is the operating system?

GITTINS: Yeah. While I was at AOSTRA, I was seconded to Shell to work on their -- I think it was the Peace River horizontal well demonstration project, HWDP for short~~ure~~. So, it was part of their Peace River development. They had ~~like~~ a big vertical well steam flood that they were doing, cyclic steam; not really cyclic steam, but vertical wells where they weren't fracturing the formation like Imperial does at Cold Lake. But, they were just injecting slugs of steam and then producing back the oil. So, that was the bulk of the project. It was, I think about a 10,000 barrel a day facility. But, rarely did they get up to 10,000. So, they were looking at SAGD as an alternative technology. To be honest, Peace River has been running for a long, long time. They've tested virtually everything there. So, at this time they were looking at trying SAGD as~~nd~~ they were a participant in the UTF project.

~~So, t~~They were well aware of how effective it was. They had a slightly different wrinkle. I think they put in two wells pairs and one of their ideas was to operate them at different pressures to try and get a drive between the well pairs in addition to just gravity as a ~~drainage~~ drive force. ~~So, t~~They'd already drilled the wells by the time I got seconded there. I was actually seconded working in Shell's office, on their team. There were a couple of other people from AOSTRA that were actually working fairly closely on the project as well just working with Shell but~~. So,~~ it was not a very successful project. At the time, we just never really got the oil and steam rates ramped up. They never seemed to really get going. I found out afterwards, I was only there for a year and then things hadn't got going by the time I left. But, I found out afterwards there were a lot of significant issues that they'd run into with where the wells got drilled and with the metering, that was a particular issue. I think just the location of the project was sort of right at the end of the steam lines.

And, so even though they ~~were~~ had high quality steam for the rest of the project, but because it was at the end of the lines a lot of water -- all of the water that was condensing in the lines ~~and~~ wound up going to that particular pair of wells. So, I heard afterwards and it's hearsay to some extent that they wound up figuring that they had quite low quality steam going into the wells, which ~~are~~ was not good for SAGD. And, they also had production metering problems so they weren't producing nearly as much as they thought. So, it turned out they were potentially putting in twice as much as they thought and taking out half as much as they thought. Whereas it appeared to be i~~o~~n balance, it probably was out of balance the whole time and so it was doomed to fail. In addition, there were some issues with where the wells were located and maybe they got too low and there were permeability barriers that they hadn't anticipated.

PMB: Now, it's my understanding that in the Peace River area, SAGD quite apart from that project, SAGD has not been a significant force and still isn't.

GITTINS: Right.

PMB: Why do you suppose that is?

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GITTINS: Well, I mean Shell has a lot of really good stuff in that Bluesky formation. It's quite thick in ~~shales~~ Shell's area. Bluesky Gething, I think it's called. So, my understanding and I've mostly been working in the McMurray area my whole career. But, my understanding is that the Bluesky is quite thick in that area, but it tends to be fairly thin everywhere else. So, most of the other companies that are operating in that area, have much thinner ~~area~~pay. And, the Bluesky is generally a lower permeability than the McMurray. ~~So, l~~Low permeability and thin reservoir is not really conducive to SAGD. The McMurray we tend to get thicker reservoir and high permeability which is why it has been so successful. So, it's not say it wouldn't work in the right location in the Bluesky. But, Shell tried it and then they ~~sort of~~ went back to one of the older processes that they were using that seemed to work better.

PMB: They've been operating in that reservoir. And, they clearly seemed to have got the best parts of that formation. They've got the best land holdings there. But, they've been operating for 30 years or something.

GITTINS: At least that, yeah.

PMB: It has been quite a long time and they've been using fairly, well I guess their technologies that they developed themselves and they seem to be quite successful.

GITTINS: Well, yeah. They've kept going. I mean they've got a facility there, so they're very successful at ~~sort of~~ continuing to operate it because it will be making money. But, they never really expanded it since the initial commercial development. So, it has not been successful enough to justify a large expansion. I believe various times in the last five or ten years they've had ~~to have~~ applications into the board to do this expansion. But, they've never actually gotten around to it. It's a tougher formation, because it's not as high permeability. ~~So, i~~It's not as good as SAGD in the McMurray ~~and~~ with the processes they've been using. So, they~~we~~'ve been successful at producing a lot of oil, but it's not necessarily a huge economic success for them as I understand it.

PMB: One of the things that I heard about, I think that they experimented with this about five years ago. I heard from somebody the other day that this is actually, this technology is developing successfully and I can't give you any more than that, because he told me this in confidence. But, instead of using steam injection, actually putting electric heaters into the well. What did he call it? TAGD: Thermal Assisted Gravity Drainage, which doesn't use steam at all, but just strictly uses electricity from the grid. And, that was originally tried I believe by Shell in Peace River. Now, this fellow was talking about using it in a different formation entirely.

GITTINS: I don't know all the details, but I think Shell has tried a lot of things at Peace River. They ~~all~~ seem to have ~~sort of~~ wound up back ~~up~~ to almost where they started, with just a cyclic steam kind of operation with vertical wells. But, I know they have over the history of that project tried all kinds of things with varying degrees of success.

PMB: CS Resources, I am trying to remember. That was named after whom?

GITTINS: Dennis Sharp.

PMB: His wife, wasn't she the C?

GITTINS: Yes, that's right. Coatées was her maiden name. So, Coatées-Sharp was the CS.

PMB: Right. What is your impression of Dennis Sharp and his wife or was she actively involved in the company? One of the reasons I ask this is that I am going to be interviewing him fairly soon.

GITTINS: Oh. Dennis is a great guy. Hélèneelen wasn't that involved in the company I don't think. She was around. I actually golfed with her actually, when I first heard joined CS Resources was at the company golf tournament. I was in a foursome with Hélèneelene. I actually still, whenever Dennis was is in town, I will meet up with him for drinks and or dinner if he has time. He's still a very busy man. But, I do love to meet up with him.

PMB: Why in the world did he move to Montreal?

GITTINS: They're from Montreal. He sort of moved out here with CS Resources because it was an oil company. But, he's always maintained a house in Montreal. It's always been their home base. So, he will fly out here on business periodically, but he lives back in Montreal now; they both do.

PMB: Are you familiar at all with any of the other electric projects? There was the PCEJ and then there was the MAISP. PCEJ is Petro-Canada -- I can't remember. JACOS was one of them. That was one little consortium and then prior to that was the mine assisted -- MAISP was one of the original electric projects.

GITTINS: I'm not that familiar with them actually. I've actually been pretty much working on the -- there is still plenty to learn about SAGD. It's not a simple process. Still, there is a long way to go before we figure it all out. My role throughout the years has really been just on SAGD and adding solvents to SAGD. So, enhancements of SAGD, but I never really looked at the electrical stuff that closely. I know I try to stay familiar with what's going on. But, I haven't seen dramatic success using electricity yet. It doesn't mean to say it's not going to happen soon. But, I haven't seen it yet. If we saw some success than we were definitely, well we'd pay more attention. But, it's not our particular area of expertise so we're sort of happier to let others...

PMB: Let somebody else play with it?

GITTINS: Yes.

PMB: Then, this I think needs to be the heart of the conversation right here. First of all, if you would please just describe how SAGD works? Second, what are the major problems that you are encountering? Third, there are a lot of efforts to improve SAGD by injecting solvents instead of steam, for example and this kind of thing? Can you talk about those a little bit?

GITTINS: Sure. In theory, SAGD is very simple. I mean, all you really need to do is ~~if you~~ put in a horizontal well pair and~~,~~ you have to start it up. You have to develop communication between the wells. So, there is always some kind of a start-up process. All you are really trying to accomplish is getting communication between the wells. Once you've ~~sort of~~ heated up the oil so that it's actually mobile between the wells, at that point then you can start just injecting steam into the upper well and producing any fluids that get mobilized out of the lower well~~s~~. Essentially, you inject the steam. You create a steam chamber which gradually expands as it heats up the oil around the edges. That oil becomes mobile and just drains down to the bottom. Then, with the production well at the bottom, you just need to produce all of the oil and the condensed steam w~~t~~hen it actually falls down to the bottom. If you can do that, ~~and if~~ there is SAGD, it should work really well.

So, in a two dimensional sense, it's a very simple process. The problems really come because in order to make it economic you have to use long well pairs. So, we're typically drilling 800 metre long well pairs and others go longer. We're at 800 to 1200 metres. But, some other companies go longer. ~~So, t~~The real complications arise in trying to maintain steam injection at every point along an 800 metre long well pair, trying to get start-up communication along every point along 800 metres and trying to maintain the~~o~~ ability to produce the draining fluids at every point along the 800 metres. ~~But, i~~It's easy to get it going in one spot. The real trick is getting it going along most of the length of the well. ~~So, t~~That's where the complications come in. Obviously, we look at the reservoir like it's a simple box of sand, but generally it is not. Generally, it's much more complicated than that. So, even though the bulk of the reservoir might be a high permeability clean sand saturated with oil, there are~~is~~ also mud stone beds that show up here and there and it's very unpredictable.

~~So, w~~We drill vertical wells to try and understand the formation. But, they only really ever tell you ~~sort of~~ what's going on in a four inch diameter and then you've got to try and extrapolate that to what is happening from there to the next one, which is probably 400 metres away. And, then you've got to drill a horizontal well pair and try and get into this clean sand. So, geology is always a problem. There are~~is~~ lots of permeability barriers in the McMurray. There are lots of things that can prevent…

PMB: So, an example of a permeability barrier would be the mud or shale formation for example? It could stand between two sections of sand?

GITTINS: Right. Yeah. So, if you get one of those between your wells, then you have a real problem getting communication between the wells. You cannot, you've got to ~~sort of~~ communicate around the barrier~~. A~~and, if the barrier is big enough that can never happen. So, between the wells it pretty much stops the process from working at all over that section. If it's above the injection well, that is also problematic, because it ~~sort of~~ prevents you growing a large steam chamber, which means the steam has a tendency then to flow directly into the production well rather than develop a steam chamber everywhere else. So, any kind of permeability barriers and it's ~~sort of~~ obvious that between the wells it would be a problem. But, even above the wells is a problem too. Again, it's back to this, ~~if~~ you've got to get steam into the reservoir along the full length of the well and you'v~~r~~e got~~ting~~ to be able to produce the fluids along the full length of the well. So, in order for it to work, steam has to go in to expand the chamber and then the fluids have to be removed in order to keep the chamber expanding. So, it's obvious if you've got a barrier between the wells, that's going to get in the way of that. But, really if you create any kind of unevenness along the well, there is always then a preference for the steam to go one spot rather than another. ~~So, a~~Any kind of heterogeneity has the potential to cause problems.

PMB: How deep below surface are your typical wells that you're drilling?

GITTINS: Well, the UTF was very shallow actually. It was about 150 metres deep. I think there has been one or two that have been a little shallower than that since. But, that is about the shallowest. At Foster Creek, we're down to 500 metres deep, which is one of the deepest I think of the SAGD projects. So, we're sort of in that 100 to 500 metre window. We could certainly go deeper. I know Senlac, that was a heavy oil project but that was closer to 800 meters then. So, it could go down to a kilometre certainly, probably deeper than that if we needed to. It's just the oil sands, generally, is not that deep.

PMB: One of the problems with the steam injection is that as the pressure builds up, sometimes it can literally explode to the surface? With Joslyn, it was classic example of that.

GITTINS: Right. That is a concern for all of the projects. Generally, you have to have a cap rock of some sort, which is an impermeable rock above the formation to stop the steam from just keeping going. As we talked about on the UTF, ~~like~~ we know there are geomechanical effects going on. The Earth is moving and there are stresses and strains. So, if you try to operate at too high a pressure, you can actually fracture through that cap rock and~~. And,~~ steam can then continue to move up. So, that is a concern for all of the projects and we do a lot of geomechanical modelling these days to make sure that doesn't happen. We also use a significant safety factor. We operate at well below the fracture pressure. ~~Like, c~~Certainly in our projects, we generally actually operate at below hydrostatic pressures.

PMB: Below hydrostatic pressures? What does that mean?

GITTINS: Well, hydrostatic is ~~the~~ just the weight of a ~~kilometre~~ column of water. ~~So, a~~At Foster Creek we're at 500 metres depth ~~or~~ so~~. So,~~ a column of water would give you a pressure of about 5,000 kpa at the bottom. ~~So, w~~We typically operate at between 2,000 and 3,000 kpa~~. S~~so~~,~~ it's a much lower pressure than it would take to even move a column of water up. Typically, to create a fracture you've got to be close to twice hydrostatic. ~~So, a~~At 500 metres depth you c~~w~~ould need 10~~2~~,000 kpa pressure to fracture and we're operating at 2,000 to 3,000. The reason we operate a low pressure is the economics are better at low pressure.

S~~o, t~~The biggest driver of steam/oil ratio is temperature. T~~So, t~~he higher the temperature we use, the more heat we're going to lose, so the higher the steam/oil ratio. There are a number of factors, but particularly the temperature of the steam is a function of the pressure of the steam. So, the higher the pressure you go to, the higher the steam temperature. And, so the more heat you're going to lose~~, so~~ around the side of the formation in order to mobilize the oil. While some companies have gone to higher pressures because the higher temperature would give you a higher oil rate with the SAGD process, the economics are driven more by the steam/oil ratio. So, to minimize the amount of steam we're using per barrel of oil~~. W~~we'd like to go to the lowest pressures we can get.

PMB: Okay, now there have been a lot of experiments of late in mixing basically different hydrocarbons. Injecting hydrocarbons for example, instead of steam into projects to see what you can get out and that kind of thing. How does that work and why does that work?

GITTINS: Subodh Gupta is another engineer that I work with at Cenovus~~s~~ and he worked with me at CS Resources as well. So, we've been together for a long time. ~~Then, h~~He pioneered the idea of adding solvents to the steam. ~~So, w~~We did a test at Senlac actually, at the CS Resources heavy oil project where we injected butane with the steam and it was extremely successful. We increased the oil rate by about 60% from one well pair~~d~~. ~~So, t~~That was back in probably 2002 I think. S~~o, s~~ince then we've been continuing to test this idea. It looks really good.

We're actually planning to do our next commercial development using solvent: butane addition to steam rather than just steam alone at Narrows Lake. ~~But, t~~The whole idea of SAGD is you heat up the oil and it reduces the viscosity so that it can flow. And, the easier it flows the faster the steam chamber can grow. So, that sort of feeds back into the temperature issue. If you run it at a high temperature, you get the oil hotter, the viscosity is lower~~. S~~so~~,~~ it flows more easily and~~. So,~~ your steam chamber grows faster. But, the penalty for that is the high temperature~~s~~ causes increased heat losses so~~. So,~~ the steam/oil ratio goes up as well. ~~So, t~~The idea with the solvents is if you mix in some solvent with the steam and~~,~~ you can get it t~~d~~o condense at the point where the oil is being mobilized, the solvent will mix with the oil and reduce the viscosity. So, you can get the effect of reducing the viscosity further, but without adding any extra heat.

PMB: So, you're injecting the butane with the steam. And, this is increasing the flow rates of the bitumen. Once you produce that bitumen, you're obviously extracting any water that's mixed with it with the production. But, do you also take out the butane or does that just remain part of the product?

GITTINS: No. The butane we would recycle~~ the butane~~. In a commercial facility at least, we would plan to put in a facility to separate the butane out from our production stream so that we can recycle it back in. I mean, a few percent will be left in the oil and it doesn't make sense to try and get every last drop of it out. Most of the solvent that comes back actually comes back in the gas stream not in the liquid stream. ~~So, i~~If we left it in the gas stream, most of it would end up going back into the steam generators and getting burned which we've done at times during testing and it doesn't hurt us, but it's an expensive form of fuel.

PMB: So, this becomes a very, an especially profitable process because you are not continually buying butane.

GITTINS: Right.

PMB: You are able to continually recycle this.

GITTINS: That's right. I meant there is some of it that gets left in the reservoir and that is ~~sort of~~ the biggest cost of adding the solvent to the steam, is you can't get every single drop of it back.

PMB: Are there other solvents that companies are using besides butane?

GITTINS: Yeah; a wide variety are being used~~ing~~ -- one of the problems with butane is you ~~sort of~~ have to buy it specially and ship it out to the site. ~~Like, i~~It's not the best substance that is easy to get. ~~So, a~~A substance that is easy to get is a condensate ~~or~~ or diluent, because you're bringing that in anyway. You need that for the separation process and to blend with bitumen to get to~~he~~ pipeline specs. ~~So, a~~All SAGD projects would typically have a source of diluent or condensate coming in for blending purposes. ~~So, t~~There is a lot of work being done and we're doing the tests as well in using those diluents and the condensates. It is not a pure substance. It is kind of a mixture from ~~sort of~~ pentane to some hexane, octane; a whole spectrum of alkanes technically.

PMB: How would you define an alkane?

GITTINS: Well, alkanes are the simplest form of hydrocarbons like~~or~~ methane. It is just carbon and hydrogen basically, with no double bonds. So, methane would be one carbon with four hydrogen atoms and ethane would be two carbons, each with three hydrogen atoms. So, each of the carbons can have four bonds in a simple structure. So, the alkanes are just...

PMB: So, what is the most complex of the alkanes?

GITTINS: Oh, I can't tell you I am not a chemical engineer~~ing~~, I am mechanical. But,~~ we~~ certainly within the diluent~~, I mean they~~ go up ~~from~~ to some~~rt~~ ~~of the~~ proportion of C10-- above~~ut~~ C10 is quite small; above a 10 carbon chain then it gets to be fairly small proportions. But, it is there.

PMB: I think in my early background we just talked about pentanes plus. You know so five carbons and a little bit more.

GITTINS: Right. That is ~~sort of~~ what the condensate is. It is the liquid stream that comes from a gas plant which is ~~sort of~~ the easy stuff to condense out of the gas stream. So, pentanes plus means it is C5 up to whatever else came with the gas. Typically, the useful range to us is probably the C5 to C9 or 10. Beyond that, it's heavy enough that it probably doesn't vaporize so the diluent/solvent...

PMB: It is important that these products are vaporized down below?

GITTINS: Oh, yes, yes.

PMB: So, you inject them with the steam and then that encourages this process?

GITTINS: Right. We would typically inject a liquid stream of solvent into the steam line. The heat from the steam would vaporize most of it. And, it is important because the steam is injected in ~~the~~ a well in the middle of the steam chamber. And, the oil is draining ~~out~~ up to 50 metres away from that. So, in order to get the solvent to help, it needs to be moved to the front where the oil is draining. ~~So, i~~If it is a liquid it will tend to just flow straight down into the production well and doesn't really do you any good. So, it's critical that you have a solvent that vaporizes so it can flow with the steam to get to the front. And, then it will accumulate at the front until it ~~sort of~~ cools things off enough that~~,~~ it can start to condense. At that point, then you start to see the dilution effect of the liquid ~~/~~solvent mixing with the oil and reducing the viscosity.

PMB: What else can you tell me about the new technologies that are being developed? I'm thinking of the solvent injection and whatever else you are either using and playing with or experimenting with or ones that you are familiar with?

GITTINS: There are all kinds of incremental improvement type things that we're working on: liner designs, well designs. T~~he liner is t~~ypically~~,~~ we've used slotted liners which are basically just a piece of pipe with very small slots cu~~go~~t in them and then there is a technique where you can ~~sort of~~ reduce the size~~s~~ of the outside of the slot. ~~So, t~~The idea is you want to keep the sand from coming into the well. Sand is problematic for us. All these McMurray reservoirs are unconsolidated sand. ~~So, o~~Once you remove the oil there is nothing holding them together and so the sand can then start to flow as well. So, the liner is designed with a small enough ~~flop~~ slot that the sand grains can't actually move through it, only the oil can move through it. But, when we get to small slots like that they are fairly easy to plug up with clays and scales and all kinds of things that can plug up those slots.

So, we are constantly looking for a better design rather than just a slotted liner. And, we're using different kinds of screens. They can make screens out of stainless steel with less corrosion. They manufacture them with much better tolerance on the size of the gaps and can then create mesh type filters to try and improve the way that we keep the sand out without limiting the way the oil can flow in and making them less susceptible to plugging. ~~So, w~~We're constantly looking for better designs. ~~So, then v~~Virtually everything we do we're looking for better designs for it; cheaper, more effective things. A lot of that is driven by the service companies that are making the different designs and then selling them to us.

Our role a lot of the time is just doing field tests to see if they work better and deciding whether we want to change our design. When it comes to ~~sort of~~ the big step change, if you like -- we've been concentrating for many years on adding solvents. One of the other things we are looking at is adding surfactants. Those are just chemicals that will change the interfacial tension between oil and water or oil and rock or water and rock. We're just actually planning to do a field test later this year. We've been doing a lot of lab testing and trying to find the right surfactants.

PMB: What would be an example of a surfactant?

GITTINS: Well, soap. Soap is a good example.

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PMB: Oh, I see.

GITTINS: You put it in your dishwater and it reduces the interfacial tension, so it helps the grease move off the plates. ~~So, i~~It's the same idea. You change the interfacial tension between oil and water for instance and then you can make the oil flow more easily relative to the water. And, so that is the idea, but you can also change the way water and oil flow relative to the rock and all kinds of ~~potential~~ other possible benefits. ~~So, a~~Again you have the same problem. You have to be able to vaporize it in order to get it to move to where you need it. ~~S~~

W~~o, w~~e did a lot of background work on finding ones that will vaporize when we put them in the steam and then ~~we~~ will condense when they~~we~~ get to the front and then once they condense, they hopefully will have an impact on reducing the interfacial tension between the oil and the water. And, we'll do a similar thing to the solvents, but the surfactants can work in concentrations of parts per million, whereas the solvents we're using 5% to 10% of the rate of the steam. So, they are much more expensive chemicals but a much smaller amount. And, obviously there is potential for using solvents ~~and~~ with surfactants and then ~~sort of~~ there is a whole spectrum of optimization we can do ~~then~~.

PMB: Where are you in this process of experimenting with surfactants?

GITTINS: Well, we're planning a field test later this year.

PMB: So, you haven't really begun it?

GITTINS: We haven't done it in the field yet, no. We've done a lot of background work, but we have to…

PMB: Do you have a lab where you test these things?

GITTINS: Yes, there are a bunch of labs in Calgary that we use.

PMB: I think that pretty much covers off most of what I wanted to ask you and I am just going to quickly have a look through your resume here to see what else we can… Do you know what would be interesting, would you please--I spoke to somebody else who works with a different company, so you will probably be able to figure out which company it was. But, he was active with Foster Creek, Christina Lake and Senlac early development. Can you talk to me a little bit about those very important projects, which also were pioneering projects?

GITTINS: Yeah. I already mentioned Senlac. That was the CS Resources…

PMB: In Saskatchewan.

GITTINS: That was no piece of cake. Our experience was drilling wells from a mine. There was a big step from drilling horizontal wells out of a mine to drilling them from the surface. And, then one of the reasons CS Resources were pioneering this was they'd been drilling horizontal wells for a long time. Dennis Sharp actually had got access to the technology from IFP, the French Petroleum Institute. He had a very good relationship with the French Petroleum Institute. He brought in horizontal drilling technology. I think some of the first horizontal wells in Canada or North American even, were drilled by Dennis's company in the Pelican Lake area. So, the company got its start drilling horizontal wells in Pelican Lake. They picked up an old heavy oil field from Gulf ~~and they sort of~~which they had tried a bunch of things on ~~it~~ and had given up on it. Dennis came in and ~~sort of~~ picked up the field and then started using horizontal wells and it was a hugely successful project.

PMB: What year was that?

GITTINS: Well, that would probably be early 90s, maybe late 80s?

PMB: I do know that Esso or Imperial actually tested the first horizontal well I think in the 1970s, '78 or '79, something like that. But, it took one or two tries at it. One was up at Norman Wells, because they wanted to drill under the river to produce light oil.

GITTINS: This wa~~i~~s the first ~~of~~ commercial development with horizontal wells at the time at Pelican Lake. Dennis will tell you.

PMB: That is good information.

GITTINS: Anyway. ~~So,~~ CS had the horizontal drilling expertise which was why they wanted to go to the SAGD process from the surface. ~~So, n~~Nobody really wanted to put in a mine. The mine was just to test the process before the drilling technology caught up. But, by this time the drilling technology was catching up. So, the Senlac project was horizontal wells drilled from the surface ~~was~~ in a heavy oil reservoir. And, it wasn't very thick. It was a pretty small, thin reservoir and it looked -- Certainly, where was some learnings we needed to make from transitioning from mine drilling to surface drilling. So, again, it is back to the liners.

We had used one called Wire Wrap Screens and we had some problems with those ones. ~~So, w~~We had problems with screen failures which led to sand production. So, the Senlac project wasn't immediately a great success, but after a few years of developing better liner options, which today we're still developing better liner options. But, at the time it was a big change to go to a slotted liner, which got us around the sand production issues.

~~So, b~~By the time we got to Phase C of Senlac, which ~~again~~ was in the early 2000s, we had ~~sort of~~ figured out all the problems and Phase C was two well pairs at Senlac. At the time, I think they were the two highest oil producing on~~ff~~-shore wells in Canada. They were producing 300 to 400 cubic metres a day of oil each. In fact, one of them was the one we first tested, the solvent ~~additive~~ aided process on and when we injected butane I think we got that one over 500 cubic metres a day. So, at the time those were hugely successful wells and that project from there went on to be hugely successful and each subsequent phase of drilling produced similar results. That was Neil and myself and Jack Suggett. I'm sure ~~you~~ if you talk to him, he was part of the group at UTF at AOSTRA too.

PMB: In fact, I interviewed Jack Suggett just a couple days ago. He was tremendous. He was great.

GITTINS: He's been a good friend of mine for a long time. So, we learned a lot. We learned a lot about building a SAGD project, operating a SAGD project. We learned a lot about just designing the well,s designing the operating procedures; just learned a lot. Actually, based on some of that success CS Resources picked up the Christina Lake lease. That turned out to be possibly the best in the country. But, at the time they bought it at a ~~little~~ land sale and it was... I think I heard afterwards Esso posted it and CS Resources outbid them by pennies, but picked it up from right under Esso's nose.

PMB: Now, I have to tell you a story about that and I forget who told me this. But, after Esso lost that bid, the differential was so small on that contract that they brought in a security firm to check the room where they had the discussions to see whether there were any bugs. So, that one was legendary.

GITTINS: Actually, Dennis had brought in a geologist called Daryl Wight~~hite~~man.

PMB: I'm going to interview him. He got flooded.

GITTINS: Yeah. He's a good resource. He was at CS at the time deciding on how to bid and he was the one that pushed everybody to up the bid. I think the bulk of the rest of the team thought they could get for it less.

PMB: What I understand from somebody, I forget, probably Jack Suggett is that somebody came in and said (I think it might have been the president), "That is fine and here is another dollar." So, there were some great stories around that one. So, just briefly, Christina Lake and Foster~~x~~ Creek~~d~~, anything you want to say about those?

GITTINS: Yeah, well Christina Lake, CS Resources picked it up. Pan Canadian, around that time bought CS Resources (or shortly after). So, we started ~~sort of~~ a commercial demonstration scale project. ~~So, i~~It was planned as a 10,000 barrel a day project. ~~So, w~~We just drilled three well pairs initially. But, it was huge resource. Because of some of the issues we'd had starting up Senlac, we didn't want to go in with a 30,000 barrel a day project immediately. So, the intent was to go in with three well pairs, start adding well pairs each time we learned and improving the design until we were confident enough to expand it. It was planned to be a 70,000 barrel a day initial development. ~~So, t~~That was just starting up at the time when ~~the CS~~AEC and Pan Canadian merged. ~~So,~~ AEC had already started up the first phase at Foster Creek. They had been piloting for a while, ~~s. S~~so, at the time Pan Canadian had a really strong SAGD team and AEC had a really strong SAGD team. And, in fact by that time both Neil Edmunds and Daryl Wight~~hite~~man were at AEC and myself and Jack were still at Pan Canadian.

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PMB: When they merged of course they became Encana.

GITTINS: ~~So~~Yes, they merged to become Encana and then at the time, because Foster Creek was already on the commercial development track. We continued to ramp up Foster Creek. And, then at Christina Lake we continued to operate at the smaller scale,~~ and~~ drilling more wells and learning more. In fact, as we speak right now we're starting up Phase E~~B~~ at Christina Lake. ~~So,~~ Foster Creek ramped up to 120,000 barrels a day a few years ago now then~~. So,~~ we switched attention to Christina Lake. ~~So, i~~In the last two years we've added two phases: Phase C and D and right now we're starting up Phase E. So, Christina Lake is now above 100,000 barrels a day and within months we'll probably now exceed Foster Creek and get 140,000 barrels a day.

PMB: Amazing.

GITTINS: Along the way we did the deal with ConocoPhillips, so we only own half of each of those projects now. And, ConocoPhillips owns the other half and in return we've got half of the company refineries.

PMB: In Wood River and I forget where the other one is.

GITTINS: Bor~~guld~~ger, I think it is?

PMB: Bor~~guld~~ger, ~~Colorado~~ Texas and Wood River, Illinois.

GITTINS: Right. So, it's a big operation now. There are plans in place to expand both Foster and Christine ~~in~~to over 300,000 barrels a day. And, in the meantime we've picked up a whole bunch of other properties. Well, Narrows Lake is actually part of the Christine Lake lease, but it is north of the lake. So, we're developing that as a separate project. ~~So, t~~That's our next one and that's the one where we plan to inject butane right from the start, s~~. S~~o, that's a commercial SAP, Solvent Aided Process we call SAP, s~~. S~~o, that's the commercial SAP development. ~~So, t~~That one is scheduled to come -- we've started ~~sort of~~ construction I think now and got approvals in place and that one is over 100,000 barrel a day development. We're also doing a dewatering test actually up at our Telephone Lake property. We have got a huge resource actually up -- it is to the east of Suncor's Firebag operation.

PMB: You called it Telephone Lake?

GITTINS: Right, yes. If you look on a map you will see that it is shaped like a telephone.

PMB: Oh, I see.

GITTINS: ~~So, i~~It's close to the project, so that is why we call it that. It's a very nice reservoir, very high permeability, lots of oil, very clean oil, nice and thick. But, it has water above the oil which is quite a problem for SAGD because when the steam chamber hits the top, because it is gravity driven, the water will come in. In fact, it's complicated a little more because it's actually fresh water.

~~So, i~~It's below 4,000 parts per million TDS (Total Dissolved Solid~~vent~~s) which is classified as fresh water by the regulatory bodies.

PMB: So, in effect it is considered potable water?

GITTINS: Not potable; no, it is not potable. It has got hydrocarbons in it. The definition of saline water versus non-saline water is it just depends on TDS. It is not about drinking or anything. ~~So, i~~It's not potable water by any stretch of the imagination, because it does have hydrocarbons in it even though it is a water zone i~~. I~~t is 20% bitumen. ~~So, t~~The 4,000 is somewhat arbitrary, but that is the current definition. But, what it means is it is considered fresh water so you're not free to just do anything you want with it. In fact, a t all of our SAGD projects the only water we really use are brackish ones. ~~So, w~~We limit ourselves to using water that is above 4,000 parts per million. ~~So,~~ At Christina and Foster Creek, we recycle most of the water. 90% or so of our produced water just gets recycled through the facility and the other 10% make up water ~~was~~ is this brackish water that is above 4,000 ppm~~. So, that~~which is really of no use to anybody else. And, so the only fresh water we really use now is for the camps and drinking water and such. ~~So, b~~Because this is still classified as freshwater at Telephone Lake, our plan is to remove it before we start the SAGD process.

PMB: To remove the water?

GITTINS: Yes. W~~So, w~~e have a test where we're actually producing the water and replacing it with air. It accomplishes two things: It allows us to take the water out and then re-inject it somewhere else so that it is conserved, but also by removing the water we prevent that water from flowing into our steam chamber. So, it improves the thermal efficiency of the process as well.

PMB: Then, after the project is fully produced, would you take the water that you've stored somewhere else and re-inject it?

GITTINS: No, no.

PMB: It will just move to another underground reservoir?

GITTINS: Yeah, exactly. So, anyway, that has been very successful. ~~So, t~~The potential up at Telephone Lake is over 500,000 barrels a day. We still ~~sort of~~ don't know how much we can get out of there. It is huge and we haven't delineated all of it yet. But, that is another big project that is on the horizon as well, people working hard on that one. In the Grand Rapids, we've got another big resource in the Pelican Lake area. A number of companies are...

PMB: The Grand Rapids is in the Pelican Lake area?

GITTINS: Right. The Grand Rapids is a different formation than -- typically you would have...

PMB: Oh, I see. Of course, I knew that.

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GITTINS: McMurray is the lowest one and above the McMurray there is the Clearwater. Above the Clearwater, there is the Grand Rapids. Those three formations make up the Manville ~~Route~~Group. I'm not a geologist, but I understand that is what they call it; ~~so, t~~There is often bitumen in all three; sometimes one or the other. ~~So, t~~The McMurray has typically been our target, but the Grand Rapids Reservoir has a lot of oil in it too. So, we're piloting. We've got two SAGD well pairs in the Grand Rapids now that we're testing. Again, we're developing our understanding of the process, figuring out all the wrinkles to make it work optimally. And, then the intent is to develop a big SAGD project there too. So, lots of expansion coming.

PMB: It's really quite amazing. Well, I'm not going to ask you anymore questions directly except this: based on everything you've said today and you've given me a lot of tremendous information, what have I left out and what do you think is really important to add to all this?

GITTINS: What we certainly haven't discussed yet is some of the challenges, ~~like~~ other than the technical. ~~Like, o~~Obviously times hav~~ar~~e evolved. Right now, our biggest challenge is -- we mentioned the water issues, the brackish water. So, that led to one of the environmental issues that we're dealing with. We're continually trying to improve both the perception and the reality of our environmental performance. So, conserving water is one aspect of it. It is obviously a perception that people haven't understood yet, but we don't actually really use any water or any useful water. The water we use cannot even be used for farmers for irrigation or cattle. It is not usefu~~l~~ld ~~for~~ water. So, that's part of it and it's a message we've been very -- I think we've been very focused on the technical issues and we've been very poor at addressing some of the more public relations issues that have crept up on us if you like.

So, obviously there is perception around the world that it's a dirty business and that's a real focus for us: trying to get better, but also trying to get the message out that it is not as bad as people are portraying it. And, that the water usage is a good example. In Alberta, of the water we use, 90% of it gets recycled. The other, maybe 80% of the rest of it is brackish water. So, there is a very small amount of fresh water that we use in our projects. Whereas you can compare that with California, there is no recycling whatsoever. They use 100% freshwater. As I understand it, the oil business gets precedence ahead of agriculture during times of drought in California. And, theiry ~~are~~ treating method of choice is big ponds in the desert, evaporation ponds. So, if you compare the two, ~~like~~ we're not like that. But, I don't think we've done a good job of getting the message out. ~~But, w~~We have a really good record on water. CO_2 emissions are ~~sort of~~ the latest one that is becoming a concern.

PMB: In fact, it's the CO_2 emissions which are the biggest public relations problem in the industry.

GITTINS: Exactly. It has such a big impact in terms of getting pipelines built, for instance. The Keystone Pipeline is held up mostly because of concerns over CO_2 emissions. The full story there hasn't really got out either. There are a lot of issues with the perception and the fact that environmentalists have been way ahead of us in the PR game in getting messages out that are hard to change, even though they are not necessarily always realistic or they are somewhat selective with their use of facts. So, it's a big issue for us and having said that the perception is bad, I mean, we're attacking it from two fronts. One is trying to correct the perception, but the other is to try and improve our record. So, certainly a big focus is on reducing our steam/oil ratio which leads directly to the~~is~~ CO2 intensity. How much CO2 is emitted per barrel of oil produced.~~?~~

PMB: One of the arguments I heard from Joy Romero who I am sure you know, is that the industry is driven to be environmentally effective, because (her argument which I believe she is sincere about) the more you protect the environment, the lower the cost for your operation.

GITTINS: That is true. It is somewhat indirect. We talked earlier about the cost of fuel is not necessarily a big component or biggest component of our costs. But, the fact is all of our costs are really directly linked to the steam/oil ratio. If we improve our steam/oil ratio for the same water treating steam generating plant, we can produce more oil~~, use it~~ with the same amount of steam and get more oil per barrel of steam. So, it obviously improves your economics. But, if you look at every area of cost, almost probably 70% to 80% of it is a direct function of the steam/oil ratio. So, technically our main focus is trying to reduce the steam/oil ratio. It improves the economics, but as well it improves the CO2 emissions. It drives both. SOR, we've been working on that my entire career that has really been the focus is to reduce the steam/oil ratio.

PMB: How has the changed in the 20 years or whatever it is that you've been involved in this? How has that steam/oil ratio improved?

GITTINS: Well, I think that's a really good question. One of the things we've been doing is moving to lower pressure. One of the reasons we started at UTF which was already at lower pressure; so the UTF project had a very good steam/oil ratio. It was about 2.5. I think today at Foster Creek we're at about 2.3 probably and Christina Lake at around 2. So, we've improved it, but there are a lot of projects out there that are at 3 and 4, 5 or 6. So, there are~~is~~ a lot of projects out there with much higher steam/oil ratio.

PMB: So, what the steam/oil ratio of 2 means is that you would inject 2 cubic metres of steam to produce 1 cubic metre of bitumen?

GITTINS: Right. And, if you've got say 100,000 barrel a day steam plant and if your steam/oil ratio is 2, you can produce 50,000 barrels of oil, but if your steam/oil ratio is 4 you can only produce 25,000 barrels a day of oil. ~~So, t~~That's really the biggest the driver of the cost of steam/oil ratio if you like, is for roughly the same capital cost and the same operating cost, if you can get your steam/oil ratio from 4 to 2, you can produce twice as much oil with no change in the cost structure. So, the revenue goes up immensely~~. So~~, the profitability goes up immensely. ~~So, i~~It's a huge driver, it always has been. I guess, just to give you an idea, if you take a cubic metre of oil sands and you steam it and get all the oil out you can, the steam/oil ratio to do that is about 1 at a typical operating pressure of 2,000 to 3,000 kpa. It takes about one barrel of steam to mobilize and get out a barrel of oil. All the rest of the steam/oil ratio is really ~~been~~ consumed by heat losses and inefficiency.

PMB: Oh, really?

GITTINS: You can't really avoid heating up the rock. So, the steam/oil ratio of one is sort of the baseline; although, if you heat it up less obviously you can. ~~So, t~~That is why one of the ~~avenues~~ alternatives to ~~go a~~ lower pressure is to use solvents to bring the temperatures down, because then we can get our steam/oil ratio below 1. But, the basic SAGD 2500 kpa, steam/oil ratio just to heat up the rock which the oil is in, in order to get it out is about 1. So, inefficiencies and heat losses are driving all the rest. So, when we're at 2, ~~like~~ half of our steam is ~~sort of~~ wasted on that. If your steam/oil ratio is 5, then 80% of the steam is wasted on that.

PMB: Now, if you were able to have steam/oil ratios of 2 or let's say 2.5 and yet you say there are other projects that our there with steam/oil ratios of 3, 4 or 5. I guess my question is, why would the ERCB or the energy regulator approve projects with that kind of steam/oil ratio when you guys have demonstrated that better is possible?

GITTINS: Operating skills, design, engineering is part of the picture, but the other part is the reservoir. Christina Lake and Foster Creek are fantastic reservoirs. So, if you go to a different reservoir, you cannot necessarily reproduce that steam/oil ratio. When I say the steam/oil ratio is ~~warranted~~ 1.0 to heat up a cubic metre of oil sands and get the oil out that is assuming you've got a porosity of 35% and oil saturation of 80%. If you go to the Clearwater ~~there~~, the porosity is lower than that. The oil saturation is lower than that. So, you've got to heat up a lot more rock within that cubic metre versus a smaller amount of oil. So, the steam/oil ratio will be higher at a different reservoir; just a function of the reservoir propertiesy. And, also the thickness ~~has~~ is a big driver, because heat losses are such a big component. ~~The~~ For thicker ~~the~~ reservoir, your heat losses are much less per cubic metre of oil within the reservoir than~~. Then~~ they would be for a much thinner reservoir, because you've got to heat it all at the same temperature.

So, reservoir thickness and quality play a huge part in it as well. ~~So, i~~If a company is in the Clearwater, you might expect a steam/oil ratio of closer to 3 or 4. If you've got a much thinner McMurray reservoir, you would expect a higher steam/oil ratio. So, it's not ~~sort of~~ simply you only approve the ones with the good steam/oil ratios. You've got companies that are making money and location and the price of oil varies on location, depending on the infrastructure...

PMB: And, the reservoir.

GITTINS: There are a lot of things that can feed into it. I mean we've been developing Foster and Christina, but we'll be moving to Telephone Lake which is much further north, much more remote location. And, the Grand Rapids is an example of a thinner reservoir with lower porosity and saturation. So, we will be looking at developing projects that are likely to have a higher steam/oil ratio as well.

PMB: Last chance, what would you like to add? You've given me tremendous information. So, don't feel obliged to say anything, but I would like to give you one last shot.

GITTINS: I guess one thing that I would like to say is one of the biggest misconceptions is that this is easy; SAGD is an easy process. In theory, it is very easy. We can describe it within~~n~~ a single

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equation, which works and we still use that equation all the time. But, the complexities of doing SAGD in reality, the actual application of the technology is not easy. It is very, very hard. I started in 1988, so 25 years I have been working with SAGD and every day I have got more to learn. There are lots of things, understanding how the gas impacts things, there are all kinds of things that we don't understand as well as we would like to. ~~So,~~ I expect to spend the rest of my career, learning and getting better at doing SAGD. I think that applies to everybody. Everybody who really understands SAGD, understands that we don't really know nearly enough about it. So, there is a perception that it is easy, that is worked at UTF so it's easy. It worked 20 years ago, so it's easy today. But, that's not the reality. The reality is, there is a lot of optimization to be done. There is a lot of understanding still to get. There has been, to some extent, a problem with people portraying this as an easy thing to do; anybody can do it. That's one thing I think is important to point out, that we don't know it. There is a lot of complexity to ~~use~~ doing this that people don't seem to understand. Even after 25 years, I still expect there ~~has been~~to be another 20, maybe 25 learning about this process and improving to really reach the potential. Even though it has come far enough that we're producing millions of barrels now across the industry ~~with this stuff~~ using SAGD.

There is still a lot of room to improve the way we do it and to improve our steam/oil ratios and to make it work better, make it more profitable and get more out; and, then from there to expand to the thinner reservoirs and keep things going. There is a huge potential out there, but it starts with understanding how poorly we're doing at the moment.

PMB: How poorly are they doing?

GITTINS: Poorly, that is a bad choice of word. We're doing very well considering how poorly we understand the process. Really, it's not a simple process and there is a lot about it. But, we're still learning and haven't figured out yet.

PMB: I've been doing research on one kind or another on SAGD for a couple years now, mostly as part of this project. And, I thought until now that it was pretty well defined; so, this quite interesting to me.

GITTINS: I mean, one of the interesting things is ~~like~~ that even back in the early days at the UTF we didn't understand gas very well.

PMB: Didn't understand?

GITTINS: Understand how gas in the formation, within the oil there is always some dissolved gas, when you heat it up, the gas comes out. So, we didn't really understand what the gas did. We could see we were producing it, but we really couldn't explain why. And, even to this day there is still a whole bunch of theories about how gas impacts things, but there is no generally accepted answer to what the gas does. So, most people either ignore it or they leave it out of their models altogether, a parallel with climate scienc~~igns~~ if you like. We can't really explain how clouds impact things, so we leave them out of the model. We had this similar issue ~~with gas~~in SAGD, with gas. We don't have a good explanation for why it has such a small impact on the process. ~~So, w~~We can ~~sort of~~ reproduce

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its impact in the models by leaving it out. But, that is not the same as understanding it. So, that is just an example of something that I have spent my entire career trying to figure out, is how gas is really impacting the SAGD process.

PMB: Do you have a favourite theory about where and how the oil sands originated?

GITTINS: Not really; not really my area. I'm more focused on...

PMB: You're the engineer not the geologist.

GITTINS: Yeah, yeah.

PMB: Because, I've come across a summary of 11 different theories and I have some ideas myself, but what do I know. Last thing, you're married and your wife's name?

GITTINS: Coleen.

PMB: Any kids?

GITTINS: I've got a son who is 19 named Mike and a 13 year old daughter called Sarah.

PMB: Where and when were you married? In Britain?

GITTINS: No. We were married in -- my wife is from Rimby, Alberta. We met after I was out of university. So, we actually just had our 20th anniversary.

PMB: When is that?

GITTINS: It was just on July the 1st this year.

PMB: Congratulations. Thank you, very, very much. That was great.

[END OF RECORDING]

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