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# VERN CARL LARSON

INTERVIEW 1 OF 2

**Date and place of birth (if available):** High River, Alberta

**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:**

Initials of Interviewer: PMB

Last name of subject: LARSON

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PMB: I'm speaking to Vern Larson, what is your middle name Vern?

LARSON: Carl.

PMB: J-A-R-L?

LARSON: C-A-R-L.

PMB: And, it's Vernon?

LARSON: Yes. My first name is Vernon.

PMB: Vernon Carl Larson.

LARSON: But, people call me Vern.

PMB: Who is retired from Imperial Oil where he was a key player in petroleum research? Is that correct; production, technology, research?



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LARSON: Whether you could say I was a key player, but before I retired I was manager of the research department of Esso Resources Canada Limited; which was a subsidiary that came about because for years Imperial Oil had been trying to talk the Ontario Government into relinquishing one of the holdovers from the National Energy Program. NEP required that certain items not be deductible as an operating expense when after several years that argument was finally lost. Imperial Oil decided to form a producing subsidiary and move everybody to Calgary and that company was called Esso Resources Canada Limited. And, Alberta did allow the deductibility of these particular expenditures.

PMB: I'm trying to remember when that happened, that was around '82-'83 or wasn't it?

LARSON: It was about 1980, yeah.

PMB: 1980.

LARSON: Yeah. So, I actually retired from Esso Resources Canada Limited and of course, that subsidiary is gone now, it will still exist of course, but...

PMB: In some paper form.

LARSON: ...well when Imperial moved the corporation from Ontario to Calgary and so the head office is now in Calgary, of course.

PMB: Okay now, you've kind of given me a lead on that, what I'd like you do is begin by just telling me about your career, you were born in High River, Alberta, went to school...

LARSON: Well of course, I went to most of my high school in High River, I took... my mother bought a house in Calgary and I took my Grade 12 at Crescent Heights in Calgary and then I went to the University of Alberta in Edmonton, and I took... I always wanted to be a chemical engineer, I read my sister's chemistry books when she was in university ahead of me and when I took my first chemistry course at university, it was called Chem 40 and the lab course required that memorize practically every equation that we ever used in the analytical part of the course, and I said if that's what chemical engineering is like, I don't want any of it, so I decided to change to engineering physics. As it turned out, I made one of those stupid mistakes that people do when they're young and foolish, I made an evaluation that was quite improper, I would have loved chemical engineering if I had taken it, but anyway, I took what I took and I'm very happy that I did do that, even if it was for the wrong reason. So anyway I ended up graduating in Engineering Physics.

PMB: From the U of A?

LARSON: From the University of Alberta. And then when I graduated, all of our classes, there were probably nine classes of 45 people and every class had four or five people just out of high school and another 35 or 40 people who were veterans, so it was a little hard to find a job when I graduated so I went on and got my Master's Degree in Electrical Engineering and I worked as a Sessional



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Instructor at the University of Alberta for two years. Then somebody came along to the campus interviewing people from Imperial Oil and I said to my friend, "Well, I'll be damned if I'll go and be interviewed by any bloody oil company." And, my friend said, "Well we're going." And, I said, "Well I'll go with you." So, I went and I was so impressed with what this guy said that I ended up standing in line so that I could sign up to get a first interview with Imperial and at the same time. A friend of mine in geology told me the field called Reservoir Engineering which involves a lot of math and physics. So, I bought a book on Reservoir Engineering and I read up about it and I said, "I think this is fantastic." So, when I went to the interview I was interviewed by a guy called Walter Dingle; so, the late Walter Dingle. But, first of all a fellow from geophysics interviewed or wanted to interview. I said, "No I'm not interested in geophysics." I was very forward and far more blunt than I learned to be later in life.

PMB: What year was this?

LARSON: It would have been in 1952. So, I waited for Walter's interview and that interview went along quite well, except, I didn't really know whether it did or not, because he asked me, well would I rather be in the field or would I rather be in an office behind a desk? And I said, well I'd like a little bit of both. He said, pounded the table, I want an answer to that question and I asked it for a reason. I said, well I'd rather be behind a desk if I told you the truth, he said, well good that's what I wanted to hear. So, next thing I knew I got an offer from Imperial and I went to Tulsa, Oklahoma after a few months of orientation, where unfortunately I didn't have to go on a drilling rig like they used to make people do in those days. Anyway, I went to Tulsa, Oklahoma and went to Reservoir Engineering school for six weeks along with 30 other people from various Exxon, Standard Oil of New Jersey affiliates as it was in those days, five or six people from Imperial were there too.

And, then I stayed on with the research department of the Carter Oil Company. Carter was a subsidiary of Standard Oil at that time too and I learned to run an analog computer, called the Electric Analyzer. It would forecast the behaviour of water dry reservoirs and I did a number of other things. I learned a bit about water flooding and the summit enhanced recovery process and then I came back to Calgary and I started to work for a living as a Reservoir Engineer. There used to be an old joke, while six months ago I couldn't even spell Reservoir Engineer and now I was one. So, it was great to be working in this field and for many, many years I just enjoyed going to work every day. And, the best decision I ever made was to probably take the route through university that I did. Because, I daresay, they were looking for graduates with some math and some physics and not just simply engineering. So, that's how I got started in this field.

PMB: And, you worked in Toronto and Calgary, primarily is that correct?

LARSON: Well, I worked in Calgary and did a lot of Reservoir Engineering at a group called the Production Research and Technical Service Department that had offices and laboratories in the Tecumseh Building on 7<sup>th</sup> Avenue which is long gone.

PMB: So, what are the years here?



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LARSON: Pardon?

PMB: What year could you start with...?

LARSON: I would maybe '52-'58 or something like that, and then the company built a research laboratory in SE Calgary, near 50<sup>th</sup> Avenue and 3<sup>rd</sup> Street SE and I was the section head there of a group of Reservoir Engineers and that's where the machine called the Electric Analyzer or the analog computer was located and then at some point in time I became the assistant manager of that department for two or three years and then I got transferred to Toronto and joined the Corporate Planning Department for three years.

PMB: What years were you in Toronto?

LARSON: I was in Toronto for a total of nine years, I think and that would've been from roughly 1970 to 1990. And after corporate planning, I joined a department called the Department of New Energy and Resources which represented the Athabasca Oil Sands activities as well as the activities at Cold Lake and I was there...

PMB: That would have been in the 70's.

LARSON: That was in the 70's and about 1975, I got transferred to Calgary and...to be...to work specifically on the Cold Lake project and I was Mr. Cold Lake in Calgary and a number of other people in Edmonton looked after the Cold Lake project, one of who was Bob Pearson, who later on became the CEO of Imperial Oil and another chap, John Nicholls and another, Alvin Winestock in Edmonton, they all ran the field operations, and then I got transferred back to Toronto because Syncrude was falling apart and the manager for New Energy Resources was spending all his time in Edmonton helping the legal people write new contracts and then as the resources was invented and I got transferred back to Calgary again, that's not quite correct. I got transferred back to Calgary at a time when, before Esso Resources Department was formed, I became of manager of what was called producing research in those days, but that assignment lasted for about a year and I was asked to prepare a proposal to management to form a research department in Calgary because the company was forming a department called Esso Resources Canada Limited and they wanted to have a corporate department that had production research, and heavy oil research, and had minerals research, and it also had exploration research, of course, exploration to these departments already existed and one of them, and two of them were new, so it was at that time that I started my association with Roger Butler and I got into, I either got back into the research business or got into the research business, I'm not sure which to call it but, in any event, I retired in 1986 and since then, I have been doing my hobbies.

PMB: You've actually retired since 1986?

LARSON: Yes.



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PMB: Isn't that interesting. I'm going to skip around on these questions a little bit, but what would you say if you were to summarize the main achievements of your involvement with the oil sands, how would you put that?

LARSON: Well, our department had first of all, very little to do with what was going on in the Athabasca Oil Sands. We were a part of the Syncrude group and they looked after their own technology so we had little to do with that. The other area of heavy oil though of course was Cold Lake. And, also at the same period our producing research. We had great activities relating to exploration in the Beaufort Sea. So, we had a frontier research group that had probably close to the 20 people in it and they worried a lot about ice mechanics. So, at the same time that that was going on, the heavy oil group was formed simply because the corporation believed that if any area of technology that Imperial was involved in, there had to be research going on at the same time.

So, the heavy oil research group was actually started at the beginning. I suppose, getting that organization was my first area of responsibility in heavy oil and I was very fortunate to learn that a chap called Roger Butler could be made available to join our group. I knew Roger from his reputation in other areas, in which he had worked, and of course he worked in Sarnia and the research department there and we were very close to the research group in Sarnia as well. I used to go every year to their research planning meetings and I knew about Roger and that was great. So, we put together a group of probably started out with six people and it ended up being about 20 people and their main area of activity was supporting the field operations at Cold Lake. Now, of course ultimately, part of Roger's area of work involved his development of the Steam Assisted Gravity Drainage. But, the others in that group, we did both research and service work and so when analytical work was required it would come through Roger. And, he would parcel it off to the appropriate people in his group or they would give it to somebody else in our department. Because, of course, we had oil analysis, crude oil analysis people and chemists of one sort of another, or two.

PMB: Now I would like to come back to Roger Butler a little bit later on, but first can you tell me whether, there was the Syncrude Crisis in 1974-75, how did that effect you? You mentioned it briefly a minute ago.

LARSON: Well, it affected me in that I got transferred back to Toronto after having been in Calgary for four years. And, we loved living in Toronto and then we had to buy a new house, get into schools again and all that sort of stuff. So, it affected me dramatically, but in terms of my work, that's where the job was. So, that's where you went. But, the job related and involved, well at that time, Bob Peterson. When I was transferred to Toronto, Bob Peterson was moved to Calgary to be the other assistant, to be a second assistant manager of New Energy Resources. And so, Bob and his group would put together a budget and I would travel to Calgary to hear their budget presentation. I would go back to Toronto and I would present that budget application to a least two other groups and so that got me involved in the Cold Lake Project at an administrative level that continued for a while until Esso Resources got transferred, were invented in Calgary and then Peterson would make his presentations directly to the board instead of me being the person who went in between to do it.



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PMB: And, he later became the CEO of Imperial, wasn't it?

LARSON: Yes, he got a good recommendation, obviously a good appraisal from me, so...

PMB: That must've turned the trick.

LARSON: He didn't need it, but he was a fireball. He was a great concern. He was on his way up. There's no way Peterson was going to be held back. He was a fantastic guy.

PMB: What was he like?

LARSON: Oh, he used to...well, all I can say is he was very interesting in a meeting. He would have...the geologists for example would be presenting at where we wanted to drill the valuation wells and Bob in excruciating detail would want to know why they selected this location instead of that location. And, I mean, he just didn't want the company's money to be misspent and, you know, so he was...

PMB: What was his technical background?

LARSON: Well, he was an engineer. He was a Reservoir Engineer. He'd been through the Reservoir Engineering process and six weeks of reservoir school, way back. I don't know actually what kind of engineer he was, whether he was civil or mechanical or chemical. I don't really know.

PMB: Okay.

LARSON: I don't remember.

PMB: Besides Peterson, are there any other notable figures that you can think of that really stood out from your career as a researcher; and Butler, apart from Peterson and Butler?

LARSON: Well, that's like, that's like, comparing apples to oranges, we only hired apples [laughs], but I guess one of the guys that I can think of is the head of our frontier research group and uh, his name will come back to me in a moment, but he was very good, another thing that was very important, I found, was that we hired people in my department, generally speaking with PhD degrees and that turned out to be the very smart thing that we did, because these guys could take some and some of them were women too, we had a very brilliant Japanese woman, Fumiko Suzuki was her name.

PMB: Fumiko Suzuki.

LARSON: Fumiko Suzuki. I just wanted to let you know that we hired the best people we could find. And, it didn't matter their colour, creed or anything else, that if they came to be interviewed and then you were very fortunate. We did get people who of course like that, that wanted to come and work for us or wanted to find out what it was like. But, the fact that people were in our research



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in our group didn't mean that they were necessarily going to stay there all the time. And, that was something that made me very proud, to know that a number of the PhD's I hired ended up working for the producing department later simply because they demonstrated great capability; extremely good capability in working in areas that weren't things that you learned about in university. They just moved the technology ahead by themselves and they acquired a reputation of being helpful people. So, not everybody can be the manager and not everybody is going to be as upstanding as Bob Peterson was, but that's not to say that there aren't a lot of outstanding people working for every corporation.

PMB: Great. Now, I'd like to shift the conversation here specifically to Cold Lake, because you have a unique perspective on that, as I recall, the first work down at Cold Lake Oil Sands Project goes back as far as '62 or '64, do you recall?

LARSON: Well...probably, probably in 196...I'm not sure when that first well was drilled?

PMB: Actually, I think have it, I have a note in front of me, I just noticed: 1964, one Cold Lake well.

LARSON: '64, yeah, well...

PMB: And according to my notes, in fact I think I got this from you, it didn't produce any oil but it led to several field research pilots of there, for the next 20 years.

LARSON: That's correct. But, the Cold Lake story goes back earlier than that. The head of our geological research group, his name was Bill Landes, L-A-N-D-E-S. He told our management at some point in time, I was advised, said when you people want to get into heavy oil, I know where there's a lot of it. So, at some point in time, the company decided that that's what we should do and we acquired a great deal of acreage in the Cold Lake. I can't tell you off-hand how much but it was a large number of acres, one-hundred thousand, one or two hundred thousand acres I would guess. And then, the company drilled evaluation wells and then finally for some reason or another, in 1964 somebody decided we better start finding out if we can produce this oil. So, the late Don Wilson, who was a management advisor he got the project of drilling this first well. Of course, we consulted with our associates and our affiliate in Houston. At that time, it would've been called Jersey Production Research. They were familiar with cyclic steam stimulation in Venezuela and they made some calculations and said well on a good day you might get five barrels a day on steam stimulating a well and the face of this scientific knowledge of these so-called experts. I mean they did what any reservoir engineer would have done. They took the knowledge that they had and they applied it. But, Don Wilson said, well I'm going to try it anyway. So, he got a steam generator and went out and sure enough the cyclic steam stimulation, you inject steam into the formation for a period of time, perhaps a month. By that time you think you've got the formation heated, then you turn the oil over to production and not very much oil came out of the well. And, my recollection, it was probably these guys were right. It was five barrels a day and gradually Don Wilson decided to increase the steam injection pressure and increase it further and continue to experiment with it. And, at one time, they ceased the injection they ended up getting 70 barrels a day which was fantastic. The only thing



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was, we didn't know why, but that was the start of production at Cold Lake and what had happened was...

PMB: Can you give me an approximate year for that?

LARSON: Well, it was probably during 1974.

PMB: Okay.

LARSON: This all occurred during that period of time of the first well, it might have been '75 then but in any event, they had created a vertical fracture and so then they decided to, that we could get oil out of Cold Lake, so we started another pilot which was called ETHO Pilot which had about nine wells in it, in very close spacing, I think maybe they were roughly, maybe one acre spacing, something like that and we found out, that among other things, that steam injection, steam would have to be injected for quite a few months before you could turn the well around and we also decided that this was far too close a spacing to use probably because it would be not economic, I'm not quite sure, but following that...

PMB: Now let me ask me for one clarification...

LARSON: Yeah, uh-huh?

PMB: You say...you talk about steam injection; this is the same as cycle steam?

LARSON: Yes of course, by cyclic steam stimulation, we really mean you inject steam for several months, in the case of Cold Lake and then you produce for several months, another, like let me say for three or four, five or six months, it produced for five or six months, then you inject steam, so you have the second cycle of steam injection and then you have a second cycle of production.

PMB: And this is also called: Huff and to Puff?

LARSON: Yes, it's called Huff and Puff, that's correct.

PMB: Thank you. Now I interrupted you, you were talking about the ETHO Project.

LARSON: Sorry, then the ETHO...the small spacing project was terminated and they started a project called May, M-A-Y, that was on a roughly, spacing of probably around five acres or two hectares and that pilot was, by this time, being operated by the producing department, it moved out of Don Wilson's jurisdiction into the producing department and at some point in time, one of the directors decided that this was going to go nowhere or was going nowhere or there wasn't any reason to have it, he decided it would be terminated, so that...

PMB: Well when you say a director, do you mean a director of the board?



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LARSON: A director at the board level of Imperial Oil...

PMB: Oh really, okay.

LARSON: ...that decided that it would be, well...it would be terminated and so it was mothballed for two years and I am told that he retired and so in his absence another director, his name is Don Lougheed decided it should be started again.

PMB: That's Peter Lougheed's brother.

LARSON: That was the former Premier's brother, yeah.

PMB: Can you recall the name of the director who wanted to cancel this project?

LARSON: Of course I could but I don't want to be sued by him so I'm not going to say his name.

PMB: Okay.

LARSON: You should take that off the record when you get a chance to do that.

PMB: You will have the opportunity.

LARSON: Okay, anyway. Don got the project started again and it was also decided that the project, instead of being operated by the producing department with which it was in competition, that they would be operated by a new department called the Department of New Energy Resources. That would have its own budget and that no longer depended upon getting money from the producing department budget to operate this group of people that thought they were going to be able to produce oil from Cold Lake, and so a group was formed and it was that new energy resources was headed by a guy called Bill Sand and so that group was responsible for Cold Lake and that was their main reason for being so there was a great amount of incentive to make it work if you could and that turned out to be a wise strategy and so the main pilot continued production for a while and we learned more things about how to produce it and I can't tell you how long it was in production.

PMB: Were you getting wells that were producing 70 barrels a day or more?

LARSON: I think they were starting, I think probably we were getting ones that started at over 150 barrels a day, I can't really recall now but they were certainly very successful in retrospect.

PMB: And you were still using cyclic steam stimulation?

LARSON: Oh yes, of course. Still cyclic steam stimulation. Anyway, Bob Peterson came on the scene at this point and he decided we should have a new pilot called the Leming Pilot and it would have, my recollection is that it would have 57 wells.



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PMB: That's L-E-M-M-I-N-G?

LARSON: Yeah that's correct. And it was more called a project rather than a pilot because, in a sense, it was a pilot, it was still experimental but it also was a very large number of wells.

PMB: Now these projects would both have been taking, taking...would've been taking AOSTRA money, is that correct?

LARSON: No, absolutely not. No, there was no AOSTRA money in any of Imperial's work...

PMB: Thank you.

LARSON: ...from my recollection, one of the reasons was AOSTRA wanted any patents and Imperial Oil said we don't need your money and we want to keep our patents and those patents are important to the parent, remember the parent shareholder of Imperial Oil Limited, over our corporate body, was an excellent corporation in those days, he owns 59% of Imperial shares and the patents, all of us signed a patent agreement that said our patents were going to be assigned to either Standard Oil of New Jersey or Exxon or an intermediate company and its name has slipped my mind. So AOSTRA's terms were too tough for Imperial.

PMB: Even though they would've paid 50% of the funding.

LARSON: I have no idea what their funding would've been, I don't remember the terms that AOSTRA had other than that they wanted the rights to the technology and as far as Imperial was concerned that gave us a technological advantage and so...however, they...it's quite possible for people to find out by themselves, they would just have to go through that process. But anyway, I don't want to appear negative to AOSTRA, I think they supported a lot of projects that wouldn't have been supported otherwise and research is expensive and if you can't somebody else's money to help you, so much the better.

PMB: Did you experiment with anything like steam flood or with fire flood or any of the other more exotic technologies in those projects?

LARSON: Well we kept abreast of those technology, we even... we probably attempted steam flooding at some point in time and found it unsuccessful and the reason that it did not really get anywhere was that it is...we found out the radius of warm oil in cyclic steam stimulation was really not that great and although we were getting 15% and maybe even 20% recovery, there was still a lot of cold oil in there and the viscosity of the cold oil was so high that it just...it's not going to be pushed out by any, even, by even obviously any fluid, whether its steam, or hot water, or even some admissible hydro-carbon.

PMB: And this is what made steam stimulation, or sorry, steam flood unacceptable?



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LARSON: Well it's certainly not. It has generally not been acceptable and hasn't been used. It's not to say it wouldn't work. It seems like other processes, namely cycle steam stimulation seems to be the better one to use, although Imperial is still doing research in that area and I know they're...I understand they still have some experiments going on with other process and of course Roger invented a variation of one process in his gravity drainage work that involves injecting hydra-carbons along with the steam. The only problem with injecting hydra-carbons, light hydra-carbons, as an example, propane or something is that propane is expensive too and you want to be able to get it back. So, you don't want to leave it in the reservoir. So, you always want to be sure that whenever you inject an expensive fluid that you're going to be able to get it back. So, sometimes things might work in principle but they turn out to be too expensive to use. Anyway, steam always seemed to be cheap way.

PMB: Now, you basically had this experimental project. First, it began as the two pilots and then you had the Leming Project. And, finally came to the decision to develop the Cold Lake Plant. Can you tell me a little bit about your involvement in that and some of the challenges it faced?

LARSON: I can't tell you, I didn't have any personal involvement in those activities but I was around when they were occurring and following the Leming Project. There was an expansion, a large expansion, probably another 50 wells or so that turned out to be quite successful. So, I believe it was quite, that was the date of the commercial project, I think it might have been 1977 when it was decided to have a commercial project and I think it was somewhere between one and two hundred thousand barrels a day, I don't remember the exact figure and so...

PMB: Oh excuse me, this was while Leming was still just really being developed, is that correct?

LARSON: Leming had operated for several years by this point in time. Leming when it first started it was producing at a level of about five thousand barrels a day and it was known by the people in our Sarnia labs that the crude from Cold Lake. It made excellent asphalt and Ontario had been buying their asphalt to feed stock from refineries in Ontario from Venezuela. My understanding is that that feedstock started getting hard to obtain and so Imperial started refining in Edmonton. The Cold Lake crude and producing asphalt and shipping asphalt to Ontario and Ontario was using Cold Lake asphalt for all their highways because it met the...Ontario has very strict highway specifications for asphalt and so a lot of the production. Well I would say, probably all of the production from the first Leming Project went into making asphalt. As a matter of fact, that project was actually making a 5% discounted cash flow rate of return and that was probably a lot to do with the decision to expand the pilot and later to go into a commercial project.

So, a commercial project planning was started. A Calgary engineer by the name of Glenn Mainland, who at one time worked in my department, was made the Chief Engineer of the project. There was going to be an upgrader and they brought in staff from Sarnia who were experts in the field of refining and upgrading and so. Two or three of those people moved to Calgary and moved their families and also Imperial had a large number of people. I think the number was five hundred people and I'm not sure if it was the Fluor Corporation who was the contractor. But, anyway



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whoever the large contractor was they had 500 people working on the design of the commercial project. And then, of course, Mr. Trudeau invented the National Energy Program and the terms of the National Energy Program meant that Imperial just didn't have the money to build the commercial project. So, termination arrangements were made with the Fluor Corporation (if that's who the major contractor was...). And, it might have been Fluor Daniel. I'm not sure what the name was in those days, but anyway that project was terminated. I'm not quite sure the date that that would've occurred, but it could well have been well around 1983. I have a note here that it was suspended in 1981 actually, but in any event...

PMB: Well, the National Energy Program was announced on October 30, 1980, if I'm not mistaken...so that would make sense.

LARSON: So, that would make 1981 quite likely a date that our commercial project planning was suspended. Then Glenn Mainland invented, I will use the term, or conceived of a phased approach where we would take a project that would produce ten thousand barrels a day and we knew it could pay for itself. And, when it did, the idea was to start. We would then have the funds to start a second phase and so the phased approach was a way to keep working in Cold Lake and keep making some money in Cold Lake. At some point in time, we were producing four phases at 50 thousand barrels a day according to some report I read the other day.

PMB: The fellow who announced this idea of the phased approach, you've mentioned his name twice, how is that spelled?

LARSON: Mainland.

PMB: M-A-I-N-L-A-N-D.

LARSON: Yes.

PMB: And his first name?

LARSON: First name is Glenn, G-L-E-N-N.

PMB: Thank you.

LARSON: He currently lives in the Red Deer area as a matter of fact. And so, that project today is now producing, I'm not quite sure what, but it'd be over a 150 thousand, or maybe in that order, 50,000, 150,000, maybe 200,000 barrels a day. It's become...as far as my personal opinion is concerned, a very, very important activity in retrospect as far as Imperial was concerned because whoever started that first well has probably kept Imperial Oil as an operating company since we're currently producing a lot of oil from there.

PMB: Who...the upgrader was never built at Cold Lake, was it?



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LARSON: Absolutely no, not at all.

PMB: And what were the reasons for that apart from the National Energy Program?

LARSON: Well do you need another reason? I don't think so.

PMB: Obviously it seemed to make sense in the late 1970's to build an upgrader and the economics of oil production have improved quite a bit since then?

LARSON: Well. I can only guess that first of all, before an upgrader is built you've got to have a certain amount of production before you can afford to build an upgrader. My guess is you need to have a hundred thousand barrels a day before you would think of building an upgrader and by the time you got to a hundred thousand barrels a day, you found places for the crude to go. There have been pipelines that are transmitting that heavy crude diluted with a hydro-carbon. So, it can be transported to some other location where there is a refining facility and the refining facility can start refining a relatively small amount of it and gradually as time goes by they can increase the size of that capacity. But, I don't know all the places where heavy crude is being refined now and of course, a lot of the Athabasca Oil Sands production is transmitted elsewhere these days.

PMB: And of course, I believe the refiners now have ways of eliminating or extracting the diluent from the bitumen so that it can be reused, is that correct?

LARSON: As a matter of fact, the diluent is recovered from the crude during the refining process and it's sent back in a separate pipeline to wherever the heavy crude was produced in the first place. So, it's actually recycled.

PMB: Great.

LARSON: So, that makes a good possible use for diluent in the first place, is that when you do, you get it back.

PMB: Now, I'd like to change the topic to Roger Butler, who was the most important single player, I believe in, in situ oil recovery, and he was originally part of your, at one point he was part of your research team, can you begin by telling me a little bit about him?

LARSON: Well, Roger was a very inventive person. And, the story goes that one of the reasons he thought of steam assisted gravity drainage related to some work he did in the 70's or 80's. At one time, Imperial Oil had thoughts of mining potash in Saskatchewan using a solution mining process where water would be injected into the potash bearing formation. And, the water dissolved the potash and would be brought to the surface and then it would be somehow or other, recovered from the water. Presumably by evaporation and you would be able to sell solid potash. But in the process of working with this process, Roger learned something about the behaviour of hot liquids and cold liquid and mainly it was something that was. I guess, fairly obvious, the hot water rose and it occurred to him that if you injected steam into a formation, not at a high pressure, just at a



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relatively low pressure. The steam gravity would cause it to rise to the higher part of the formation and any condensation would go to the bottom. If the hot steam condensed and the steam itself melted any oil, the oil would run down and also go to the bottom of the formation. I guess he considered the idea of having a horizontal well that would be at the bottom of the formation and his initial concept was a single vertical well drilled above the horizontal well. You would put the steam in the vertical well and that was the first horizontal well project that was started in Cold Lake.

PMB: I want to mention two things here: tomorrow I'm going to be interviewing Chi-Tak Yee, he was Roger Butler first graduate student, he tells me he's seen a paper that Butler has shown to him, which is dated 1969 when Butler had the original idea but he didn't develop it until some years later. And then, the other point he makes, this is from a telephone interview we had the other day. The other point is that he makes is that he believes the horizontal well drilled at Cold Lake was the first horizontal well ever drilled anywhere.

LARSON: No, that's not correct

PMB: Thank you, I didn't think it was.

LARSON: I suspect horizontal wells had been drilled elsewhere in the world, but the first long horizontal well that I'm familiar with was drilled at, I think it was at Normal Wells and I know the name of the drilling engineer is George Bezaire.

PMB: How is that spelled B-I...

LARSON: B-E-Z-A-I-R-E. He currently works for Imperial Oil in Calgary and he's head of the Corporate Planning Department there.

PMB: When did he drill that well?

LARSON: Oh, must've been sometime. It might've been around 1965. There's a paper written about that well and it was a truly horizontal well and it was quite a long horizontal well. I don't know what names he used to control it, but controlling where you're drilling takes a lot of skill and knowledge and a certain amount of information. I'm not familiar with the technology of how that's done but that was successful there.

PMB: Now can you tell me...

LARSON: That's a minor point I think where the first one was drilled. The important thing is Roger thought of drilling a horizontal well and he knew that it was possible.

PMB: Okay, so his other original idea was to drill a horizontal well and have vertical injectors.

LARSON: Yeah, that's right. And, there was a lot of trouble getting that to pair wells, all I can remember is we would ask Roger, "Is it working yet?" and he'd say, "Well no but we're going to



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keep trying.” It was probably about two or three months before there was a success at that well, but at that time he decided that vertical wells were not the answer. At least they demonstrated the principle that steam would form a steam chamber. Steam would rise in that steam chamber that you would get enough heat to cause the oil to become sufficiently fluid and that it would flow by gravity through the formation. Of course, it had to be a fairly high permeability formation for this to happen, but that wasn’t a problem at Cold Lake. There was lots of permeability there and anyway, he proved that the principle worked. He says, “Gee if it’ll work with a vertical work it will sure work a lot better with a horizontal well.” However, he did a lot of lab work to investigate the nature of this process and one of Roger’s models was a high pressure model. It was probably eight feet in diameter and three feet high and had walls three inches thick. It was like two clam shells bolted together and it would’ve withstood a pressure of probably two thousand pounds per square inch. He could inject steam in that facility at a high pressure and had insulation. I daresay that or he’d lost his way to the problem. I’m not quite sure what the technology was exactly. Anyway, that was the ultimate of models. He had a lot of other visual models and he shows a lot of pictures of these visual models in the text book that Roger wrote called, “Thermal Recovery of Oil and Bitumen.” It’s a seminal book on steam assisted gravity drainage as well as a lot of other process for recovering the oil.

PMB: I read the chapter on SAGD in that book yesterday and he has quite a number, I would say 50, fairly, what to a non-engineer, I would call fairly complex mathematical equations that describe the model and the evidence that it works.

LARSON: Yes, he did. And, that’s one of the wonderful things about chemical engineers and about people who have advanced degrees in chemical engineering. They learn a lot of math. They learn a lot of physics, so they’re able to take a physical problem from first principles, express it a form of mathematical and differential equations and solve those differential equations. Engineers learn to do this too, but they don’t learn quite as well as the advanced students do. And, of course, Roger was one of these people had that capability.

PMB: What was his degree in?

LARSON: Well as far as I know it was chemical engineering.

PMB: Bachelors?

LARSON: Oh, he had his PhD.

PMB: PhD as well, okay.

LARSON: Oh yeah, he did.

PMB: Okay. Why if his experiment was successful that Cold Lake, I presume that it wasn’t as successful enough to just place cyclic steam stimulation?



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LARSON: Apparently, steam assisted gravity drainage requires that you produce a steam chamber that might be if your formation is a 100 feet thick which Cold Lake is. Then you want the steam chamber to be hopefully 100 feet thick so then oil is going to have to drain from this so-called steam chamber. Now, this steam chamber is not vacant space. It's not a chamber in the sense that it is empty. It's not empty. It is full of the saturated, permeable and porous sand formation and so the steam does rise through this, the heat rises, the steam rises and the oil has to flow downwards from this so-called steam chamber. But, if the oil encounters any horizontal, I guess the geologists say, stringers, if it encounters any impermeable horizontal stringers then it can't travel any further and it gets stopped.

Well, apparently Cold Lake has got too many horizontal stringers to allow that process to work sufficiently well. And, my guess is it works in the Athabasca oil sands. It seems to work well there, because the formation in the Athabasca oil sands must be more homogenous and has fewer, if any, of these so-called stringers. So, my understanding is the process is not the best process to use in Cold Lake. That being said, cycle steam stimulation still recovers. I'm not sure how much recovery they are getting nowadays but probably if it's in the order of 30% they're still leaving a lot of oil behind. So, people are doing research. As I understand, my former company is in ways of getting that remaining oil out and one may be in due course. If the formation gets hot enough, you have established inter-well communications. And, then you can use some kind of a flooding process to move the oil from one well to another or from one unrecovered zone into another by forcing it to go there by using either some fluid or maybe some miscible substance like propane or pentane or something like that.

PMB: In the notes that you prepared for me, you said that you didn't have much personal involvement in Butler's work but he was head of what you called, the Heavy Oil Research Division and you were the manager, so I guess he reported to you, is that what that means?

LARSON: Yes.

PMB: Can you tell me a little bit more about his work within that division, or within that organization, the research center and maybe specifically the kinds of things he did?

LARSON: Well, Roger had an idea and a number of us thought it was a good idea and of course Roger talked to other people in the...our heavy group, Heavy Oil Operations Department, where they were running cyclic steam stimulation projects and running them very successfully at Cold Lake. So, he would talk to these people and say how about trying out steam assisted gravity drainage and Roger did not have very much success in convincing other people that this project was going to work in the field.

PMB: Why do you think he couldn't persuade people?

LARSON: Well, I know some of the people that disagreed with it. They'd have disagreed with me too. Well, I must confess, sometimes you get to a level at senior management who say, well it won't work and if it would work it'll be too expensive. I've never heard an engineer say that. Engineers just



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say it won't work. So, why they decided that, I don't know. But, Roger encountered a number of people. I remember one engineer saying I might as well go out there and try and stamp the world out with my feet. That's the types of silly reactions, but that was it. Fortunately, we had a management in Imperial Oil that said we're going to do research and of course these research projects had to have some practical application, mostly industrial research. I would be very surprised if any industrial research organization does pure research. Pure research is research with no foreseeable purpose in mind other than just to find out what happens. We don't do that in industry. In industry, we do research because we believe it happens. We may be able to use this in a process of making some money.

Well, the issues with respect to keeping the project like Roger's, is going through a budget process. I have to tell my superiors that we're doing research in steam assisted gravity drainage. And, they have to hear about it and they have to decide whether it has merit or it doesn't have merit. If they said well we think you're wasting our money, well nobody said that. So, we kept putting the money that it took to keep Roger's group together. And, then whomever he talked to about the first horizontal well. It was probably Bob Peterson that said, let's do it and I don't know who did it, somebody did though.

PMB: So did this piece of research have to go to the board, or to what level did it have to get the vote?

LARSON: No, no, no, no... well there were always, it probably... The board hears about these things in relatively small pieces or in broad terms. And, the people who hear about it in greater detail are the people below the board level who have responsibilities of their own. For example, every department in Imperial Oil has a contact director and the contact director may decide to ask a lot of questions about this research. The contact director is approached by the guy that I report to who usually has me with him to answer questions that he feels he's unable to answer. So, maybe the contact director is the person that says it is okay. All I know is, these projects can be started and be stopped and that's the way it goes.

PMB: Okay. Now the first horizontal well drilled at Cold Lake and this was a key moment in the history at SAGD, do you recall anything about that beyond what you've already said?

LARSON: No I do not, not at all.

PMB: You don't have any idea, it was kind of a deviated well, or... a lot of the modern technology is really not available, or is this correct?

LARSON: I wouldn't say that, I wouldn't say what was available, see George was there used some kind of technology in order to drill the well that I'm calling a horizontal well up in the Norman Wells area, I don't even remember why they drilled it as a matter of fact but...

PMB: Okay.



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LARSON: I can imagine why they wanted to drill it, because in those in days we were building islands in the middle of the McKenzie River and the McKenzie River Ice Islands were part of our frontier research group. They designed islands that were built in the middle of the McKenzie River so that we could drill an exploration well and they were ice islands that were designed.

PMB: Now, the frontier research group, was that part of your division?

LARSON: Yes, yeah.

PMB: Okay, what were the four divisions that you had; you had heavy oil research...

LARSON: Well, frontier research was part of the production research division but in the frontier research. We had a big exploration program up in the Beaufort Sea and at our laboratory we had what was called an ice basin, that was this very huge, a huge... We used to call it the swimming pool and that thing would freeze in the winter time and we would build a... we were trying to protect the islands against ice crushing against them. So, we had to build islands that were sufficiently strong to withstand ice forces. And, so we had a means of producing ice forces in this ice basin that would hydraulically push a sheet of ice against the artificial island that we had built in the ice basin and we did all this work in winter time.

PMB: Up in the far north?

LARSON: No, we did that right here in Calgary.

PMB: Oh really? Okay. So, you had frontier research. You had heavy oil research. What were the other two?

LARSON: Well, there was exploration research and that included geophysical and geological research and there was a minerals research because at that time. We had a minerals exploration group too and we actually had a share of a zinc mine in Nova Scotia. At that time the group was the minerals exploration group and was headed by a guy in Toronto. As a matter of fact, he discovered the diamonds in Saskatchewan that are being mined now.

PMB: Oh really?

LARSON: Yeah.

PMB: In your notes you say that some years ago Franz Griebe...T-R-I-E-B-E.

LARSON: Would you spell that again?

PMB: Oh, I'm using your spelling: G-R...

LARSON: G, as in George.



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PMB: G, as in George?

LARSON: Yeah. Okay, that's fine, Griebe.

PMB: G-R-I-E-B-E. And, it is Franz, F-R-A-N-Z.

LARSON: Yeah.

PMB: Who was one of Roger's reports, one of Roger's section heads and I've prepared an extensive of recommendation to the Manning Award Commission that Roger receive their major reward, but he wasn't...was not selected and then you said a few later, a U of C did another submission but with a similar result. Can you talk a little bit about that, you're obviously disappointed in that and what are the reasons for that, why are you so disappointed, why do you think he in particular was so deserving of an important award.

LARSON: Well, a lot of people think that without Roger's process, well let me put it another, Roger discovered a process that will allow industry to produce 230 billion barrels of unmineable oil sand Athabasca now I think that's a pretty important contribution to the world probably and certainly to Alberta and now that obviously, I don't know in what light it was viewed by the people leading these submissions, and by the way, the submission that won, if I'm not mistaken, was a medical one and if that's correct it was a by a guy that saved lives so what's important life or oil in the Athabasca oil sands.

PMB: What year did you do this approximately?

LARSON: I can't tell you off-hand.

PMB: Since, 2000 or before that? It doesn't matter.

LARSON: Well, I can't tell you off-hand. I don't know if they make archives available but it would very interesting if they did.

PMB: Well, one of the things that many people comment on in respect to the SAGD process is that it's just environmentally a cleaner process.

LARSON: That it is.

PMB: That it is, do you agree with that?

LARSON: Well, I would hesitate to compare one process to another in terms of its environmental merits. What one needs to do is have some environmental standards and decide that these standards should be met. I don't envy the people that have to decide that when environmental damage has to come to be an unsustainable one, but unfortunately environment means a lot of things to a lot of people. Some people think, some people worry about carbon dioxide in the air causing global



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warming. I happen to be among the group that believes that that's all a bunch of nonsense and there are some very erudite people that believe it's a bunch of nonsense and I happen to believe them. So, when you talk about environmental consequences, well you have to burn hydrocarbon usually to make steam. And, to some people coal is dirty. I don't happen believe that coal is dirty. Coal produces more water vapour than natural gas does when you burn coal and there are people who tell me that or that you can read about that water vapour is a worse greenhouse gas than carbon dioxide is. And, so when you burn coal you get less water vapour and yes you do get more CO<sub>2</sub> but we've already dispensed with this CO<sub>2</sub> argument because I said so.

And, so now you're left with water. So, it's better to burn coal and furthermore coal's a darn sight cheaper than any other source of hydro carbon. So, the people who are throwing rocks at coal are again, as far as I'm concerned, misguided. So, then when you ask me to comment on a question that you commented on, I have to think of carbon dioxide. And, I have to think of coal and a lot of people think about water. Well, we did a lot of work in recycling the water at Cold Lake and a great percentage is recycled that we use and so...

PMB: And, recycled water that you've already used, you reuse.

LARSON: True.

PMB: But there's also...

LARSON: Any steam that condenses in the reservoir and ends up producing water; that produced water is recycled.

PMB: A lot of projects also use brackish water from reservoirs that can't be produced as ground water and it's basically non-drinkable.

LARSON: I'm not a specialist in generating steam but I believe, there is some limit as to the solids that you can have in water that you're putting through steam generators.

PMB: Now you've been out of the...you've been retired since 1985, what's that 35 years, 36 years now almost, and... or was it '86 that you retired?

LARSON: Yes, '86.

PMB: So, 35 years you've been out of the industry in a formal way, but I'm sure that you do stay abreast of a lot of the research and development in the oil sand sector. Do you have any comments on how the, how it is progressing and whether it's going at a rapid pace or maybe could be faster or maybe is too slow, what's your thinking?

LARSON: Wellm I think it's very hard to keep abreast of the research that's going on in those areas.

PMB: Sorry. Do you know Bill Mooney?



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LARSON: Well, I know a Mooney, whether it's a Bill Mooney or not.

PMB: Well, he's another person I interviewed that was he who just called and I'm doing a second interview with him in a couple weeks, but anyway, quite the character, he's really something.

LARSON: Who did he work for? We had a Mooney working for Imperial Oil.

PMB: Well, no he worked for City Service, he was the guy who got the Winnipeg Agreement basically put together in 1975, quite an interesting character, but basically a guy who just has a way of just charming a deal into action, he put the Winnipeg Agreement and in many ways it was that...well it was that agreement which saved Syncrude from disaster, anyway, he's trying to call me right now but I'll call him back in a few minutes. Sorry, we're talking research.

LARSON: To try and answer your question about comparing one recovery project to another, if any project causes pollution in the river that's causing hardship somewhere, then that should be controlled and if there was any truth to these things about what happens in the air then that probably should be controlled too. But so far, I mean, the arguments that I read about as far as the air is concerned, there are articles that appear in the National Post. Now, if you read the Globe and Mail and worse, if you only read the Toronto Star, you're never going to learn anything about the other side especially in the Toronto Star and the Sun. They don't even bother writing about it, because their reader's aren't interested in that. So, now if I was going to keep up with the literature in research I'd still be subscribing to the Journal of Petroleum Technology. But, I quit doing that a long time ago. I don't subscribe to the Journal of Canadian Petroleum Technology either. So, I'm not reading any technical papers. That's not what my interest is, you know. I've done all that so what I read about and comment on are things that are accessible to me in magazines. Well, I read Aviation Week. I read the Economist and it's pretty good. I read the New Yorker Magazine and it had a tremendous article about the oil spill in the Gulf. I read a magazine called Glass on Metal, which is about enamelling and that's enough magazines. I don't want to read any of these other magazines.

PMB: I do comment though, it was at least ten or twelve years ago, the Economist, which I subscribed to it until a couple of years ago and yeah, just to read it, it consumed all my time but they actually did about twelve years ago subscribe to the notion of global warming.

LARSON: Oh they still do!

PMB: They do have an editorial position that global warming is a real thing.

LARSON: I know they do, yeah, well that's too bad. I haven't given up the magazine yet. I quit the Scientific American years ago, because they decided to make an environmental magazine rather than a science magazine.



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PMB: Now, I think we're kind of almost done for today anyhow. But, this is actually a related question for you: In your view today, speaking now as Joe Citizen and not a technical expert, how has media coverage effected oil sands development?

LARSON: How has media coverage effected oil sands development? Well, first of all, I think the media's job is to publish information that they think is of interest to their readers and that will sell. And, also that is of interest to their shareholders in that it will sell newspapers. So, they can be sensational to some degree, because that sells newspapers. At the same time, their informative; you know if the one of the Indian tribes finds deformed fish in the river and they publish that. Well, that's okay and if they have an axe to grind and believe that it's the pollution in the river that caused those fish to be deformed then no one should censor that either. On the other hand, if a scientist as one has said, well the numbers of examples of those things is extremely small and we don't believe that they're representative of the situation and that should be published. If a newspaper has a policy of being anti-oil sands then I mean an editorial policy, then they're... well I guess I don't buy that newspaper. That's all. But, I don't think any newspaper has quite got that kind of a position but individuals, because newspapers are made of individuals and individuals write articles and they write articles for various reasons too.

So, I think one has to be circumspect and maybe a little bit suspicious but not overly suspicious of what the media does. I think the media has a job to do and they're part of the world and we just have to put up with it. And, the people that want to disagree with the media, they'd better find a voice to argue about it or we can also say, well what the hell difference does it make? Who reads the globe and mail anyway or whatever? I used to read the Globe and Mail but I happen to like the Post better and I can't... I'm already reading two newspapers a day and that's too many. I like the Globe and Mail, if I... I could disagree with a columnist in there and I disagree with the position that they take in the economist also, but they're not blatant about it but that's what they choose to think so...

PMB: I have one last question for you and feel free to tell me this is none of my business.

LARSON: I wouldn't say that.

PMB: Well you're welcome to use those words... how many children do you have?

LARSON: I have three children.

PMB: And their names and maybe year of birth, or if that's inappropriate tell me.

LARSON: Well, they're all adults, they all have responsible jobs so they're... but I don't need to say old they are, they're old enough to make their own living and that makes me happy.

PMB: They're names?

LARSON: Well, my youngest is Craig and he works for a Wall Street company in Manhattan and lives in New Jersey and has two children. My middle daughter is Vanessa and she lives in Perth,



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Australia and she works for a major oil company in Australia in Perth and my eldest daughter is a financial analyst and she works in Toronto, she has an MBA, she has a degree in economics and an MBA and has a chartered financial analyst certification so...they all took after their mother! They were smart!

PMB: Over-achievers! And you're wife?

LARSON: Well my dear wife passed away about, in 2008 and she was school teacher for two years and then she became a secretary to a lawyer for a number of years and loved doing that and then we started having family so she decided to stay home and look after the family.

PMB: Her name?

LARSON: Her name was June.

PMB: And, what year were you married?

LARSON: Oh 1953 I guess it would've been.

PMB: I think that covers, thank you very much, this has been a great interview.

LARSON: Okay, you're welcome.

**END OF RECORDING**



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