

DR. CLEMENT BOWMAN

1

2 Date and place of birth (if available):

3 Date and place of interview: June 28, 2011, at the Bowman Center for Technology and
4 Commercialization, in Sarnia, Ontario

5 Name of interviewer: Robert Bott

6 Name of videographer:

7 Full names (spelled out) of all others present: N/A

8 Consent form signed: Yes No

9

10 Initials of Interviewer: BB

11 Last name of subject: BOWMAN

12 BB: I guess what we'll start with is just the three minute biography where you were born and raised,
13 went to school, and who you worked; the real quick one.

14 BOWMAN: I was born in Toronto in 1930, I took my education at the University of Toronto in
15 Chemical Engineering, took my undergraduate and graduate training there and worked for a while
16 with DuPont in Kingston in the nylon business and then ended up joining Imperial Oil in 1960 and
17 that started a long career of involvement with the oil sands and back and forth between eastern
18 Canada and western Canada.

19 BB: You stayed with Imperial until when?

20 BOWMAN: I started off, as I said, Imperial in the 60's, about a year or two after I got started, I was
21 seconded to Syncrude Canada Limited and ended up the 1960's, that decade, as the research, as the
22 first Research Manager of Syncrude, I worked very closely with Frank Spragins, who was the
23 President of Syncrude during that period and then later on at the end of that decade, Imperial Oil
24 wanted me to come back and do their own research activity in Sarnia. And then I came back to
25 Imperial's research in 1974 through the efforts of Peter Lougheed and his plans for AOSTRA, I
26 became the Founding Chairman of the Alberta Oil Sands Technology and Research Authority and I
27 formally had left Imperial at that time, since I couldn't hold two jobs at that point. But anyway, I
28 stayed almost ten years with AOSTRA and then once Imperial had an opportunity for me to come
29 back to the fold and about 1982, '83, I came back to Imperial as a Research Vice President and
30 stayed with them until 1986 and then there was an early retirement program that was very attractive,



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31 everybody from the president down got a computerized retirement offering and I ended up taking it
32 because I had then an opportunity to go back to Alberta as President of Alberta Research Counsel,
33 there I was working with many companies on joint projects for breakthrough technologies and from
34 that point, after I left as President of the Alberta Research Council, I started working with the
35 Canadian Academy of Engineering and I was the Chair and Energy Task Force that was focused on
36 what Canada to do to be superlative in the fields of energy and to use the oil sands as the keystone
37 for becoming an energy superpower, this was a concept that the Prime Minister introduced, Stephen
38 Harper introduced at the G8 Summit in St. Petersburg in 2006 and essentially I had been working
39 on that assignment ever since and just to kind of put a little bit of a future on this, I'm presently
40 helping lead an effort to develop collaboration between the Alberta's Industrial Heartland and the
41 Sarnia-Lambton Petrochemical & Refining Complex, through that collaboration to increase the level
42 of upgrading of the oil sands, of the bitumen in the oil sands that takes place in Canada. To me this
43 is the critical issue that remains to be solved in the development of the oil sands. So I haven't been
44 able to stay away from the oil sands, I get away for brief periods, but somehow I get attracted back
45 in. So it's been the theme of my career, is the oil sands, that's my life work.

46 BB: That's quite a story, it's practically our whole research project; it touches on all these events and
47 characters and Spragins, that's S-P-R-A-G-G-I-N-S?

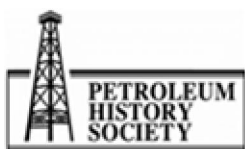
48 BOWMAN: I think it's a singular "g" but we can check on that.

49 BB: Okay, yeah, we'll check.

50 BOWMAN: I've seen it both but my recollection is one "g".

51 BB: Now when you joined that Imperial, in 1960, did they give you any hint that you might be
52 becoming an oil sands guy?

53 BOWMAN: Not at the start but about a year later, a year and a half later, they had a project here
54 called the sand reduction process and this was a process by which the oil particles in the oil sands
55 were agglomerated and these agglomerates were screened away from the sand as an initial stage in
56 the upgrading of the oil sand itself, getting rid of 90% of the sand, this concept was invented by a
57 person called John Bichard, who had an important history in some of the early work in the oil sands.
58 But I assisted John in developing a pilot plant to test this idea and Imperial asked me and a couple
59 technicians to take this out to Alberta and test it at Fort McMurray along with the process that
60 Syncrude was testing at that time. And this was 1963 that I took the pilot plant out to Alberta, 1962
61 I took the pilot plant out, and I tested it alongside the other processes and this was an excellent
62 process for handling the coarse grain tar sands that sits at the base of the formation, close to the
63 valley floor but for many of the tar sands which are high in clay, this sand reduction process was less
64 effective but anyway, it was through that pilot plant project that got me involved in the oil sands and
65 at that time I thought I'd better learn something about it and I read all the papers of K.A. Clarke and
66 many other researchers and that basic work that was done previously has been the foundation that I
67 borrowed and used in all of the subsequent work I've done.



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68 BB: So that's the big thick binder you showed me.

69 BOWMAN: Exactly. And that binder was used but they were in the Syncrude Project at that time
70 and then it was called City Service Athabasca Inc., there were four companies involved and they all
71 had their research departments connected to it so when Syncrude saw this binder I'd prepared, it
72 made copies and sent it to the four companies and the various research divisions of those companies
73 and I guess it was then the effort that I had made in that literature survey and also my work in being
74 realistic about the assessment of this sand reduction process, Syncrude came, or City Service at the
75 point came to Imperial and said they would like to borrow me and that's when I moved out to, first
76 of all Fort McMurray and later Edmonton where we set up a research department there, so I got
77 involved directly working with Frank Spragins for the balance of that decade.

78 BB: A couple of little questions, it was John Bichard, B-E...

79 BOWMAN: B-I-C-H-A-R-D. And his work was described in a paper in the second conference on
80 oil sands, or the 2nd K.A. Clarke conference, I may have the conference name wrong, but it was a
81 conference of oil sand papers in Edmonton around 1962 or '63, that honoured the work of K.A.
82 Clarke and John Bichard's paper was in that symposium.

83 BB: Now, the Syncrude consortium, I think started around what? '59?

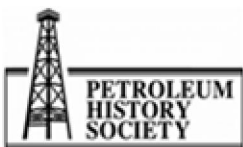
84 BOWMAN: Yes. The Royalite was the one of the initial companies in that, and they brought in
85 Atlantic Richfield and then City Service came in and then Imperial, not necessarily in that order.

86 BB: Yeah. Now the...oh you moved to Fort McMurray, now did you family at that point?

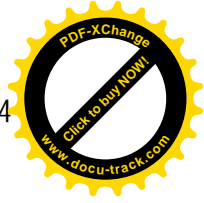
87 BOWMAN: I had two young children, one was three months old and we moved to Edmonton and
88 then we had a mining camp up north in Fort McMurray and I would fly up there for ten days and
89 then come home, which was the standard for the workers at that time, and we had a research lab at
90 Fort McMurray, at Mildred Lake, it was a Mildred Lake campsite and then, I'm getting ahead of
91 myself here, but when it looked like Great Canadian Oil Sands would get the first approval,
92 Syncrude still wanted to build a larger plant than the government wanted to see, so it looked like
93 Syncrude wasn't going to get an early permit, so the Syncrude went into a holding pattern and the
94 Mildred Lake site was shut down and the research component of that was moved to Edmonton
95 where there was a facility out at 17th Street and 101st Avenue that was the Syncrude research site for
96 most of that decade, the 1960 to '70 decade.

97 BB: What was your first reaction to actually going to McMurray, to the north?

98 BOWMAN: Hugely exciting, I felt I was going back in history and being part of an explorer and
99 seeing a potential that was unbelievable and I can still remember standing on the floor of the valley
100 just north of Fort McMurray and looking up and seeing this oil sands deposit where it was exposed
101 and picking up clumps of this sand...and being able...of the oil sands and seeing the little grains of



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102 quartz sand embedded in this and I thought this is a miracle material and what will happen to this,
103 and just being there to see it was very, very exciting.

104 BB: Of course it had been exciting geologists for over a century.

105 BOWMAN: There were many others who, long before me, stood in this same spot and sensed that
106 excitement...**McConnell** and then all the initial developers that came in, the policemen from New
107 York City who came in to try their hand at it, and **Max Ball** and **Draper** and there was so many
108 people, so many explorers, so many entrepreneurs and so many failed efforts.

109 BB: And of course, **Ellison Clarke**, being the two most persistent on the government side.

110 BOWMAN: Yes, on the geology side, **Ellison Clarke**, the two name that just march through and I
111 never met Ellis but I did meet K. A. Clarke once and it was at this conference that, whatever that
112 date was, '63 or so and he gave his paper and there I was, a young researcher way in the back and I
113 thought, I'd like to go up and say who I was and meet him but I was too bashful and too shy and I
114 never did, and I missed my opportunity but then I got to know Mary Clarke very well in subsequent
115 years and helped her a little way in getting some of his papers organized and interpreted and I've got
116 her two books and I've read all of those and it's a history of Canada.

117 BB: We've interviewed her for the project.

118 BOWMAN: Oh definitely.

119 BB: Keeping things in sequence, so we're in 1963 and what were the main research challenges still
120 facing Syncrude at that point?

121 BOWMAN: From the commercial side was to get a design in place and that was a credible for
122 economic activity and it was Syncrude's belief that they needed a plant of at least 100,000 barrels per
123 day and this was a stumbling block and Great Canadian Oil Sands, now Suncor was also active in the
124 same period and was doing very similar things to Syncrude and getting ready for a commercial
125 project and Great Canadian Oil Sands, this gets into a very strategic decision that was made by **J.**
126 **Howard Pugh**, who was the chairman of Sun Oil, in the literature you can find the stories of this,
127 but essentially one of his board meetings of Sun Oil, he went to his board and said, I don't know if
128 he was facing opposition to their project, the Sun Oil Project, the GCOS Project, but he claimed
129 that at that meeting, that if his company didn't want to get behind it, he would put his own money in
130 and go ahead and that's written up by an observer at that meeting that I, somewhere I've got a copy
131 of that transcript, and then a little bit later there was a hearing before the Energy Resources
132 Conservation Board and I know from two people that attended that hearing that a letter was read
133 out at the hearing, and I imagine **George Govier** was the chair of that meeting, I'm almost certain,
134 the letter that was read out was that, if the government granted a permit for 31,500 barrel per day
135 project that, I don't know if he said he or the company, they would put the money into that without
136 any reservations and the people I know at that meeting, said the mood at that hearing changed
137 immediately and shortly after the Great Canadian Oil Sands got the permit for that project, so to me



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138 J. Howard Pugh, who I also had not met, to me is one of the visionary heroes because he took a
139 chance essentially with his own money, his own reputation and made that project work at whatever
140 size the government wanted and so our history has shown the wisdom of that.

141 BB: For Syncrude, you still had many research challenges, you were mentioning just the clay for
142 example, and then of course the upgrading processes...

143 BOWMAN: Both Great Canadian Oil Sands and Syncrude had similar problems on the, first of all,
144 it looked like the best approach for getting the oil out of...the bitumen out of the sand was the Karl
145 Clarke Water Process, so they both ended up using it, their ratio was how to get the remaining fines
146 out of the separated bitumen, the froth and Syncrude and Great Canadian Oil Sands were following
147 slightly different approaches but I think the big issue they had at the time, and still have, is the
148 tailings issue, the clays that remain suspended in the water phase and take a long time to settle was
149 seen right from the start as a major impediment of the Clarke Hot Water Process, in fact I just read
150 recently about Frederick Camp paper he wrote in the 70's where he predicted that this was such a
151 serious problem that it was not a fatal flaw but it's one that was going to stay with the industry and
152 take enormous amount of research to solve and that was since 1970...I have a copy of that paper
153 incidentally and I can show you after Bob.

154 BB: Is Camp, C-A-M-P?

155 BOWMAN: C-A-M-P. And 50 years later, we're only now starting to get to the solution of this clay
156 problem.

157 BB: I interview Bill Cary who was...

158 BOWMAN: Maurice Cary?

159 BB: No, William.

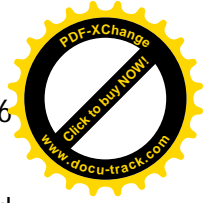
160 BOWMAN: Oh another Cary.

161 BB: Yeah, who was Suncor's or GCOS first Environment Manager and he was hired "to solve the
162 tailings problem" in 1972.

163 BOWMAN: The work I did which I haven't commented with Syncrude during the 60's, our focus
164 was trying to understand the clay problem and we put a major effort into understanding the
165 interfacial and molecular properties of the oil sands, trying to understand what the interaction
166 between the clay, water and the oil and the sand and the work we did was presented at the World
167 Petroleum Congress in 1967 in Mexico City and probably that paper probably summarized much of
168 the theoretical work we did during the period, again trying to understand the nature of the clay and
169 its interaction with the oil.



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170 BB: Is a lot of the problem that more...that specific type of clay that soaks up so much water and
171 bonds so tightly with water?

172 BOWMAN: The basic issue is the silica sand in the oil sands, it's completely water wet and it drops
173 out of the sand when the oil sands are mixed with hot water. The fine clay particles are partly oil
174 wet, they're at the interface between the water and the oil and they're very hard to remove and in the
175 process, most of them do get separated from the oil but they're so fine they stay suspended in the
176 water that's used and it takes years for them to settle if their left on their own and Suncor was faced
177 with the issue of having to open up one new tailings pond after another to handle this material. But
178 at that point, just a general comment I make, the technologies that were developed during the 60's
179 and 70's for the mining of oil sands, at that time, oil...pardon me, water and air were free, so it didn't
180 matter how much water you used, there was no cost associated with it and the upgrading of the oil
181 didn't matter how much carbon dioxide was put off, because nobody worried about it, but the issue
182 the oil sands are now facing is that water and air are no longer free and there were technologies that
183 were being developed in the 60's and 70's that would have been much better than the technologies
184 that Suncor and Syncrude used but they were not economic because there was no penalties for the
185 water and air contamination.

186 Two examples, one would be the Bill Taciuk, T-A-C-I-U-K, process which was a dry process for
187 recovery of oil from the oil sands, used no water. Another concept was Bill, or pardon me, Bob
188 Ritters, R-I-T-T-E-R-S, process that was electrophoretic, E-L-E-C-T-R-O-P-H-O-R-E-T-I-C, I
189 think, process for consolidating the clay that was in the middling stream, he could consolidate it
190 through electrical force so dense you could walk on it, but these two processes they were added
191 costs and so these weren't pursued at that time, but these are the kinds of things that need to be re-
192 looked at now.

193 BB: Well people keep talking about Taciuk, but it's never been scaled up.

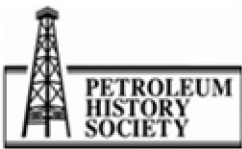
194 BOWMAN: It was scaled up to the extent it was used, Bill did license it to several, not in the oil
195 sands, but for other purposes and so he had some pretty large, semi-commercial applications of
196 this...

197 BB: But he couldn't convince the oil sands?

198 BOWMAN: He convinced AOSTRA.

199 BB: Right.

200 BOWMAN: That this was a worthy thing to pursue, and I won't make any comment on now, there
201 a lot of things that we should be looking at now and they're being looked at from beyond the in situ
202 side, there's many new technologies that are being looked at that would not have been economic in
203 earlier periods.



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204 BB: I've been hearing rumours of something like electrophoresis in the in situ. Anyway, we're still in
205 the exciting 1960's and throughout this time, you're living in Edmonton and going up to do your
206 work in Mildred Lake?

207 BOWMAN: Yeah, about...an early stage here, when the Mildred Lake Camp was shut down then we
208 moved down to Edmonton for the balance of that decade, that was probably '63 or '64 when the
209 Syncrude pilot plant up north was shut down, so we moved the research and built a smaller pilot
210 facility at this research unit that was on 17th and 101st Avenue and then I stayed as Research
211 Manager with Syncrude until 1969, at which point I went back to Imperial Oil. I have another
212 comment I make to people, I was only able to hold a job usually five years they find out about me,
213 and send me off somewhere else.

214 BB: Now were you doing a lot of that research in-house or as they do now, farming it out to
215 academics and labs, so this Edmonton Research Center, were you doing all the bench work right
216 there or...?

217 BOWMAN: We were doing it all right there, we had a number of University Professors working
218 with us as associates and consultants, even Harry Glenning, who became the President of the
219 University of Alberta, came out at least every second or third week and we'd make use of his
220 information and advice and we worked with Auto Strauss on his work understanding the
221 fundamentals of the oil sands and we had Dr. Yon Leja, who was a minerals processor from the
222 University of Alberta, that's L-E-J-A and we had a, kind of a university group that were interested in
223 getting more practical work underway who were keenly interested in teaming up with the researchers
224 of the Syncrude researchers, to me it was a very active period. Getting back to the fundamentals and
225 the pilot plant was small scale but it was trying to translate what we were finding in lab work into a
226 method of improving the Clarke Hot Water Process, and we certainly learned how to reduce the
227 amount of clay that was trapped in the so-called froth that comes to the top of the separation cell,
228 we made major advances in that, but when I think back to what Clarke did in 1930, '31 and '32 with
229 his equipment and I think my gosh, we did advance but what he was able to do at that stage with
230 very little support from the establishment is amazing.

231 BB: Now maybe you could describe that a little...how do you reduce the amount of clay in the froth?

232 BOWMAN: One thing we learned was and really it followed up some of the principles of Dr.
233 Clarke, not to add air into the separation cell, to minimize it, and one approach was in a lot of
234 minerals processing, they have devices which inject air into the bottom of the separation cell and if
235 you do that with oil sands, a lot of the clays will float, so the essence was to have a separation cell
236 that was relatively coalescent and use only a minimum amount of water, enough to effectively
237 separate the phases and not over mix it and we got into a lot of work on chemical additives, Clarke
238 had noted that the PH has to be slightly above neutral in order to get good separation, some oil
239 sands tend to be more acidic and they don't process at all well and so we did a lot of work on the
240 chemicals and you could certainly improve the quality of the froth by adjusting the PH and adjusting
241 the chemical environment.



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242 BB: So that was the...adding caustic?

243 BOWMAN: A caustic was certainly one that we tried, the simplest one we tried, we also tried many
244 other chemicals that are used for PH controllers, we tried flocculants, if you add the flocculants, if
245 you add for instance calcium or magnesium, this is not a good thing, you start agglomerate the oil
246 and the clays start to precipitate together and Clarke again had found that out that so-called
247 polyvinylene metal ions, the calcium, magnesium and iron, if these are high in the process, it
248 interferes in the recovery of the oil, so I guess that period was trying to get the chemistry balance
249 correct and...

250 BB: What about on the upgrading side, did you also look at the variations on coking, hydro-treating
251 and that sort of thing?

252 BOWMAN: We only did that from the standpoint of doing engineering and economic assessments,
253 Syncrude had a team that looked at the different approaches for upgrading but no research was done
254 on-site on that, we made use of the licensors of these processes and there would be some pilot plant
255 work done by the licensors.

256 BB: Now if I remember right, a lot of that was coming out of the, now Exxon, it would have been
257 Standard Oil labs in New Jersey?

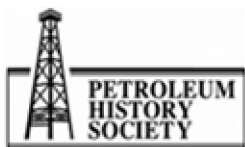
258 BOWMAN: Yes, certainly a lot of the work on the fluid coking came out of the, it would really be
259 Exxon or Research and Engineering that was kind of behind that and a lot of consideration was
260 given to hydro-cracking of the bitumen and there was pilot plant work done on that but he Syncrude
261 research time at the south was not really focused on upgrading at that time, it was on the recovery
262 part.

263 BB: It was to deliver the bitumen to the downstream...

264 BOWMAN: Yes, exactly.

265 BB: Okay, so this takes us up to '69, okay then what happens?

266 BOWMAN: Then I went back to Imperial Oil, I came back as Manager of Chemical Research in the
267 Sarnia Research Center here and did that for approximately four years, five years and then there was
268 an announcement that Peter Lougheed decided to set up a group called AOSTRA, the Alberta Oil
269 Sands Technology and Research Authority and they were about to appoint a chairman and that they
270 were wanting to do 50/50 field projects with the companies and the purpose of AOSTRA was, as
271 announced at that time, was to develop an in situ recovery process for each of the major oil sand
272 deposits, Cold Lake, Peace River, Wabiskaw and McMurray formations, and at that time the multi-
273 national oil companies had just about abandoned work on their leases and what I heard on the street
274 was that they had much better investment opportunities in other countries and I was told that what
275 Peter Lougheed did is, say we've got to get these companies back and we'll do it through a hundred
276 million dollar fund and we'll put in, the government will put in the other. Well at that point, I'd



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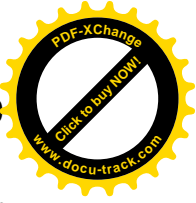
277 actually moved from my job as Manager of Chemistry Research in Sarnia, I had moved a year
278 before, I think 1973, to Manager of Petroleum Research, since they had the two divisions here and I
279 thought well we've got some good ideas for the oil sands here, we should go out to AOSTRA and
280 make a proposal for, here's a project that we'd like to do, jointly with AOSTRA and so I kept
281 waiting for the chairman to be announced and I had a friend out here who is Paul Gishler, who is
282 the Manager of Chemcel Research in Edmonton and I'd worked with him in the chemistry, the CIC,
283 the Chemistry in Canada, and I called him a couple of times and I said, do you know who has been
284 appointed, no its certainly not announced, so I was getting sort of anxious, I didn't want other
285 companies to get in there ahead of Imperial, so I finally called him one more time and said surely
286 they've announced this person, Paul, he didn't say it nastily but almost in exacerbation, he said, Clem
287 why don't you apply for this job. So I called George Govier, who had I had met from some earlier
288 work with Syncrude who was the chair of this section committee for the chair of AOSTRA and I
289 said will make any sense putting my name in, well I won't go into all the details, but I did put my
290 name in never expecting it and one day he called up and said guess what!

291 So anyway that's how I got Chair of the Alberta Oil Sands Technology and Research Authority and
292 this was a concept that's so different that anything government has done before and I think people
293 really don't realize the chances that Peter Lougheed took on this, it was a system, a very different
294 system for a government to be involved and very different from what they're doing in the United
295 States, because one of the founding principles was that technologies that was developed through
296 joint projects with industry would be owned by the government and this violated a principle that
297 seemed so sound, you wouldn't think anybody could disagree with it, but the U.S. would announce
298 the principle and this, anything that's done with public funds, should be freely available to the public
299 and that's the way the Federal Government in Canada worked, they had a lot of research efforts, the
300 money they put into joint projects with industry, but the guiding rule was that it had to be freely
301 available to the public, cause it was public money. The fallacy in this is that, technology that's freely
302 available to everyone is of value to no one because you can't then get any investor to put some
303 money into it, because everyone's sitting on the sidelines with, have the same opportunity to gather
304 this up at no cost.

305 So this principle and you asked a bit ago crises, crises to me was one of the crises in this period, the
306 oil company lawyers from the States just could not believe of a government that would be
307 expropriating the ideas that were developed out of these joint projects and one of the companies
308 never accepted it and the rest did, and they finally realized, hey this is a pretty neat idea, we go into a
309 project, we get full use to all to all the technology that comes out without restrictions and its
310 protected and the government won't give it away to anyone else unless the government would allow
311 other companies to use it under a fair market value terms, and it turns out the fair market value is
312 what the original company had to put into in the first place, so it was a way of keeping the system on
313 a business basis, but that was an issue but most of the companies, essentially all of them, it was
314 Amoco, and Shell, and BP and Union Oil, all the joint projects that we did in the next ten year
315 period, were all done on the basis, the government owned the technology, the company had full use
316 rights, the government had the right to sell that technology to other companies for their leases, so it
317 wasn't blocked for use. So that's the story of AOSTRA and getting started.



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318 BB: On that licensing, that subsequent licensing...Amoco develops, you know, slaughter lighters or
319 something, if they do it as an AOSTRA project, AOSTRA pays half to do it and then...what's the
320 next step, Amoco wants to do it they can go ahead and...

321 BOWMAN: They just do it without any thought.

322 BB: And so they have a license because they helped develop the... but then Company B wants to use
323 it, do they then license it from...

324 BOWMAN: The government.

325 BB: The government. And the fees from that licensing go where?

326 BOWMAN: They go back in to the AOSTRA pool, to fund new projects.

327 BB: Okay, but what does Amoco get out of it?

328 BOWMAN: They don't get anything out of that.

329 BB: Except the use of the technology.

330 BOWMAN: Yeah.

331 BB: Well without having to pay a fee.

332 BOWMAN: And yeah and they get to use it well ahead of anyone else, because they've already got
333 the project in the field, so they've got a five year timeline, like these were five and ten year projects,
334 so by the time we knew the project was a winner, by that time, they had such a lead that they'd...

335 BB: So it's mainly a time advantage.

336 BOWMAN: Huge time advantage, yes.

337 BB: And now were you going to have your own research staff or was this mainly a funding or
338 evaluation kind of operation?

339 BOWMAN: In AOSTRA itself?

340 BB: Yeah.

341 BOWMAN: The deal was that AOSTRA could assign, would assign an engineer on the management
342 team of the project and in addition, AOSTRA had a small core of technical people who were kind of
343 guiding and also adding some good ideas into the project and the management committee would
344 meet frequently and it was a joint committee between the company and AOSTRA, most of the
345 people were company people. It would be interesting for your to interview some of the companies



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346 that were involved in AOSTRA during that period and get their reaction to it, I was amazed how
347 smooth it went once we got started, once we got the lawyers out of it, it seemed to break pretty
348 smoothly and so those projects were long projects and they took up...one other thing I'll mention, in
349 1975 when I joined AOSTRA, Peter Loughheed really followed this very closely, we didn't know
350 what to do at that point, we knew what we were charged with, we were to get a demonstration of a
351 project, in the field, that was economically competitive in each of the oil sand deposits, so we
352 convened a number of meetings with industry and I met with individual companies separately over
353 the next 18 months and we developed a plan on how to move this ahead, I also met with the
354 presidents of all the universities in Alberta to get their researchers connected to it.

355 That's another little thing, we had university people also assigned to these field projects, but not to
356 digress too much here, in this 18-month period in developing a plan, at the end of this 18-month
357 period I got word back from Barry Melon, who was the Deputy Minister for the Energy
358 Department, that the Premier was a little concerned we hadn't spent any money yet, he had a
359 hundred million dollars and we'd spent a trivial amount and but anyway, around the 18-month mark,
360 we announced five field project which would need far more than a hundred million dollars to carry
361 out, so the Premier invited me to attend Cabinet Meeting to present my case and I went back and
362 presented the story that to do the five projects, we needed another \$132 million dollars and the
363 Cabinet approved it almost immediately, so the \$100 million got increased to about \$232 million,
364 I'm going on memory but I don't think...

365 BB: That's sounds about right.

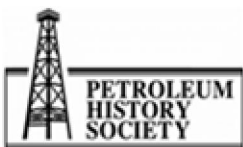
366 BOWMAN: And so that was a breakthrough that we got entrenched in our thinking that these were
367 big projects, five year projects, ten year projects and that it was going mean a big commitment and
368 the very early commitment of the Alberta Government that they were going to see this through was
369 again remarkable and when I look back other governments how they tackle big projects.

370 BB: Now Imperial would have been one of the companies involved in this, how did you deal with
371 the conflict of interest? Did you have to resign from Imperial?

372 BOWMAN: I had resigned from Imperial, it turned out Imperial was kind of focused on Cold Lake
373 at that time and had already got work underway and Imperial on their own, decided they didn't need
374 AOSTRA's support for what they were doing. Then it turned out that one project that they were
375 finally interested is Roger Butler's work, in which case, they did get involvement of AOSTRA, in a
376 way. But Imperial was not...I had left Imperial Oil and so I didn't...and Imperial Oil probably gave
377 me more trouble with the legal aspects of their company but...

378 [END OF NO. 1]

379 BB: Okay this is our second session with Clem Bowman and this time we're going to start with the
380 Roger Butler. When did you first meet Dr. Butler?



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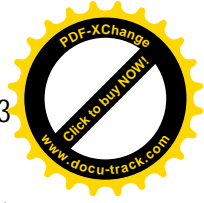
381 BOWMAN: The first time I met Roger was when I came to Imperial Oil in 1960, he was my boss.
382 And I worked with him during this period when I was involved with the sand reduction period that
383 I mentioned earlier and we kept in contact and I'm not sure at what stage, it was much later in our
384 career when I came back in 19... to Imperial Oil in 1969, sometime during the next period of a year
385 or two, he talked to me about an idea he had of horizontal wells and he had developed, he showed
386 me some differential equations he had and I think at the time I understood them, but I've kind of
387 forgotten the principles now, but he showed me how that you could have horizontal wells and how
388 there would be heat and mass transfer between them and he went to Imperial Oil to try to interest
389 them in this without very much success and over the next year or two, every time I met with Roger,
390 I no longer worked for him at that point, but we were just colleagues, he would expand on his
391 theories and not too much further happened on that, that I'm aware of until I joined AOSTRA in
392 1975 and I knew that Roger was continuing his work and I think at that point, and I think I've seen
393 the patent he got, that was assigned to Exxon Research and Engineering I believe, on what was the
394 forerunner of his gravity drainage idea, but there's another part of this story that I think I may be the
395 only one that knows, so let me try that.

396 In about 1978 or 9, a man came into my office who I'd met before, his name was Gerry Stevenson,
397 he was the President of Norwest, now what was the true company name? Norwest Mining? I sort of
398 have it in my papers, but he came into my office when I was Chairperson of AOSTRA, and said, the
399 oil companies have got it all wrong, he said, it's silly to be, and we're talking about the in situ side
400 now, the idea of drilling vertical wells into the oil sand and only contacting the pay zone for the few
401 meters where there's a bitumen and having to put multiple wells down in these grid patterns just
402 doesn't make sense to me, he said. He said I'm a mining man and the logical thing to do in a mine is
403 to put down a shaft and to drill horizontal wells from that shaft and then every foot of well that's
404 drilled is in the pay zone and he said, he had gone to oil companies with this idea and they said, well
405 the cost of putting down a shaft into the oil sands would be excessive, no decent oil company would
406 ever conceive of that idea and they said, moreover there's methane down there and you're going
407 have explosions and so they threw up every kind of problem. And so he came to my office and sat
408 there and made his plea that we should build a facility, put down a shaft and he had worked out what
409 the costs would be and according to his numbers, drilling a shaft into the deposit is not an expensive
410 operation and the coal companies know how handle methane in spades.

411 So anyway, we put together a concept called the Underground Test Facility, and this was the brain-
412 child of this Gerry Stevenson. And the board of AOSTRA and I haven't talked about the board of
413 AOSTRA, that's another thing the Alberta Government did that was unique, this wasn't an advisory
414 board, we got to spend some time on this at some point, this wasn't an advisory board, this was a
415 management board, that board made decisions. We had on it some pretty powerful people, vice-
416 presidents from oil companies, from people that knew the environmental issues, president of
417 universities, we had a very impressive group of men that knew patent law, and anyway, we took
418 Gerry Stevenson's idea to the board and the board discussed it at great length for several meetings
419 and then we thought this was a project that should go ahead and we went to the oil companies
420 looking for who was going to put up the other half of the funds, it was a \$100,000 million dollars as
421 I remember, when everything was added in and no oil company would put any money into it, but



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422 everyone said they would support it technically with their people and they'd join in on it, they'd have
423 people help us on it. So anyway, it turned out AOSTRA had to put all the money in, the only time
424 that AOSTRA put the full amount of money in, that it wasn't a joint project, so we violated one of
425 our principles right at the start there. And we picked an area near Fort McMurray for this test site,
426 and at that point, Roger Butler, his position in AOSTRA, I don't know if he was a director of in situ
427 at that stage or not, what his actual position was, it varied over time, but it seemed this was the
428 obvious time to test his principle of gravity drainage, so Roger became part of the team, of the
429 technical team and management team and the project was built and my understanding, I did not stay
430 for the full completion of it, because by that time, I had gone back to Imperial, but I was there for
431 the start of it and my understanding from Maurice Carrigy, who was the Vice-Chair of AOSTRA
432 and who was the Project Executive from AOSTRA on this Underground Test Facility, my
433 understanding is that through the course of that project, they essentially got 80% of the bitumen
434 from that test zone, which is a huge recovery level that's a...I would hope that somewhere that you
435 can get confirmation of the 80%.

436 I knew it was high, but essentially, the shaft was dug, the horizontal wells were drilled and Roger
437 Butler Gravity Drainage Approach, steam going in one well and recovered from an adjacent well
438 underneath or above, so the steam well heated the oil and then it drained into the production well,
439 that was the testing of the SAGD process and it was the putting together of two people's ideas,
440 Gerry Stevenson and Roger Butler. And I think, I think he's still alive, I know he lived in Canmore
441 for a long while after he retired, but Norwest still exists as a company, the name may be a little
442 different, but I've lost track of him recently, but to me he was the key figure in this, that got the
443 AOSTRA aboard, keen on the project on horizontal wells.

444 BB: By the way, I've been down in the... I was down in the tunnel.

445 BOWMAN: Good for you!

446 BB: Remember you had that, Welsh miner who actually did...created the shaft and he took me down
447 on a tour...I don't know when that was...late 80's, early 90's, somewhere in there.

448 BOWMAN: Good for you!

449 BB: Now let's go back a little, now what was Butler's position when he was your boss, was that in
450 chemicals? Or?

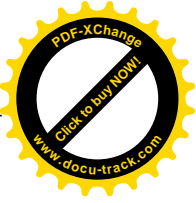
451 BOWMAN: It was in the petroleum side of research here at Sarnia, he was kind of section head and
452 I was a new hire and that was my relationship to him.

453 BB: And during all this time, Imperial was going with their huff and puff, their cyclical steam
454 injection, that must have been a curious role with him, having his idea in his head while his company
455 is going on this other path.

456 BOWMAN: Yes.



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457 BB: Actually, maybe you could tell me a little bit about his personality and what kind of guy he was?

458 BOWMAN: I just recently printed up a document which was a bio of Roger written by someone
459 and I intended to read that before we met here and I just never got around to it, but I can certainly
460 tell you, when I first met Roger I found that he was a little difficult to work with, only difficult in the
461 sense that he was so bright, that's not the right word, difficult, he was so bright that you kind of felt
462 that he was always a step ahead of you and his mind was working so fast and so quickly that you felt
463 a little bit in awe of this, so I felt that working for him, one really had to be alert and not make
464 mistakes and understand what you're doing very clearly. Not that he'd be critical but he would say,
465 well this isn't right, you forgotten something here, you've forgotten that there's an equation, that if
466 we put this in. So it took me awhile to appreciate him as what he really was, he was a warm
467 personality and he certainly helped people with their work, and generous, and I got to know him
468 very well through, we cross-country skied together and did many things together subsequently and
469 when I came to AOSTRA I saw the value of him working with AOSTRA and what he was adding
470 to the team technically, in his vision and his concepts, so...I can bring tears to my eye thinking about
471 Roger Butler, I can.

472 BB: You mentioned cross-country skiing, another one of my passions; where would that have been?

473 BOWMAN: It was out west in the trails, the mountain trails.

474 BB: Where? Around Banff or Jasper?

475 BOWMAN: I remember one we went with Takaka Falls, there was a trail there that we went with
476 Joyce and Roger.

477 BB: Were you living in Edmonton at this time?

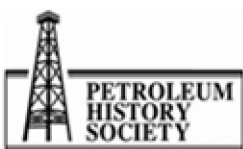
478 BOWMAN: Yes, oh yes, I would have been living in Edmonton. I lived in Edmonton three times at
479 least.

480 BB: Was he also in Edmonton or Calgary?

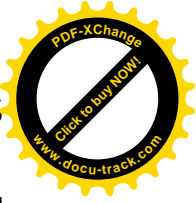
481 BOWMAN: He was in Calgary at that point, he had joined the University of Calgary, well he went to
482 Calgary with Imperial, I don't know what stage he went to the University of Calgary but that's where
483 he was, that's where he did most of his infinitive work was there.

484 BB: Yeah, I've seen the biographical write-up, possibly the same one and did he come to you with
485 AOSTRA right away in '75 or?

486 BOWMAN: No, not in '75 he didn't. He got linked with AOSTRA at about the time when the
487 horizontal well thing got really going and I don't know, I wasn't part of the actual engagement of
488 Roger into the team, we had put together with this Maurice Carrigy was our designated board
489 member on the Underground Test Facility team and it was through Roger I think that, or Maurice



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490 that Roger got formerly engaged in the team and I think his position was the director of technical
491 programs or something at that point and he worked out of Calgary AOSTRA, AOSTRA had a
492 Calgary group and he worked out of Calgary.

493 BB: They're at the research park out by the University?

494 BOWMAN: Yes...no, the actual office of AOSTRA was downtown at the Standard Life Building,
495 the person that ran that, when we set up the Calgary office of AOSTRA was Ray Phillips and Ray
496 Phillips may be the one too that brought Roger into it at some point but there was a lot of
497 interaction between the university people in Calgary and the AOSTRA office in Calgary.

498 BB: Now can you spell Carrigy?

499 BOWMAN: C-A-R-R-I-G-Y, and you'll find him, he's a geologist, he's embedded in the history of
500 the geology of the oil sands.

501 BB: And is it M...

502 BOWMAN: M-A-U-R-I-C-E.

503 BB: Okay.

504 BOWMAN: I'm going to give you a document if you want it, that he has a written, a paper that he's
505 written and you'll see his role.

506 BB: Somewhere I think I have that coffee table book that was done about AOSTRA, the 20 years,
507 or 10 years...

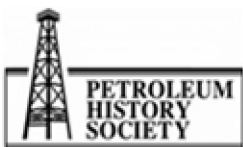
508 BOWMAN: Yeah, there was the five year one, which I've got a copy of in the car, and then there
509 was one Bill Yurko did, which was the 50 year one.

510 BB: Is that the one with that sort of blue cover?

511 BOWMAN: Yes.

512 BB: Nice, really nice pictures.

513 BOWMAN: It's a big book, that one, Bill Yurko was the chair at that point, and then there was a
514 five year one which I'll give you, I'll show you a copy of, it's in brown and the newspaper came out
515 when we put this out and I think I've got the clippings somewhere, I don't know what, it was an
516 Edmonton reporter that talked about this five year report of AOSTRA and his headline was "Sand-
517 Sensational" and his comment was, "this is most impressive document in colour and understanding
518 and one thing after another that has come out of the government in a long time, perhaps forever",



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519 was his comment. So we put a huge effort into describing the principles of AOSTRA in that five
520 year report. Now I don't know if you knew Bill Yurko or remember?

521 BB: Not well, I remember him though.

522 BOWMAN: But I mean he had an ego the size of a...and what he did in that ten year report was
523 over the top in many respects.

524 BB: Now, Roger's insight into the horizontal, was he an engineer by training?

525 BOWMAN: He was a chemical engineer and actually I met Roger before I told you I met him. I
526 didn't want to go into all the details but at the University of Toronto when I was in my last year, he
527 was a demonstrator, he'd been hired as a lecturer at the University of Toronto and I met him at that
528 stage, I was a student and he as junior professor or lecturer and then I met him again when I joined
529 Imperial Oil and then he had since joined Imperial ahead of me, but yeah, that's Roger Butler.

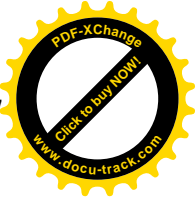
530 BB: But this idea of the parallel wells, you wondered where the inspiration was, that whether it was
531 from mining or just looking and saying, gee we've got these wide pay zones then but...

532 BOWMA: I think he was facing what Imperial was doing the huff and puff, where you had and
533 injection well, perhaps in the center and then you had production wells on the outside and the flow
534 was radial and the permeability was unequal in all directions, so you'd leave big chunks of pay zone
535 not contacted and then so, the thing was, you'd keep on putting these in, but they were not very
536 efficient and I think Roger could see the inherent inefficiency of something that was a radial flow
537 and as you moved out the steam would miss bigger and bigger areas, so there had to be, I'm sure in
538 his mind, there had to be a different approach, so the idea of putting the horizontal wells in, well the
539 first obvious thing and that's the one on Gerry picked up on and convinced us on, is every foot you
540 drill is in the pay zone, not like when you're coming down here, all of this, sort of wasted area and so
541 Gerry's idea would...we'd always do it with a shaft and drill out, well about that similar time, industry
542 was making great advances in drilling horizontal wells from the surface and they were able to do a
543 directional drilling and it turned out to be, in the long run, cheaper too, drill all the horizontal well
544 from the surface but again, with every foot in the pay zone.

545 Well Roger's idea was that you could heat the oil and then when you heated it, it would drain by
546 gravity and then if you had another well underneath it, you could pump the drained oil out of that
547 well, now I think the novelty is more than this, the novelty is that once you get one zone drained
548 and you just have no oil in there, its just a sand, you really have a steam chamber, so as you put new
549 steam in, that steam chamber, the steam will want to rise, it rises a bit, it heats the oil above and that
550 oil can now drain down into the area underneath because it's got no oil in it and the oil will drain
551 through that sand very quickly, so its this concept of a steam chamber that grows as the oil is
552 drained out of it and it rises and it keeps rising, so you actually contact the whole pay zone, there's
553 nothing left like these radial patterns that you would have in a huff and puff, so you would have to,
554 you know, if Roger was here he could explain what drove him to it, but my understanding of it is the



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555 growth of the steam chamber and the ability of the steam wanting to rise and increasing heat, the
556 zones above the pay zone, really is the basis behind it.

557 BB: You mentioned that selling this whole underground test facility and concept to the board and
558 you started to talk a little about the composition of the board, maybe you could talk first about the
559 board and how it worked and then how this particular project got through?

560 BOWMAN: The board met every second week, so it wasn't like an advisory board that met twice a
561 year, it met every second week for an all-day meeting, the first board, who was the first board
562 members, there was Maurice Carrigy, there was myself, there was Ballantyne, there was Fred Kidd
563 from Shell, and the other names will come to me...Peter Johnson was a lawyer, there was Ed
564 Ballantyne, Carrigy... there were seven of us in total, I think of one or two more names, but anyway,
565 this board, every application that came for funding went to this board, and they would study it and
566 make their own decision, and then we would meet and make a decision and one principle we had
567 was that if one board member was not willing to sign on, we didn't make a decision, we would bring
568 it back the next week and would keep working it until every board member felt this was the right
569 approach, and we never deviated from that, we never voted on anything.

570 BB: So a consensus?

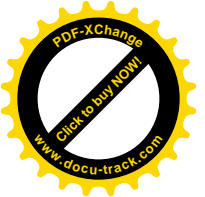
571 BOWMAN: Yeah and had to be full. And another thing the board did, is that we had a registrar who
572 took minutes and the minutes he took were detailed, almost word for word, what was said at the
573 previous meeting and at the next board meeting I would ask, does the board want to take these
574 minutes as okay, or do they want to have them read and we'd spend an hour, and hour and a half
575 reading the minutes from the previous meeting and we did that for the ten years I was out there.
576 Each year, when there was an audit done, a government audit of AOSTRA, the auditor was
577 astonished at the thoroughness of the minutes and the fact that we read these every week because
578 we wanted to make sure everything was right and that was, and that's one thing I'm pleased about
579 AOSTRA, is that there were many other government funded agencies in Alberta and elsewhere, that
580 were in trouble during this period through lack of financial due diligence or financial stewardship
581 and there was never a question about the many hundreds of millions of dollars that we spent, they
582 all had due process and it was the board members who insisted on this and when it came time to
583 make the decision for the Underground Test Facility, I think we had, we weren't not able to make a
584 decision at the first board meeting but we were at the second and the one board member I know so
585 well, but I can't, his name will come to me, he's the one that said, look, if we don't do this, nobody's
586 going to do it, we've just got to do it and that was it, we had an agreement and we approved the
587 \$100 million dollars, without any industry support.

588 BB: Now to get industry support, would they come in sometimes as a consortium or did you need a
589 specific company to...?

590 BOWMAN: On almost all of them, that's a good question you ask, on almost every one, it was a
591 single company and then we allowed additional companies to come in under, on a small basis, 12.5%



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592 percent, we would work with the major company and if there was another company that had some
593 technology that might be of use, they came in as a minor participant and they would pay the 12.5%
594 percent which would be apportioned to do the two main sponsors, so we had some projects where
595 we had the four associated companies involved...or three of them was the most we had, in addition
596 to the major company, so this ended up with a number of the projects being out on a consortium
597 basis, with the consortium developed after the fact.

598 BB: And that would be 12.5% of the total, or 12.5% percent of the corporate half?

599 BOWMAN: It was the total. As I remember we did almost always 12.5% of the total, so it reduced
600 the cost of the total project.

601 BB: This was all very clear to me in the 1970's, things have faded.

602 BB: Now was in situ the sole focus, or did you also look at mining?

603 BOWMAN: It was 80% roughly, in situ, there was some mining, I mentioned the Taciuk Project
604 and the Ritter Project, were both mining and there may have been some others, I'm wondering if we
605 could just pause for a moment and let me get my five year book here, because there are some
606 answers to...

607 [END OF NO. 2]

608 BB: We're now resuming and Clem has brought in the five year AOSTRA Report which must have
609 been around '80, '81?

610 BOWMAN: Yes, if it has that date on it, it's one that I made reference as being in the paper as
611 "Sand-Sensational" in the eyes of some reviews, Merv Leech was the Energy Minister at that time,
612 it's 1975 to 1980 was the period, and this largely, it's the in situ process that are covered but there is
613 a description of four extraction mining projects, the Redco Engineering, one of Bob Ritter was one,
614 and dry retorting, the Bill Taciuk and some work on Solvent Extraction, but the main emphasis was
615 on the in situ challenge and most of the projects were in this work, field projects that were done on
616 the different deposits, they included the project with BP on Marguerite Lake Pilot in Cold Lake, the
617 Amoco Gregor Lake Pilot in Fort McMurray area and the Peace River Shell Project, which had
618 interesting...

619 BB: Still.

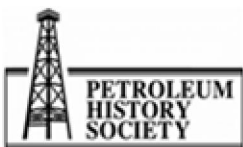
620 BOWMAN: Still plugging along, and we actually had a horizontal drilling project underway with the
621 Gulf and this was really the start of our interest in, sort of, horizontal drilling but Gulf was not
622 willing to go ahead with that and that actually was a story on its own, I guess, there was more than
623 one source of ideas on horizontal drilling and we were disappointed that we didn't go ahead but
624 then, as I mentioned, AOSTRA finally, with the help of Gerry Stevenson made the decision to build
625 the Underground Test Facility.



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- 626 BB: I wonder if that...was that the property that eventually became the **Surmelin** Project?
- 627 BOWMAN: Yes.
- 628 BB: Yeah. Interesting the way these things connect eventually.
- 629 BOWMAN: I don't think we've listed in here the companies that might have joined at different
630 stages; I'll put that aside for the moment then.
- 631 BB: But Imperial was not part of?
- 632 BOWMAN: Imperial was never part of, formally part of the field project that was done with
633 AOSTRA. It was the only one of the multi-nationals and I think their emphasis was on one deposit
634 only and that was the Cold Lake, however, they were a participant in the Syncrude Project all along,
635 but that Project we started long before AOSTRA, so.
- 636 BB: The, well I guess Cold Lake, the geology is a little different, so I cyclical steam was practical
637 there.
- 638 BOWMAN: It had a chance of working there, there bitumen viscosity, the API was a little higher, a
639 10 or 11 degree API, so it was a little easier.
- 640 BB: Well now they've modified with the horizontal.
- 641 BOWMAN: Yes, they've incorporated that, so.
- 642 BB: Now were there any other, first of all, bit personalities during...did you run into Erdal at some
643 point in there? Yildirim?
- 644 BOWMAN: I know of him and I've met him, I don't have...
- 645 BB: Because he was City Service and then Exxon, the 90's became very prominent in the research
646 side.
- 647 BOWMAN: Well see that was...I had left then; I was retired, many times...
- 648 BB: So-called retired. Who were some of the personalities that were kind of pushing and pulling on
649 research on the 80's?
- 650 BOWMAN: Well I think I've touched on some of them already, K. A. Clarke was way on back, J.
651 Howard Pugh I've mentioned, Frank Sragins; his role was somewhat kind of different the way it
652 worked out. He became the President of Syncrude at the start of the Syncrude when it changed from
653 City Service Athabasca and became Syncrude, the President of that was Frank Sragins and, Frank
654 was the one that kept the four companies involved in that Project alive, Atlantic Richfield was the



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655 first company, I think, that dropped out and there was a juggling for a position and that's story in
656 itself, the Alberta Government eventually took a piece of that to keep it alive. But Frank Spragins
657 and his belief in the vision of the oil sands was the only thing that kept that Syncrude Project intact
658 in the 60's and one thing that was remarkable to me, he was the first that developed, a really a
659 concept that was many other products that could be produced from the oil sands and he had a chart
660 in his office of all the organic and inorganic products that could be made from the tar sands and the
661 oil sands and there was a huge chart on this wall and he promoted the idea that there could be a
662 major industry based on this. And again, 40-50 years later we're starting to think about this again,
663 sort of in the upgrading side, what other things can we make, should we shipping the raw the
664 bitumen out of the country or should we be upgrading it beyond synthetic crude oil into value added
665 fuel products and chemical products so he was the first one that used to talk about that during this
666 period and we're just now getting back to some of the ideas in his legacy.

667 I mentioned John Bichard, the chemist who did a lot of the early work on the properties of the oil
668 sands, the developer of the sand reduction process, his research work, all the contributions he's
669 made have been pulled together in a book, that the successor to AOSTRA printed or published, my
670 only copy of that I think I left behind and someday I'll try to get one, but it's a great wealth of
671 information for early researchers that are starting out in the oil sands, I mentioned Gerry Stevens
672 already, Roger Butler. In the case of Otto Strauss, he was a university professor in the chemistry
673 department and very much of his career, university professors were adverse to really getting involved
674 in the oil sands, they felt it was not a career path, they couldn't write really sophisticated papers and
675 the chance of getting Nobel Prizes, etc., it was a dirty material, hard to work with, and not the kind
676 of thing that a university professor liked to work on, so it was very difficult to get university people
677 involved in the oil sands and in the case of Otto Strauss, he was one that got involved early in it and
678 spent his career and has written hundreds of papers, that again are definitive papers on the various
679 aspects of the oil sands and I guess that's another contribution of AOSTRA, that if you look
680 through the literature, the number of university professors that got their start through being an
681 AOSTRA Professorship or being a lead researcher on various university projects focused on the oil
682 sands.

683 BB: One of the people on our list is Marissa Dusseau.

684 BOWMAN: Marissa Dusseau...

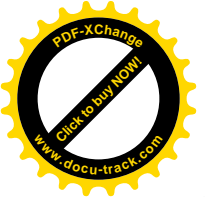
685 BB: Hundreds of papers.

686 BOWMAN: He's written a lot, he was an AOSTRA Professor, sponsored professor, I'm sure he was
687 in his career and I'm pretty sure...I maybe have to check on that, but he got connected to the oil
688 sands.

689 BB: Yeah, I'm interviewing him next month. Now going back to Spragins for a minute, he was also
690 a visionary in other ways, everything from the involvement of the aboriginals to the team concept
691 industrial organization...that whole philosophy that became Syncrude and making it this flow-



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692 through joint venture where the four companies each participated, or well, now ultimately there's
693 eight or ten, I was just wondering if you had any dealings with him on these more philosophical,
694 managerial kinds of things?

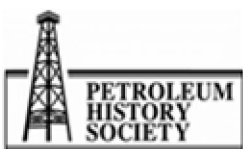
695 BOWMAN: All the things that you've mentioned were apart of Frank Spragins and the team he had
696 working for him so dedicated to all the principles he had, and he saw the importance of the oil sands
697 to Canada and to the region and so took a strong interest in the research work we were doing and its
698 impact, so the things that you've mentioned were part of Frank Spragins and the vision that he left.

699 BB: It must have been for those of you that are sort of, in the industry or sharing the vision, it must
700 have been something that the February 1975, when it looked like Syncrude might not happen and
701 then they had the Winnipeg Agreement and all that, do you remember what that was like, were you
702 just sort of watching the news and reading the newspapers.

703 BOWMAN: Yeah, I was watching...I wasn't part of that at that stage because I was still back with
704 Imperial in the '73, '74 until '75 and then I got involved on the in situ side with AOSTRA, but I
705 followed it in the paper and it was a great relief to me when the pieces finally came together and it
706 was kind of a Canadian pulling together of something that was something that was at risk and its
707 amazing that it happened and I don't know who gets the credit for this, I know the Alberta
708 Government certainly gets some, for picking up an equity piece and the Federal Government also, I
709 think, deserves some credit but it's one of the few times when Canada has rallied around and made a
710 big project happen. Something I've been doing in the last year or two, I've been looking at the
711 characteristics of the big projects that Canada has had, what were the characteristics? Going back to
712 the Rito Canales, and St. Lawrence Seaway, and Trans-Canada Airways, and there's ten or eleven big
713 projects that Canada has had in its history and every one of them has got a story line of almost not
714 happening and usually one person came along as a visionary and made it happen. C. D. Howe is one,
715 involved in two or three of these. And it's amazing to me how one single individual can galvanize
716 sort of action to change the nature of Canada. And Frank was one of those people and the Syncrude
717 Project was one that took a lot of pulling together.

718 BB: Now going back to AOSTRA and these SAGD projects, which ones...how did they fit together,
719 what ultimately came of out that? They weren't all equally successful I assume?

720 BOWMAN: No, in fact, the first five projects that AOSTRA picked were ones that industry
721 believed in but themselves, the risk was too high. In the case of Gulf Project, it was underground
722 combustion and all the engineering people had said that if this would work, this would be the most
723 energy efficient and so it was the most logical, someone had to get in the field and do that. That was
724 the riskiest one of them all probably and yet it seemed to be the one that if AOSTRA had a role to
725 play, it had to bring this to fruition and my understanding of... and I'll tell you what, that was the
726 coldest winter that we had, up at Gregor Lake, trying to get that steam into the ground, pardon me,
727 the air in the ground and get that that heat flowing. I guess it really failed as a commercial project,
728 and I'm not sure my understanding is complete but one of the critical issues that wasn't foreseen is
729 that you can't get that much combustion gases into the formation without doing some damage, its



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730 not like steam, you put steam in, the steam condenses, so you can get a little bit of water without
731 running into difficult, but the sharing of the casings in the underground combustion thing was
732 serious, the combustion gases, the volume of them were such that the ground shifted and the
733 casings for the injection wells cracked and broke and so it was an engineering issue that was pretty
734 serious, now people still talk about going in now with combustion processes and there's a lot of
735 learning from this one, so I guess as a project you would have to say, this did not work, we found
736 out it did not work, was the success of it. And then the Shell Peace River Project, it had a different
737 kind of concept, there was an under...at the base of the oil sand was a water layer that was horizontal
738 water layer that was fairly permeable and the idea of if we could inject steam into it, we could get
739 sort of a horizontal movement of steam, something like a horizontal well effect and that was the
740 concept behind the Shell Project, making use of a specific underground geological characteristic and
741 again, I'm way of out of date now, Shell's still up there and I don't know how much the technologies
742 evolved from that period, but I think that was a moderately successful project.

743 Certainly, Roger Butler's SAGD concept of horizontal wells was probably the singular achievement
744 of AOSTRA but again, as I've mentioned, I think one of the achievements of AOSTRA is to get
745 university industry and government working together tackling these issues in a very effective way
746 and if you look at what happened with AOSTRA, it got, when it's...I guess I was originally told by
747 the Premier that he saw this as a five year project and as soon as we got started, we saw it was a ten
748 year project and I stayed for the full ten years and I would've stayed longer if Imperial hadn't gotten
749 back. I had a feeling that our major role was over at that time, we had project working in each of the
750 deposits, some were more successful than others, we got the university industry and government
751 working on a team basis that had to an extent, it hadn't before, so I could've accepted the argument
752 and maybe I made the argument that our job was largely over, it didn't take five years, we were
753 slower than we were supposed to, it took ten years.

754 Well what happened to AOSTRA after that, they merged back in as department of the government,
755 of the energy department and the name of it at that point, I'm trying to think..., and then it evolved
756 into the Alberta Research Institute, ARI, which existed up until this last reorganization and its now
757 Alberta Innovates, energy environment solutions, with many of the same people, it's now headed up
758 by Eddy Isaacs who was part of the research council team that sponsored by AOSTRA back in the
759 70's and my concern is that as it evolved out of AOSTRA into a department of government and
760 then as kind of a research focused entity and now back into something that has some of the
761 semblances of AOSTRA but without the independence and without the money but with many of
762 the hopes that AOSTRA sort of has, its coming closer to being a vehicle that can move the industry
763 ahead, but its missing those two components, the independence and the money.

764 I've been working with Eddy Isaacs on their 20-year plan and this is using the appropriate system
765 where we've developed 2020 and 2030 Alberta Energy goals and measuring performance toward
766 these on an annual basis and I'll give my own impression of what's happened is that we started
767 doing this with the group ARI and now with the new group since 2003 and they've made annual
768 progress that we've measured with an appropriate system, they've made, what I would expect a
769 reasonable progress each year, they've now reached the point that I think they're stalled to make the



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770 next step, they need to get into the field, they need to get into some field demonstration projects and
771 their level of dependency and their financial capability, I don't see any hope that they can move the
772 next step at what I sort of call, crossing the chasm to get into commercialization, they don't have the
773 ability AOSTRA did to actually get these things across the chasm into commercial demonstration
774 but they've got the goals and they've got the people and they've got the government commitment to
775 these goals, and yet?

776 BB: Now when you talk about the challenges and goals, there's...well I always divide these things up
777 in to the economic, environmental and social aspects, and you know, initially the challenge was the
778 economic one to make the numbers work.

779 BOWMAN: Yes.

780 BB: And to extract, and I guess from the Province's point of view, to recover the resources, you
781 know, you mentioned the 80% from a Calgary...

782 BOWMAN: From a conservation respect.

783 BB: And certainly we've come a long way in that but then now we have these environmental
784 challenges, the CO₂, the tailings, the one that I always wonder about is the minerals and things that
785 are not being recovered at the moment that are in those tailings and in the ore, people have tried
786 that? Did you support any of that work?

787 BOWMAN: Yes, zirconium, titanium, the heavy metals in the...

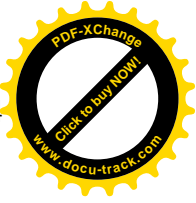
788 BB: Yeah.

789 BOWMAN: We tried so hard on that, and that was a key part of Frank Spragins chart and there's
790 been some attempt at getting these out. Again, I personally feel you can't do these as individual, one-
791 company, initiatives, you can't expect a company to come in, okay we'll get the zirconium out or the
792 titanium out and expect to set that up that as a commercial venture, somehow it's got to be a
793 collective vision here. Once the process is in place, once the materials are in flow, once the tailings
794 are moving out, once the heavy metals are in the froth, once you've paid for all a lot of the material
795 handling, it should be then possible to put a process in place to do something with the minerals and
796 some of the by-products, it's got to be integrated in the total plan, it can't be a stand-alone little
797 piece and that's what we've done up until now, it's got a be... Canada has to say, this is the resources
798 that's the under pinning of our belief that we can be a energy superpower, we can make the wealth
799 for the country that would generate the social programs we'd like to have in the future and its going
800 to take a national commitment to do this and each piece of it has to fit in and it the same problem
801 on the upgrading side now.

802 I had chance to meet some of the companies who are thinking about the upgrading of the bitumen
803 and one of the statements was made to me, that none of the multinational companies will ever build
804 an upgrader in Canada period. Actually, it's not a period, there's a comma, there's an implied comma



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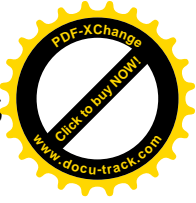
805 in there, that none of the companies of the multi-national companies will build an upgrader in
806 Canada, unless...and it's interesting what the "unless" might be, at the same...the day after I heard
807 this statement I just mentioned, I attended a breakfast that was hosted by the Edmonton Chamber
808 of Commerce, one of the speakers of that was Peter Lougheed, Peter Lougheed made the comment
809 and I think it was a blunt as this, that if he was in power, there would never be a permit granted on
810 the oil sands that did not include an upgrader. So the comma is, that there has to be some other kind
811 of national plan where the economics are not an individual companies' economics which and
812 individual company will always say, well if we can pipeline this bitumen to our refinery in the States
813 that's already got...we've already paid to have a capability of upgrading this, it's cheaper for us to do
814 that...those individual decisions are the drivers, then we'll never get the collective wealth out of this
815 resource.

816 The government has to say that the socio-economic benefits to Canada to not being hewer of wood
817 in a drawer of water this time, but to extract the full value out of this resource, that the government
818 has to be involved in this and we have to share that risk the same way it shared with the Syncrude
819 Project. We can now change your individual company economics by sharing that risk and by our
820 taking a piece of the action here and in this, let's do the heavy metals, let's do the upgrading to petro
821 chemicals, let's see what we can do with the clays to upgrade them. That's the situation that we're in
822 and it's the single company economic, just as an aside, it's the single company economics that have
823 driven us to build electrical transmission lines to the U.S. north and south and so we can move
824 electricity east-west across the country, why, because single company economics say we can sell the
825 next block of electricity to a grid in the States, it's cheaper, and it's always true, I mean the
826 economics are right. But the socioeconomics to Canada about building the whole industrial
827 infrastructure and having the jobs and the wealth that's generated from it are missed in these single
828 company economics. So I think when you bring up the by-products and what not, why haven't we
829 done that, I think the economics are wrong.

830 I mean they're correct from a company standpoint, but from a country standpoint their wrong,
831 because they don't bring in the socio, they don't bring in the environment, they don't bring the other
832 issues you refer to. And the only thing I'm left to do now in the oil sands, is to set, have one last
833 crack at this thing and that's my...I made a list of my involvement in the oil sands, you kind of talked
834 about all of them and I've only alluded to this last one, we've finally have got the Alberta Industrial
835 Heartland which I think of a part of a corridor, industrial cluster in Alberta, from the oil sands to the
836 Alberta Industrial Heartland, to the Devon Golden, Bio-Mile and down to Red Deer, there's an
837 industrial corridor here that's fantastic. The Sarnia-Lambton, where the oil industry started has got a
838 great history here, what did in the last war with the polymer, making synthetic rubber and all the
839 connections it had in the upgrading area. Sarnia-Lambton Petrochemical & Refining Complex, it's
840 an industrial powerhouse, so what I've concluded in the work I've been doing with the Canadian
841 Academy of Engineering, I'm on my soapbox now, is that if these two energy corridors don't team
842 together and really work effectively, the idea of Canada being an environmentally superpower won't
843 happen.



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844 So I've thrown this idea out in the last month or two, and through a lady, Sandra Elaine McCoy,
845 who I met perchance in Montreal at the World Energy Congress last September, I told her about
846 this idea, she said well I like that idea, let's team up on it, so with her help, we now have got, and it
847 was announced last week in the newsletter of the Alberta Industrial Heartland and also announced
848 in a newsletter out of the Sarnia-Lambton Economic Partnership, well maybe it was...it came out
849 yesterday, I don't know, the Alberta Industrial Heartland and the Sarnia complex here and the single
850 project they've highlighted is the upgrading of hydro-carbon and biomass feed stocks and the
851 strange thing it was Alberta that was most insistent on biomass being part of it. So we've got
852 hydrocarbon feed stocks from the oil sands and other places, we've got the biomass feed stocks,
853 maybe there's opportunities in co-processing these in some way for the value of Canada.

854 So we're going to put together a team and we're asking for something like AOSTRA support, one
855 half from government and one half from industry to develop the next technology for upgrading our
856 resources in Canada to value added, moving up much higher in the value chain, way beyond
857 synthetic crude oil in this case and that's a project that's got legs and it's my last project, and when
858 I'm through this one, I'm out of oil sands, my last attempt.

859 BB: Let's go back for a second, on the mineral side, now the solvent extraction method was
860 supposed to have the potential for getting more of the minerals out and I remember a little company
861 called Solvex that actually started building a project...did you have any observations or involvement
862 in that chain of events?

863 BOWMAN: It was after AOSTRA period, I know who they are and I think it should be tested in my
864 belief. It's the kind of thing that now deserves to be tested and it's got the same kind of barriers that
865 we faced with the **Umetech**, the dry thing, the economics at that point were not quite right, but
866 things have changed now, so sure.

867 BB: And you mentioned the problem with in situ combustion, now somebody is now doing this toe
868 to heel air injection method, from your understanding does that try to address some of the
869 problems, or build on that previous research?

870 BOWMAN: Yes, I think it does.

871 BB: I think there is some of... I think we have some...

872 [END OF NO. 3]

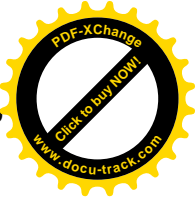
873 BB: Could you go back and tell that Bitumount story again? Your first visit up there with the mayor
874 and...

875 BOWMAN: You have the...

876 BB: We're rolling!



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877 BOWMAN: Well my first visit to Fort McMurray was in 1962 and was to visit the Mildred Lake site
878 with this pilot plant, the sand reduction process and I met Claire Pedon, who was the Mayor of Fort
879 McMurray.

880 BB: Do you remember how that's spelled?

881 BOWMAN: P-E-D-E-N, Claire, C-L-A-I-R-E. And he did project work for the Syncrude site but
882 was also mayor and one his assignment was to take provisions up to the Bitumount Plant, north of
883 Fort McMurray, where the site of the demonstration plant that the Alberta Government constructed
884 in the 1948 to '52 period. That site was supervised, care-takered, by a man named Ernie who
885 apparently had some connection with British Royalty, which I have forgotten, so Claire Peden went
886 by boat and took myself and two colleagues up to the Bitumount Plant, which is a major historical
887 site in the oil sands and we took provisions up to this Ernie, who served us a nice meal, bacon and
888 eggs and we toured the site and saw the old tumblers and screw conveyers and separating vessels,
889 like visiting a bit of history and that was trip that I've never forgotten and its just one example of the
890 many, many remains of devices and equipment that's made its way north into that region,
891 entrepreneurs and explorers trying to solve the mystery of the oil sands.

892 BB: Now you mention that Bitumount was quite significant in the evolution, what was...how do you
893 get from all the failures, to Bitumount, to commercialization?

894 BOWMAN: 1948 was a crucial year, the oil sands had hit a wall at that point, there were disastrous
895 fires in the previous, during the war, of different approaches, largely sponsored by the Federal
896 Government in developing processes for recovering oil from the oil sands, none of those processes
897 were based on the Clarke Hot Water Process, there were other routes that were taken, these were
898 not successful processes and as I said, at least one of them, maybe more ended in fires. So the
899 industry looking at the industry, looking at their potential at this stage, it looked pretty dismal, all the
900 attempts that had been made for commercial projects had failed. The Alberta Government and it
901 was mainly Premier Ernest Manning who decided that something needed to be done, so they
902 decided they would have to invest and build a demonstration plant based on the hot water process
903 that K. A. Clarke had developed and they'd do that by building a plant, a demo plant at Bitumount
904 and it took a couple of years, two or three years to build and test and the test was considered to be
905 quite successful and the Alberta Government were so pleased with this effort, that I understand the
906 entire legislature visited the plant at one stage.

907 The government hired Syndey Blaire to do an economic assessment of the project, and this was a
908 very detailed assessment, it's worth reading today, very carefully done and the language used was
909 carefully prepared and Blaire concluded that the oil sands could be developed economically under
910 current conditions, at current market values and his actual words, if I have a chance to look at some
911 crib sheets here on my list of what happened when the oil sands hit walls during various time
912 periods, Syndey Blaire stated that the oil sands were commercially viable source of crude oil, that
913 could compete on the world market, that's a quote from his report, and as I said, it was a very
914 cautiously stated, it wasn't overly stated, it was the oil sands weren't ready, and of course, nothing



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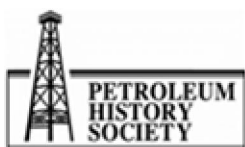
915 happened until 1967 to move this further ahead, but that was a monumental decision on the Alberta
916 Government to build a plant and themselves to demonstrate it, and to me, it's something like the
917 decision that government made with AOSTRA to build the underground test facility to show that
918 the in situ development could be done through techniques of the horizontal wells, which speaks to
919 the role of government, important role of government.

920 BB: Then there's the...the other thing, of course, is the role of technology and today, I guess we
921 would say that the two critical ones over the last twenty, thirty years, were horizontal drilling and the
922 very large trucks and well, I think Newell also would say, hydro-transport. In the absence of those
923 technologies it was kind of amazing the concepts could all develop and sort of be in place when the
924 technologies came along to make them possible and that goes back to what you were saying before,
925 what companies won't commit until their particular approach will be economic, whereas
926 government or collectively they can take chances on something that might or might not work.

927 BOWMAN: I think that's right, I think when the governments can get involved and then timing is
928 not, the timing doesn't have to be perfect, for a company to move, it's got to have a case to take it to
929 its board; that now is the time. We've got six different investments we can make, this is the one
930 that's...you warned me about this, this is the one that is right for us, now, we're maybe a society in
931 total, its needs to take...time is not maybe is critical, technology may not ready right on time, but if
932 the vision is right, then maybe we can get the pieces to come together eventually, so the Bitumount
933 Project, '52, '62, it was built 15 years too soon in one sense. But maybe it took industry 15 years to
934 contemplate it, and then it had to wait for the visionary to come along and that was J. Howard Pugh,
935 no technology had yet been proven at a commercial scale, the Bitumount one had been done at a
936 semi-commercial scale, so I think he...I don't hear his name mentioned very often, but to me, this is
937 the key point that was made in 1967, his commitment that really made the industry move ahead and
938 the other pieces fell in place, the Frank Spragins, Eric Newell, Jim Carter and all the others that were
939 involved.

940 BB: Now I know its jumping around a whole lot, but could you tell me about your pro-grid and your
941 most recent work and how it fits in together, what is pro-grid?

942 BOWMAN: Pro-grid is an evaluation methodology, as a decision-making, a decision assist
943 methodology that is based on intangibles and what's behind this is that when I look at most of the
944 decisions that AOSTRA made and the decisions that I've made, in my personal life, they're all based
945 on intangibles, not on bricks and mortars, they're not things that accountants like to deal with, so if
946 this is true, than how can we evaluate things that are hard to put numbers on but are more
947 important than the numbers and this led to the concept of pro-grid and, it arose out of AOSTRA in
948 one sense, in that, in AOSTRA we were looking for, what are the two over-arching criteria that
949 we're going to use to make decisions on what projects to support and we decided early that first of
950 all, it had to be based on good engineering and good science and if it wasn't credible, if engineers
951 and scientists would not see this as a credible approach, that would have the chance of working, that
952 that was one major criteria. The other is that had to have a clear cut business application, it had to fit
953 the geology and the economics had to be reasonably sound. So it had to have a good commercial



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954 interest and a good science backing. So once I left AO STRA, I used to think about well how did we
955 make decision at the board, well I thought, first of all we had to have these two principles, and then
956 I realized what was behind those decision were many intangible factors, the quality of the people
957 that are working on it, the business team and the likelihood that there would be an industrial
958 receptor and generally the state of the technology at that time, so out of this, I developed kind of a
959 consulting practice, that were based upon evaluating decisions on which there were two over-arching
960 objectives and the over-arching objectives I found were largely intentioned and competing and then
961 there were supporting factors that largely could not be quantified, could you develop a language
962 scale, we call language ladders, that would measure the progress, the quality of these intangible
963 factors.

964 And I knew there were a lot of evaluation systems in the literature that were based on numbers, on a
965 scale of one to five, one is good and five is bad, or vice versa, or a ten-point scale, but these didn't
966 have any language behind them that different reviewers could use, so we developed a language scale
967 and see if I can give an example, say on an intellectual property, the lowest scale could be the ideal
968 looks as if it could be patented but nothing had been done, the next level up a patent application has
969 been submitted to a patent office, and the third level would be the patent had been granted, and the
970 fourth level is the patent had been granted and put into practice and the results have been confirmed
971 by independent investigators.

972 Or another one might be, the case of the commercial attractiveness of a project, the first level might
973 be the process has been tested on a laboratory scale, and the next level might be, it's been verified by
974 independent investigators and the next level would be, it's been put into commercial practice and
975 commercial trial where products have been produced, next level might be, customers have bought it
976 and are willing to pay market price, something along this time. So its language, one example of this
977 is...I've lost the phrase, it will come to me in a minute, the man that developed the wind scale,
978 Admiral... back in the 1880's where he developed language to decide whether it was safe for ships to
979 go out to sea and the lowest level would be the wind rustles trees, or smoke rises, and then it goes
980 up hurricane forces.

981 BB: I know the one you mean.

982 BOWMAN: Oh, so close to my tongue, but in any event, there's a lot of attempts to use language to
983 measure things that are not tangible, so that's how pro-grid was developed and its now being used
984 by many, many Canadian intensive organizations, the Canada Foundation for Innovation uses it to
985 evaluate infrastructure investments for universities and hospitals and they have put several billion
986 dollars of investments in place and they have two over-arching objectives and they only have about
987 four or five supporting objectives, so they're not looking for...they're only looking for a few things
988 as their decision tool approach. I was also struck in the early days of Pro-grid, of seeing a book I'd
989 read, called the, "The Power of the 4x4 Matrix", by Alex Lowey, and he investigated, he and his
990 colleague investigated 50 decisions that are made in industry, in life and in general and he noted
991 they're almost all determined by two over-arching objectives where there is only two things that
992 they're really attempting to do and if you can get through and understand what those two objectives



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993 are, then everything, almost everything else kind of falls in place. So we've had venture capitalists
994 make use of this, we've had charitable foundations use this as an assist in making decisions and I
995 think we've had a book written on this called, "Intangibles", and in this we describe a dozen or so
996 case studies of big decision which are made and which the Pro-grid system had been of use, so we
997 did make use of this in evaluating a science strategy for Canada, done by the Canadian Academy of
998 Engineering, in which we took a look at 27 different energy strategies for Canada, or components
999 for strategies and we used the Pro-grid system to evaluate the maturity of them, and not only are we
1000 able to develop where they are on a chart of two over-arching objectives, a grid, we can also indicate
1001 what has to be done to move further up the chart, so not only does it measure the current position
1002 you're in when you're making a decision, but you can then track performance forward and although
1003 this grew out of the AOSTRA experience, I think the actual application of this, to technology and
1004 intensive purposes, was really honed up by a suite of Canadian Technology managers from Spire
1005 Aerospace and from Dupont and Imperial Oil and a number of other technology managers, have
1006 got behind this and have now honed it, so it's a simple approach, it cuts out a lot of things that
1007 aren't important in making a decision, but it also provides a paper trail, so once the decision is made,
1008 you can see why and what the reasons for it were.

1009 BB: That's the Beaufort scale, the wind...I'm pretty sure.

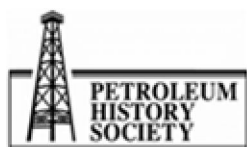
1010 BOWMAN: Beaufort Scale. Admiral Beaufort. Beaufort is it, absolutely, good for you!

1011 BB: I do cross-word puzzles! Fascinating trying to keep somewhat on topic, so in a way, this is kind
1012 of an intellectual product of the oil sands work as well as the, all the you know, the hardware and oil.

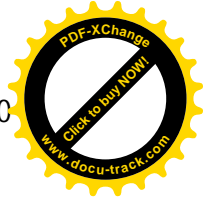
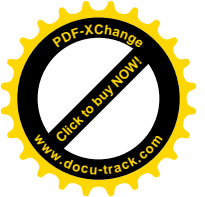
1013 BOWMAN: It's a bit of the intellectual under-pinning and its used as I mentioned, with Alberta
1014 Innovates, the energy and environment solutions, it's used to track their progress from where they
1015 were in 2003 and charting where they hope to be in 2020 and 2030, so its tracking the sort of energy
1016 plan, and their criteria was selected for this particular purpose and they evaluate the impact on the
1017 environment, the economic impact, the environment, the enablers are things that they need to do to
1018 make it happen, they measure the management competence of both the government and industry
1019 and they measure the quality of the partners that are involved in the projects, and they measure the
1020 quality of the strategy the government has set, the environmental strategy, the water strategy, the
1021 energy strategy, all these components that the government talks about are embedded in what's called
1022 the evaluation matrix, and in there, the matrix, there's a flow from the inputs they have, the monies
1023 they have and the ideas they have to the impacts they want to have, and in the middle, are the
1024 enablers, the things that enable them to achieve or convert inputs to impacts.

1025 BB: Now we've talked about quite a few of the notable people you've encountered, did you have
1026 much direct viewing with Peter Lougheed or Don Getty?

1027 BOWMAN: I had quite a bit with both of those people, Peter Lougheed, soon after I joined
1028 AOSTRA, had me into his office and said the following, he said, that this door is open if at any
1029 point in your work you find a barrier to achieving your goals of AOSTRA I want you to come to



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1030 your office, well I never did on my own, I was summoned a few times for different reasons, as I
1031 mentioned the one time, when it was clear that we needed more than the \$100 million dollars,
1032 actually Alberta had a dinner for me two years ago in Calgary and one in Edmonton and I guess this
1033 was to reflect a little bit on my role on the oil sands and it was right after that I had received another
1034 unexpectedly this Global Energy International Prize, that Russian President Demetri Medvedev
1035 awarded me, so the Government of Alberta thought they should...it was really based on my work on
1036 the oil sands, the Alberta Government thought they would kind of have a dinner, they would invite
1037 that hadn't worked with me in my career, and Peter Lougheed attended the dinner and gave a little
1038 talk about his early experience with me, which was interesting and certainly, I've been impressed
1039 with his continued interest in the oil sands, and what he's now doing, just in speaking behind the
1040 scene.

1041 Don Getty was one of the Energy Minister's I worked for and I found Don Getty to be an
1042 inspirational leader and very different view of him of then you would sometimes would read in the
1043 press, he knew what AOSTRA was doing, he would bring people to talk to AOSTRA where there
1044 was a worthwhile interaction, and he had made sure that the committees that he had, that had the
1045 best advice they could from AOSTRA and had me over to make presentations as needed and when
1046 he became Premier, I felt the same sort of relationship with him that was, I thought his judgments
1047 were extremely good.

1048 BB: Did you get drawn into any of the fighting that goes on within government, the bureaucratic
1049 wars, Alberta's kind of notorious for them, but maybe you were arm's length?

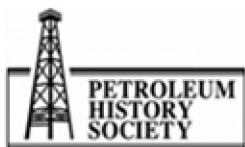
1050 BOWMAN: At one stage Alberta and the Federal Government were at odds, obviously, with the
1051 National Energy Program, which was later than my period, because that was at the end of my
1052 period, the National Energy Program, prior to that, during the 70's there was a lot of interaction on
1053 the technology end, between Alberta and the Federal Government, in fact, we had a program
1054 ACERF Program, Alberta...

1055 BB: Alberta Canada?

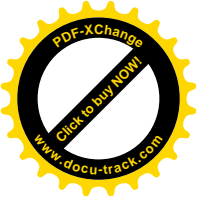
1056 BOWMAN: Yeah, Alberta Canada Energy Research Fund and, see what period when that was? That
1057 was using monies from one of the federal taxes that was put on oil and it was put into a research
1058 fund, and there was a joint committee of Alberta and Federal Government people on it, that were
1059 choosing projects to support, research projects, technology projects to support and that was a very
1060 effective interaction of Alberta and the Federal Government, so any reaction that I had at that time
1061 was, whatever the fighting was at a higher level, I was below it, the shots were going overhead, I
1062 wasn't part of it.

1063 BB: Is that when they set up the lab in Devon? The Canmet?

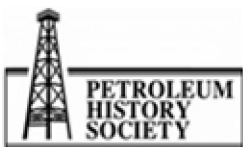
1064 BOWMAN: It was set up during that period as part of, I think as part of the money that came out
1065 of this fund, yes, set up that Devon lab.



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- 1066 BB: And did they mainly look at the upgrading side?
- 1067 BOWMAN: It was upgrading, almost largely upgrading, coal upgrading and bitumen upgrading.
- 1068 BB: Yeah, I visited there, but it was during one of those periods when they weren't doing a lot. Nice
1069 lab though. What about the role of organizations and associations, whether it was CAP, OPEGA or
1070 any of those, and maybe it was after your time when there was the Conrad, the resource partnership?
- 1071 BOWMAN: I think there were a lot of organizations that were supportive of the oil sands and one
1072 of the credits of Canada, it seems to be able to generate a civilian type of organizational system that
1073 supports the country, like the ERCB, it was very successful in its standards and conservation were
1074 world famous and I think the Conrad was an attempt for the oil companies to team together to
1075 develop some shared technology and so I think there's a lot of examples where we've been able to
1076 put together collectives that have been constructive. I think the way that AOSTRA and these
1077 successor organizations have continued to work with industry have been good and you don't see
1078 these kinds of mechanisms in other countries as highly developed as we've got.
- 1079 I mentioned that I'd been involved with a Canadian Academy of Engineering over the last five years
1080 and it's taken a strong interest in working...looking at the interface between government and
1081 industry and what kind of projects Canada should do and I think CAP and the other industry
1082 associations, they all have technology or arms to them, so I think although they have an agenda in
1083 mind, the organization was set up for a purpose, I think they're pretty good at contributing to the
1084 Canadian scene of industry and its development and the social impact of them.
- 1085 BB: Now you've mentioned a couple of technologies that could have taken off the Taciuk and the
1086 Ritter, were there any others that come to mind? Or things that looked like dead ends at the time,
1087 but may...
- 1088 BOWMAN: I think the various approaches that people have talked about on the in situ side, using
1089 solvents, solvent plus steam, they were all kind of dead ended back in the AOSTRA days because of
1090 economics, but work is still going on and companies are doing test work in the field right now, so I
1091 think the air and the water problems are solvable and... on the tailings side, Fred Camp indicated
1092 might be a serious enduring problem on the oil sands and it has been, the recent advancement of
1093 Suncor on the Trio Process looks very, very impressive and they've been able to reclaim land, the
1094 tailings much faster, they're adding a flocculent, and that concept was well-tested by AOSTRA, but
1095 the time is ripe now to do it and Suncor has got an approach that involves some very strategic and
1096 neat ways of handling and treating the tailings and getting the water to be released from the clays
1097 very quickly and have made a major advance, so I think there are changes that are happening as we
1098 speak that's going to solve one of the major problems on the mining, which is tailings, and I think
1099 Alberta Innovates has got a suite of ideas that need to be tested, so I think a lot of the problems that
1100 are now have been identified publicly, there's processes in place to resolve them and of course, these
1101 are not, the solutions are not the first thing that the media pick up. It's the problems that the media
1102 generally want to emphasize and I guess I'm glad of that too.



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1103 BB: What about on CO₂?

1104 BOWMAN: CO₂ is the tougher one for the oil sands because of the distributed nature, the in situ
1105 people have been able to make some progress here by using less steam and so there's less release of
1106 carbon dioxide from the production of steam, so they've made a quantified improvement in the
1107 production of carbon dioxide. In the upgrading side, I think there are huge opportunities to make
1108 improvements here. I personally believe that one of the answers, it's on the coal and use it aside of
1109 gasification process, the concept of gasification of heavy materials almost every book I've ready by
1110 extreme environmentalists, Kim Flannery and George Monbiot and many others who are very
1111 strong advocates that we have to reduce the carbon dioxide dramatically, in their writings also say
1112 that, the fossil fuel people not a way out of the problem but a technology that would really, in a
1113 major way, help their cause and that's gasification and in the full case of gasification with oxygen,
1114 really taking a coal or heavy resid or a bitumen, reacting it with steam and a small amount of pure
1115 oxygen, this process produces hydrogen, a concentrated stream of carbon dioxide and electricity.

1116 It's much easier to recover that small amount of carbon dioxide without the nitrogen in it and store
1117 it and the hydrogen could be used as the source of hydrogen for upgrading the bitumen rather than
1118 using natural gas. So there are ways of using a systems approach which will involve some integration
1119 in our various energy sources, such as coal and resids and the oil sands, in a way that reduces
1120 dramatically the amount of carbon dioxide that's released and also provides an alternative source of
1121 hydrogen as opposed to using natural gas. So I think the future, we will be looking for these
1122 integrated systems approach to managing our resources that will be the way that the carbon dioxide
1123 issue is handled.

1124 BB: And once you've got that concentrated stream, you can use it for enhanced recovery or...

1125 BOWMAN: Yes, or geological storage.

1126 BB: CC?...

1127 BOWMAN: CC?

1128 BB: Have you had any incidents of bad press or sort of, media encounters that you recall?

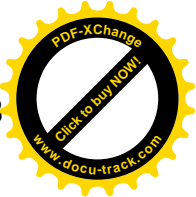
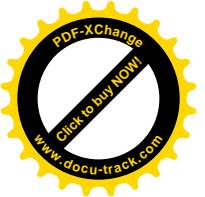
1129 BOWMAN: Oh I have had none I think in my experience; I think the media has been very fair, very
1130 accurate and also understanding. Do you remember Martin Keely?

1131 BB: Was he stop?

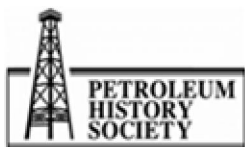
1132 BOWMAN: I think he had something to do with Oil Week at some point, anyway, he was one that
1133 followed AOSTRA at almost every meeting, Martin Keely, I'm sure I have his name right, but he
1134 could be critical, but he could be very fair, but I'm only using him as one example of people that
1135 followed AOSTRA, I've never heard of any criticism, I would have no criticism that I've been
1136 involved with.



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- 1137 BB: You're one of the fortunate few apparently. Now you mentioned the person in Edmonton that
1138 we should try to interview?
- 1139 BOWMAN: Ron Gray...
- 1140 BB: A-Y or E-Y?
- 1141 BOWMAN: Isn't that terrible?
- 1142 BB: Oh that's a tough one.
- 1143 BOWMAN: A-Y. He came from Royalite and was one of the first technical people involved in what
1144 I would call the Syncrude Project and it evolved from Royalite to become City Service Athabasca
1145 and Ron Gray, who lives in Edmonton was one of the first people involved and was a senior person
1146 in Syncrude, and would be a worthwhile talk about that earlier period, 1957 to '62.
- 1147 BB: At that point it really looks like the mega project, that it might go ahead, right away in the 60's.
- 1148 BOWMAN: Oh yeah, it was going full bore at that point. Mildred Lake Pilot Plant was a big effort
1149 and they were going to build a plant immediately on that and...
- 1150 BB: About this Russian prize, how did that come about, the Global Energy International Prize?
- 1151 BOWMAN: Well I got a call one day, I was in Florida and I got a call one day from the former
1152 Ambassador to Sweden, the Canadian Ambassador of Sweden, and he said that someone in Sweden
1153 is trying to contact me and wanted an email address, so he made the link with a guy in Sweden, a
1154 scientist in Sweden and when contacted me he said that he had heard me speak about the oil sands
1155 in Canada at a meeting and he was involved on the committee for the Global Energy International
1156 Prize and he wanted to put my name up as a nominee for the prize and needed some, he had certain
1157 information that he'd gathered, but there was some holes in it and wanted me to supply some holes
1158 and I knew nothing about the Global Energy International Prize at all, and so I sent some
1159 information to him and he said the Prize Committee was meeting on April 16, 2008, so I thought
1160 nothing more of it.
- 1161 And then on April 16th whatever it was, I got a call from a lady that could speak English but was
1162 clearly not a Canadian, English-speaking person and I got the message saying that I'd been selected
1163 for this prize and she said it's a \$1.3 million dollar prize that I was sharing with two other people,
1164 and of course, it got my attention and I learned a bit later that this is a prize that had been started in
1165 2002 in Russia, a number of oil companies in Russia established it to be what they called the Nobel
1166 Prize in Energy, because they didn't think that in the Nobel Prize system there was attention that
1167 things that were more commercial, there was more scientific advances, so they established a prize
1168 that was equivalent to the size to a Nobel Prize and this was the sixth year it had been awarded or
1169 something like that, well I learned then, two things that in order to get the money, I had to appear



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1170 and I had to give a talk on oil sands, so I actually wrote a paper for that purpose, on oil sands and I
1171 should have brought a copy of it with me.

1172 BB: Well there were a number of things on the website that I trouble getting into and that might
1173 have been one of them.

1174 BOWMAN: Well I should have brought a copy, but anyway, it was the actual presentation I made in
1175 Russia and it was a week that...it was like a fairyland week, I'll tell you, my wife and I went and as
1176 soon as we arrived there was what was called a, someone assigned to us as a handle for that week, a
1177 young girl that spoke perfect English, and a car and a driver and we had a fabulous week, and they
1178 had dinners, the final dinner was in a castle and in each room of the castle they had a different
1179 musical people, harpist and a singer, and we went round and they had a movie in the castle and we
1180 sat and heard a movie, and then they had a dinner and the first course of the dinner was in honour
1181 of Canada and it was pork roast with maple syrup sauce but at the actual presentation itself, the
1182 President was there and I was asked by the people that I had contacted that were the executive
1183 directors of the prize committee said could I say anything at this presentation that would be more
1184 interesting that wasn't just a technical matter and he said they're awfully bored with these people that
1185 got the awards that they just want to talk about technical things, is there anything I could add, and I
1186 said, I could add something, so here's what I would say, so I told him what it would be and he said I
1187 want you to say exactly that.

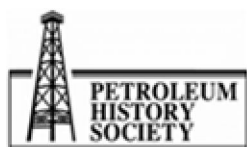
1188 So I got up and I had my so many minutes and I talked about Canadian Oil Sands, the importance
1189 of it and Canada as an energy superpower and all the sort of aspirations we had and then I said, Mr.
1190 President, there's something else I could say about Canada and Russia, there's something more
1191 important than oil and gas and its hockey. And I went back to the 1972 series and I explained all the
1192 excitement of how Russia had come in and done very well, right up until the last game it wasn't
1193 decide, in the last couple of seconds of the last game and I didn't say how it ended but then I said,
1194 two months ago in Quebec City there was the final game for the Canada Cup and Quebec and
1195 Canada were in the finals, and Canada was ahead by two goals going to third period, and I said,
1196 Russia tied it up and won, I can't remember if it was overtime or not, and I said, at that the end of
1197 that game, everybody in Canada stood up, applauded the Russians because Canadians know what
1198 good hockey is like! So anyway, I could see the smile on the Presidents face and the audience, so that
1199 was my contribution to hockey [laughs]!

1200 BB: And World peace [laughs]!

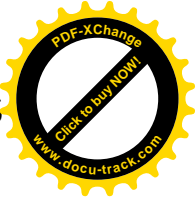
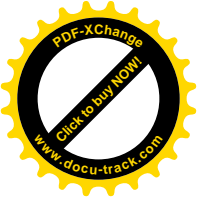
1201 BOWMAN: And World peace [laughs]!

1202 BB: Now you've mentioned a number of people that we might interview, are there any others that
1203 you might not have mentioned yet? By the way we're working right now from a list of about 35 that
1204 we sort of, first round choices, and then as we complete those, we'll develop another 35 and the goal
1205 is eventually to do about 100.

1206 BOWMAN: What will the final product as opposed to physical things and tapes of conversations?



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1207 BB: Okay, well the archive, anything can be in an archive, although they like flat objects. There'll be
1208 the recordings themselves, which these days are digital files, probably stored on DVD's I think, as
1209 well as on hard drives, the transcripts and once this is transcribed, I will attempt to proof it and send
1210 it down to you and if you're patient and you want to go through and proof, you're welcome to and
1211 that's actually very helpful because a lot of time transcriber and I won't know spellings or
1212 misunderstand, although you speak very clearly, so that's a plus. Then we try to do a short summary
1213 of what topics were covered and a short biography of the subject, so that's that file. Then the
1214 Glenbow is continually adding to their petroleum collection which has books, documents and quite
1215 a few of the things like this probably either are there or should be in there and of course, a serious
1216 researcher would have access the Provincial archives and the U of A. So our main purpose for this
1217 project at this time is making sure the primary research is done; that we interview people while
1218 they're still alive.

1219 BOWMAN: It's the best time to do it, isn't it!

1220 BB: Well its one of our great regrets that we don't have Roger Butler on tape, because you know, he
1221 was really a key person in that particular technology. It's interesting, it's a little different from most
1222 of the previous oral histories, there are almost 300 of them, we're with geologist and entrepreneurs
1223 and different kinds of stories, this one is mainly engineers and...

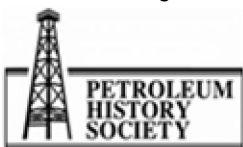
1224 BOWMAN: And people that build things...

1225 BB: And also, not the kind of corporate hero...we don't have that many Jack Gallagher figures, there
1226 much more Karl Clarke figures, people who labour.

1227 BOWMAN: Who were down in the mine, working the hubs. Exactly.

1228 BB: Yeah. So it's a little bit different in that sense, but anyway, that's the purpose is to get that
1229 primary research and to have this human element to go along with whatever documentary history
1230 there is. So I don't know, have we run out of stuff, you've got some more stuff?

1231 BOWMAN: I've got one more little thought process? Not anymore stuff, let me just kind of talk
1232 through this, this idea that I'm working on, which I think I've got it all in here now. But the oil sands
1233 have hit a wall, again, again and again and each time a visionary has led the industry over the wall, so
1234 I've tried to understand what is it that takes and so I've got a list of six visionaries, and we've talked
1235 about them I think, but let me just try to see if I've missed anything, the first wall and you
1236 mentioned this earlier, that there is not light oil silver bullet, people drill to find this source oil and
1237 they didn't find it and so the thought was then, in the 20's we can use this for road payment, we
1238 tried that, and a little problem, when the sun hits it, it softens a little too much. So then we had to
1239 use oil sands as they are, so that's what K. A. Clarke faced and he developed the hot water process
1240 and not only that, he developed what he called six statements that defined the hot water process,
1241 and those statements, if you look them up, have stood the test of time and no other researcher has
1242 said these are not valid and the process is the basis of current surface mining oil sands. And I think
1243 that the thing that intrigues me about him is that he was determined and got limited support in this



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1244 work and yet he did, he went out in the field and he dug the oil sand and so, that to me was a guy,
1245 when the oil sands had hit the wall in '28, really solved the problem and then the next one, we talked
1246 about this, I'll just mention again, 1948 where the legacy of early decade failed commercial attempts
1247 and the government built this Bitumount Plant and the guy that was behind that was Ernest
1248 Manning and so his belief in the oil sands and it continued, I had lunch with him a couple of times,
1249 after he was Premier and he was still talking about the oil sands and different kinds of people we
1250 need to bring in, so he got us over the wall. The next one was the issue with the Suncor, the Great
1251 Canadian Oil Sands where this J. Howard Pugh, singlehandedly talked board into it and the
1252 comment he made at the ERCB hearing was, and then I quote, "I believe in the future of this
1253 project and I will put up my money with no reservations if the permit is granted." So he hit a wall.

1254 And the next project was Syncrude, and when that project was put on hold and the sponsors at that
1255 point were following like flies and it was Frank Spragins who really kept that group alive and he set
1256 up the first lab, the research lab, and the way I spell it here is with a single "g", so I hope it's right,
1257 because this was the car photo that I've got in here and I think I took it from that, but anyway, that's
1258 something we can worry about, but he had this long-term strategy for upgrading the oil sands. But
1259 he had this long-term strategy for upgrading the oil sands and then 1975, this was where Loughheed
1260 saw the oil companies were walking away from the deeply buried deposit, set AOSTRA up. So, that
1261 SAGD, we've kind of talked about that. It's kind of interesting at the 2009 Summit of the Americas
1262 in Trinidad, that Obama was at, that AOSTRA was proposed as a model for energy development for
1263 the South American countries as a way of industry and government working together and there's a
1264 story written up on that by Annette Hester, have you interviewed Annette Hester at all?

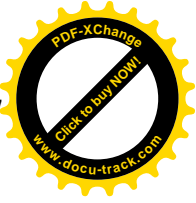
1265 BB: No.

1266 BOWMAN: I think you should connect with her, she did an analysis of AOSTRA in the role of
1267 Peter Loughheed and Clem Bowman and she's fair, very fair and, you know, it's not negative at all,
1268 she's a writer and she works out Calgary. Annette Hester. H-E-S-T-E-R. And so now I think that
1269 we're in a similar position that the oil sands have hit a wall now and the comments I've made that
1270 water is no longer free and that we can't use air as a dump and the problem with hydrogen,
1271 hydrogen and bitumen will forever be joined at the hip, you can't do anything with the bitumen
1272 without adding hydrogen and it's not logical that natural gas would be the source of hydrogen
1273 forever and ever, I don't believe.

1274 And then the comment that I did touch on, that in future to hit the wall we're in now, we need a
1275 new visionary and the energy's going to be developed as an integrated system, with the oil sands,
1276 coal, hydro and nuclear and renewable energy, all performing a different kind of role in here,
1277 somehow we need to get to a systems approach and we need the visionary to do this and we're
1278 looking for this visionary and my story ends up, that I have two pictures, one of the female, one of
1279 the male, but we don't know where the visionary is, but we need one. So I'm just adding this as
1280 another little kind of story of my look at the oil sands and the role of people at different time
1281 periods that came along, that did what was needed. Now I haven't included Roger in that as a
1282 direct...and I probably should, because SAGD will become that, well I guess I did mention him in



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1283 the sort of AOSTRA story and his role in AOSTRA in the SAGD, I did mention it. Now is there
1284 anything else?

1285 BB: Now we want to remember to copy your release...what's the date of this?

1286 BOWMAN: The 28th it is...

1287 BB: Oh and then you're supposed to check, put a little check on each of the days.

1288 BOWMAN: Are there any that I shouldn't check? I'm kidding. I am free to remove my consent,
1289 well I'm just saying that I am free, I'm not holding back my consent am I?

1290 BB: It just really indicates that you've read that...and make sure we know that you can, you could
1291 also say nobody can have access until you're dead.

1292 BOWMAN: If I check the whole thing, there's no problem in doing that is there?

1293 BB: That's the idea. It's just that I wanted to have the check marks on it.

1294 BOWMAN: Okay, I've read it before and I'm at the point that I got nothing, I'm not at risk to
1295 anything...

1296 BB: Judgment Proof! And if we can get this copied, you want to have one to keep.

1297 BOWMAN: I'll just go give that to _____ right now, and get that done.

1298 BB: Is there anything else we wanted to...

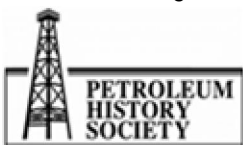
1299 BOWMAN: Well yeah there's one or two things I want to give you which I could get just
1300 momentarily, so I'll go get that now, do you want another coffee or anything.

1301 BB: Oh I could go for another one.

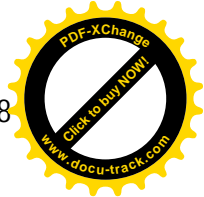
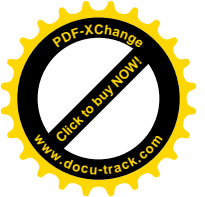
1302 [END OF NO. 4]

1303 BB: We're now resuming out at Clem's house by the lake and what we want to do this time is talk a
1304 little bit about the UNITAR and the international side of the oil sands. So, maybe if you could tell
1305 me about the origins of that?

1306 BOWMAN: Well this really started in a phone call from Joseph Barnea, who was the director of the
1307 United Nations Institute for Training and Research and he was wanting to do an investigation of the
1308 importance of tar sands as he called it then, to the economy and the status of it and whether it was
1309 economically competitive and after a few exchanges, what evolved from this was a fairly major
1310 conference in Edmonton, the future of heavy crude and tar sands and it was co-sponsored by a
1311 number of organizations, certainly was from the UNITARD and the Alberta Oil Sands Technology



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1312 and Research Authority, the U.S. Department of Energy was a co-organizer and it was done in
1313 cooperation with the Government of Venezuela, through their national oil company and a number
1314 of other institutions, the State of California was involved, the Federal Government was involved
1315 with Canada through EMR and the U.S. Geological Survey as well as the U.S. Department of
1316 Energy and there were a total of, I think, four conferences, two in Edmonton, one in Caracas and
1317 there was one also in Long Beach, California which maintained a thread of continuity in oil sand and
1318 heavy oil research for a decade or so, and it was a mechanism for researchers and engineers to keep
1319 in touch with what other countries were doing and there was even a sharing of an information
1320 center in New York, that AOSTRA helped set up and Maurice Carrigy, one of the geologists from
1321 Alberta was a executive director of it for a couple of years in New York City, so it was one of the
1322 first international efforts of getting some level of cooperation and then sharing of research, there
1323 was also an exchange of people between Venezuela and Canada.

1324 I personally do not know what's happened after the period of 1980, but I think maybe some of the
1325 personal exchanges are still in place but I don't think the U.N. or UNITARD have maintained any
1326 continuing program that I'm aware of, so again, it's a time period when the level of cooperation was
1327 high and it would be appropriate probably now, for a similar effort now that the oil sand industries
1328 are firmly established to think about a similar effort attacking some of the environmental/social
1329 problems that relate to the processing of heavy crude and oil sands.

1330 BB: Now as I recall, that was also one of the few times when there was a real attempt to quantify the
1331 international oil sand and heavy oil resource, for a long time, the only figures you could find, were
1332 from UNITARD, from those papers at those conferences.

1333 BOWMAN: Yeah, I think this was certainly the geological aspect of this was important and in all the
1334 conferences it was an attempt to quantify what the reserves were like and what part of the reserves
1335 were economically recoverable at that time and what the technical barriers were.

1336 BB: Now Venezuela, my recollection is that they're extra heavy oil is actually more producible than
1337 the Canadian, but they haven't developed to the same degree, what would you think would be the
1338 reasons for that?

1339 BOWMAN: It was more producible in the sense that they could get some primary recovery and
1340 unlike the oil sands where the primary recovery is almost zero, so with moving to a thermal process,
1341 probably it was more effective to get the initial recovery going, I don't know why they haven't
1342 developed faster, their political system is so different and had changed enormously from the time
1343 that Alberta teamed up with this cooperative effort and I can't speak of their political goals of now.

1344 BB: They have to just develop, as far as I can tell, mainly primary production and some steam.

1345 BOWMAN: Yes, that's my understanding.

1346 BB: Do you remember what years those conferences were?



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1347 BOWMAN: Yes, if I could pause, I could do them all and I will in a moment or two, may have to
1348 interrupt the tape, the first one was in June 1979 and that was in Edmonton, and that was the
1349 published soon after with some collaborative efforts by a team of editors. Can we stop this, if we're
1350 doing this we may as well do it factually and get the other two. I guess I have to wonder whether
1351 there were two actually held in Edmonton, there was certainly on June 1979 and then there was one
1352 in Caracas in February 1982 and then there was a third one in Long Beach, California that I think
1353 was still a continuation under the UNITARD umbrella, so I think I was wrong on the four, I think
1354 there were three. About 1982, I left the scene with AOSTRA so I'm not sure what took place from
1355 that point on. I also note that long before this, that Canada and Venezuela were teaming up on oil
1356 sand geological story and reserves and booked the Oil Sands of Canada and Venezuela, 1977, Book
1357 of the Canadian Mining and Metallurgy, which was a special edition produced on that topic, certainly
1358 a sharing here of geology and the processes that were used for upgrading the heavy oils, so there's a
1359 long history of collaboration by these two countries by researchers, which my guess is, that has not
1360 continued at the same level, which is a disappointment.

1361 BB: There's some evidence that their reserves may actually be as large as or larger than Alberta's. I
1362 think they claim 275 billion barrels or something like that, of recoverable.

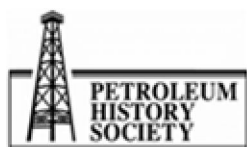
1363 BOWMAN: And they've also reported up in the trillion barrels of in place, so these are numbers. I
1364 think Canada has got further improving up their recoverable reserves, I think there's more
1365 confidence in the Canadian figures, but.

1366 BB: Do you think ...how much of all this technology we've developed do you think is transferable
1367 because there's also Africa and Russia, because there's also Africa, Russia, there are other places of
1368 oil sands of one sort or another.

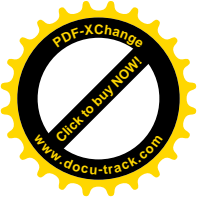
1369 BOWMAN: I think probably the amount of sharing is less in the recovery part of it, because much
1370 of the heavy materials in other countries is a different structure, it's not with an oil and a sand where
1371 the sand can be separated, a lot of it's more like the oil shale in the U.S. which is a carrageen, and
1372 you can't separate the hydro-carbon from the sand without, or from the rock without retorting it, or
1373 boiling it off essentially, so the Canadian experience with both the mining and the in situ, is not
1374 transferrable to many deposits unless they have this same kind of geological situation with oil wet
1375 sand, I mean, water wet sand. And on the upgrading side though, there probably are opportunities
1376 for learning how to crack these heavy materials and upgrade them. Having said that, I think the
1377 Canadian Oil Sands Geology is so distinctive that much of it is unique and a Canadian problem and
1378 a Canadian opportunity.

1379 BB: And I guess that would also apply to the oil shale and sands in Saskatchewan?

1380 BOWMAN: It would be to the oil shale they have there, certainly with the heavy oils they've got
1381 though, some of the techniques used in Alberta, could also used be for the heavy oil deposits which
1382 needs some form of thermal stimulation.



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1383 BB: Yeah carrageen is a real puzzle, maybe for the next generation. Shell has been working on some
1384 stuff in the States though with actually, I think, freezing.

1385 BOWMAN: Yes. Freeze the zone, they have a perimeter and they freeze everything in that
1386 perimeter, so that's...

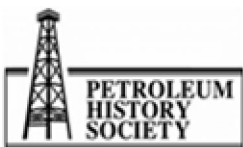
1387 BB: Anyway, another topic.

1388 BOWMAN: Another topic.

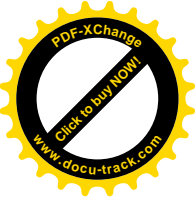
1389 BB: Well there is an open-ended question that you've sort of answered several times and your book
1390 will probably tell us more and that's the future. Obviously dealing with the environment is part of it,
1391 the economics look good right now.

1392 BOWMAN: We kind of talked about the future and where Canada is going and where I've reached
1393 in my thinking and the colleagues I'm working with, the issue of Canada, Canada can win as an
1394 energy superpower, but it won't win unless it's in the game, unless it gets the right team members in
1395 place. So we've tried to examine and we're going to put this together in book form, and the thing
1396 we're concerned about, you go to any book store and all you read about the energy industry globally
1397 is bad news and problems and the bestselling books have a negative view of the oil industry, what
1398 it's doing the environment, what it's doing to lifestyle, etc, etc. And we think that there's another
1399 side of this story and at least it deserves a chance to be told. So we're putting together a package, in a
1400 book form, which is another look at the oil sands industry and different aspects and we're going to
1401 start from what the Canadian energy assets are, how prolific they are and how Canada is unique in
1402 the world, going from gas hydrates to hydro-electric, to the oil sands, to our nuclear power
1403 capability, the high technology we've got, our uranium deposits, which are one of the world's largest,
1404 to our land mass which will sustain a huge biomass industry, to everything we have going in the
1405 energy area unique in the worlds, with these assets, what's the current situation, how much of the
1406 economy is built around this.

1407 We have regions like the Alberta Industrial Heartland and Sarnia Refining and Petro-Chemical
1408 Complex, where we have the capability and the knowledge to build a Canadian winner in the energy
1409 superpower business and yet, we need some big projects to do this and Canada has developed in the
1410 past through big projects and the oil sands have got to be one of the biggest projects, but it has to
1411 be, the oil sands can only be developed in partnership with the other sources we've got, the oil sands
1412 are useless without hydrogen, they're massively hydrogen deficient and so we need another resource
1413 of hydrogen that's almost as big as the oil sands. So the question is, where are we going to get the
1414 hydrogen? And one key process for that is the gasification of hydro-carbons and/or biomass which
1415 will produce hydrogen, and can also, if done correctly produce carbon dioxide in a concentrated
1416 form that it can be captured and stored. But in order to be a true energy superpower, we've got to
1417 be able to blend in renewable energy, solar and wind; and these are intermittent and are very difficult
1418 to connect into the system, which leads to the concept of a national grid, an energy superpower, by
1419 definition, has to have a national grid that it can move electricity from one end of the country to the



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1420 other. We also, those of us working on this, think that we don't understand carbon dioxide. Carbon
1421 dioxide is nature's blessing that we have completely misunderstood, we see it now only as a problem
1422 to get rid of it, carbon dioxide future generations will show it's a material in its own right, nature
1423 does this by making trees from carbon dioxide, we haven't yet learned how to do this efficiently and
1424 economically, but there are people working on that issue. There's opportunities for Canada to lead
1425 the world and the upgrading of our raw resources and do higher value products and really basing the
1426 Canadian economy in this century on our energy sources and our assets, we've got to learn how to
1427 develop hydrogen and we have to learn how to use carbon dioxide in this process and we have to
1428 learn how to do this without contaminating our water, all of these are engineering challenges that we
1429 at least know how to start to develop the solution for, so this is an exciting opportunity for Canada,
1430 winning as an energy superpower and that's the story we hope to tell.

1431 BB: Well defining the problem is the first stage of the solution. One question I would be interested
1432 to get your answer to, is scale. The mining has been done at very large scale, in situ has lent itself to
1433 moderate scale and Imperial has brilliantly demonstrated the idea of phase development at Cold
1434 Lake, we've covered nuclear, we've also, we've only gone large scale, we haven't tried small scale, are
1435 we going to get out of... [didn't hear], do you think scale is essential or can we get around that and
1436 look at more incremental or mass produced technologies?

1437 BOWMAN: I think we're moving toward smaller units and certainly, in hydroelectric, the
1438 development of hydroelectric we'll be talking about sort of, harnessing smaller projects as well, the
1439 river run hydro in situ is certainly amenable to smaller projects, the Taciuk dry process would be
1440 amenable for small projects as well, they can even be done on a skid mounted basis for small
1441 projects, I think the opportunity for integrating the energy assets will allow for some small projects
1442 as well, the idea of coal processing of coal and biomass there will be smaller quantities of biomass
1443 generated that would be regionally supplied and I think there will be an opportunity of upgrading
1444 these on a much smaller scale than we've envisioned and I think time will tell on this and I think the
1445 whole concept in the original days of Syncrude, is that you had to have a hundred thousand barrel
1446 per day tar sand plant to be economic and that's been proven not to be the case, they've been able to
1447 develop much smaller projects.

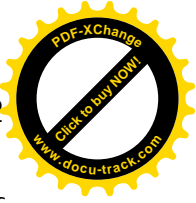
1448 The concept of using trucks and shovel dropped the scale enormously, originally it was these huge
1449 draglines, that they had to be so large to be efficient, the bigger they were, the more riskier they
1450 were. So I think in the earth moving area, they've got the scale down to be smaller, and in the
1451 processing of the bitumen, scale is much less a problem because usually the big plants are multiples
1452 of small units anyway, so you can have a smaller number of units, so think generally, scale will come
1453 down, is my impression.

1454 BB: Cokers have tended to be large though.

1455 BOWMAN: They've been large and have been large because they were originally large or they have
1456 to be built large, I don't know. I think gasifiers don't have to be built huge, because universities have
1457 small lab scale gasifiers and I'm not sure the scale up is linear from that point on, it's...



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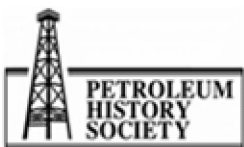


1458 BB: Well there's also a small nuclear reactor in Hamilton, so it can be done. Have we run out of
1459 topics?

1460 BOWMAN: I think we have.

1461 [END OF NO. 5]

1462 [END OF INTERVIEW]



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