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PETER G. LOWERY INTERVIEW

"INNOVATION IN POWER SYSTEM PLANNING: AN INTERVIEW

WITH PETER G. LOWERY, "JUNE 11, 18, 1990

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Los Angeles Department of Water and Power

POWER SYSTEM ORAL HISTORY PROJECT

INNOVATION IN POWER SYSTEM PLANNING:

AN INTERVIEW WITH PETER G. LOWERY

Interviewed by Thomas Connors

The Bancroft Group

Dates: June 11, 1990, June 18, 1990, June 26, 1990
and July 27, 1990

BIOGRAPHICAL SUMMARY

PERSONAL HISTORY:

Born: April 21, 1916, Buchanan, CA

Education: California public schools, Clovis High School, Fresno State College, University of California, Berkeley [Electrical Engineering, 1939], University of Southern California, University of California, Los Angeles [graduate work in mathematics]

Married: 1945, three children

CAREER:

1939 Hired by Pacific Gas & Electric to work on Sacramento Municipal Utility District buy out of PG&E facilities in Sacramento area.

1940 Hired by Bureau of Reclamation, transferred to Boulder City, NV, to work at Hoover Power Plant as test engineer.

1943 Joins Army Signal Corps, becomes radar specialist.

1943-45 Serves in South Pacific during World War II.

1946 Returns to Boulder City to resume work with Bureau of Reclamation.

1947 Joins LADWP as relay tester, PO&M.

1951 Transfers to Statistical Section, PO&M.

1960 Promoted to Electrical Engineer, made head of Computer Studies.

1966 Becomes Senior Engineer, Operating Engineering, PO&M.

1967 Appointed Senior Engineer, Power Resource Planning, System Development Division.

1973 Promoted to Assistant Engineer, System Development, also becomes Principal Engineer of Resource Planning.

1975 Becomes Engineer of System Development.

1983 Retires after 36 years of employment with LADWP.

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MEMBERSHIPS:

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California Water Resources Association

TAPE NUMBER: 1, Side A

June 11, 1990

TC: Let's start with your personal history. Could you tell me, first of all, when and where you were born?

PL: I was born in Madera County, in a little place called Buchanan, California.

TC: Madera County is up north, I take it?

PL: It's north of Fresno.

TC: And what year was that?

PL: Nineteen sixteen.

TC: And what town were you born in?

PL: It's called Buchanan. I'm not sure that it exists now.

TC: Okay.

PL: My father was in the mining business. This is in the southern end of the Mother Lode where most of the gold mining was in California. There was some in southern California, too, but most of it was done up there.

TC: Interesting. That was my next question. It had to do with your family circumstances. So your father was a miner?

PL: Then. Well, he was in, I should say, the mining business. He was on his own. He was not a miner, a hired hand, if you will. He was interested in gold mining and copper mining and so forth. So they used to claim property, mining property, in those days, and that's what he did.

TC: Well, did he set up mining operations?

PL: Yes, but small-scale.

TC: Oh, small-scale.

PL: He would hire people, indigents and people that would come through, get a job, make a few bucks and then move on.

TC: Yes.

PL: But mostly he did it himself.

TC: Was he successful at it?

PL: Well, reasonably successful.

TC: He kept on with it, I guess?

PL: He kept on until the mining business went to hell in the early twenties, so we moved down from the hills. I don't remember the exact date, but it was in the early twenties. And so we got to Pinedale, California, which is just north of Fresno.

TC: Okay, yes. That's on the road going up towards Yosemite [National Park]?

PL: From Fresno, yes. It's on [Highway] 41, which is going to be a . . . Well, it's a freeway to Pinedale now, but that's about as far north as it goes.

TC: Yes.

PL: Well, what he did there, see, is use his hard-earned money to build the post office there. He had gone into the real estate business, which was unsuccessful, because there's a lumber mill there, Sugar Pine Lumber Company, and it went broke and everything went. So then he got into the farming business. He bought a farm just outside of . . . Well, it's east of Pinedale, a little north of Fresno.

TC: Oh, I see. And what did he raise? Was it cattle?

PL: Grapes.

TC: It was grapes, oh.

PL: Primarily grapes.

TC: Jumping back a minute, was he born here or had he come out here from the East?

PL: No, he was born in Austria.

TC: In Austria, oh.

PL: Yes.

TC: And he just came out here as a pioneer, obviously.

PL: Well, he came out here to join his uncles who came before him.

TC: Okay. And had they been involved in the mining business?

PL: Yes, mining and other businesses. There's several of them. I'd have to count them.

TC: Well, if you moved out in the twenties, that means you were just four or five years old, so did you ever get to witness any of the mining operations that he was involved in?

PL: Yes, well, not in the southern end. We moved up to some other property that they owned. Some of this stuff belonged to his uncle, my granduncle.

TC: Oh, I see.

PL: So he went to mine some of that. Oh, I was, I guess, in kindergarten, maybe first grade. I actually went down and dug a little bit. (chuckling) And they prepared for blasting and things like this.

TC: Well, that's quite an experience.

PL: I never was involved in actually doing the blasting, but we'd drill the hole and put the powder in.

TC: But you're saying that by the twenties the mining possibilities were pretty much finished?

PL: The mining possibilities were gone.

TC: Yes.

PL: And that has a lot to do with the formation of the Department [of Water and Power] east of the hills. You probably got this from somebody else here.

TC: No, go ahead, tell me about it.

PL: The Water System up in the Owens Valley, you know, was built basically in two stages. I mean, I'm not as qualified as others because I don't know the exact history, but, roughly speaking, in the early days, the [Los Angeles] Aqueduct was built. I believe, in 1913 it was completed.

TC: Yes.

PL: That was the so-called first aqueduct.

TC: Yes.

PL: The second aqueduct was when all the trouble started and they were buying more land. And the farmers would gladly have sold their land because the Owens Valley farming was primarily to support mining, as I understand it.

TC: Oh, oh.

PL: And, see, there was no way to get the stuff out of there.

TC: That's true.

PL: So they sold their produce to the miners. And the mining business simultaneously went to the dogs everywhere.

TC: Oh, yes, interesting.

PL: And so they gladly, apparently, sold their properties, a lot of them did, to the Department, put the money in the bank and the bank went broke.

TC: Yes, that's right. That was the Watterson's Bank, yes.

PL: Yes, the Watterson's, yes. That was about 1926 or thereabouts. I mean, I don't know these dates first-hand, obviously.

TC: But you were close enough to the experience to absorb that, yes.

PL: Right. I was on the other side of the hills, see, and these people were on this side. So we left the hills and we got to Pinedale, I think, in 1926.

TC: So did you go to school in the public school system there?

PL: I started school in kindergarten in Sonora, California, which was an early mining town. Sonora is up in the hills east of Stockton. I started going there and then we moved a couple of other places up there and finally left. Oh, [my father] did a little bit of mining in Rawhide, California, which is near there.

TC: So is the farm where he ended up?

PL: Actually, we moved to Pinedale. Oh, I guess I left Pinedale in fifth or sixth grade. I think I left in the middle of the term and finished going to school, grade school. We had grade

school. It changed a little bit. Maybe you didn't have quite the same thing. We had the first eight grades in one, and then we went to so-called high school, which is the next four years.

TC: Oh, I see, yes.

PL: They've changed the system now.

TC: Yes, they changed it. Now they have junior high school and high school. Which high school did you go to?

PL: I went to Clovis High School. Clovis is a little city, or was a little city--it's grown considerably--northeast of Fresno.

TC: Were the grapes your father raised table grapes or wine grapes?

PL: It was wine grapes, primarily. Some of it was to make raisins.

TC: Oh, yes, that's right. That's raisin country, yes.

PL: And some of it was wine grapes, which was sold to people who made wine--not bootleggers, but made in the home. (chuckling)

TC: Well, yes. What happened during Prohibition? Prohibition came in somewhere along there.

PL: It came in after World War One. I don't know the date, but in the early twenties [1920-1933].

TC: Yes, that's right. You could sell a certain amount for home consumption, I guess.

PL: No, you couldn't. No, sir, no.

TC: No?

PL: Prohibition was . . . Well, as I understand it, and I may be offbeat, what happened was that Prohibition ended in [Franklin D.] Roosevelt's administration.

TC: That's right, okay, 1932, yes.

PL: Not instantly, but first they had 3.6 beer and so forth.

TC: Yes.

PL: And in that period, you could make your own--and maybe it's still true--each farmer could make maybe 200 gallons, I think it was, free of duty.

TC: Yes, yes.

PL: Then after that you had to start paying. But before that you couldn't, except people did.

TC: Yes, yes.

PL: You know, there were people from southern Europe, Italians or such people, they grew up on wine.

TC: Sure, I know. Prohibition affected all the Napa Valley. Those wineries were really hit hard during Prohibition, and some of them were able to keep alive by . . . I think, church wine was exempted.

PL: Well, the Catholic church always bought wine. It wasn't a lot, just what they used on Sunday in the services.

TC: Yes, sure. Did you have any siblings, brothers and sisters?

PL: Yes, there were six of us, four brothers and two sisters.

TC: And was your mother from California or was she from the East?

PL: Oh, no, she was imported. (laughter) She was imported by my father.

TC: Imported from where?

PL: From Austria.

TC: From Austria, oh.

PL: It's now Yugoslavia, but, actually, the passport was from Austria.

TC: Did he travel back and forth?

PL: Well, he went back.

TC: I mean, did you keep ties with the old homestead or the old hometown in Austria?

PL: Oh, yes, because, you know, they were old-fashioned. Throughout Europe it was the same thing: the oldest son inherited the whole works, you know. (chuckling) And he was responsible for most all the property there. He was the oldest son, that's why. The oldest son of the oldest son.

TC: Oh, I see.

PL: All his uncles flew the coop and came to the United States. I think all of them settled here. I think one of them settled in New Orleans, but the rest of them . . .

TC: Had they been farm people back in Austria?

PL: Yes, so he knew a little bit [about] what he was doing. I mean, they had grapes and olives. Well, I don't know, I've never been there, so I can't say.

TC: Yes, that was my next question. Did you get to go back there much?

PL: Most of the family has been there, my brothers and sisters, but I haven't.

TC: Well, did you grow up speaking Austrian in the home?

PL: Well, a little bit. I mean, we knew English though, so I don't know how good I was. (chuckling) But I didn't go to school having to learn the language. My father used to speak Italian, too, so I didn't know what language I was talking. I spoke a little bit of Spanish and used Spanish words with my kids just for the heck of it, so they didn't know. (laughter) A bit confused.

TC: Well, how did the Depression hit your family? Was there devastation or were you able to weather the [Stock Market] Crash and the ensuing difficulties?

PL: Well, it was hard, but we weren't devastated. I went to school during the Depression.

TC: You would have been in high school then.

PL: Well, the Depression didn't end until I . . . Well, I got out of college in 1939, so it wasn't then--at least where we were it wasn't. Well, it was better then than earlier.

TC: So, in high school, did you study engineering? Did you take any . . .

PL: You don't study engineering in high school.

TC: Well, I mean drafting and the kind of math that you would need for engineering? Did they have any sort of . . .

PL: No, I didn't know that engineers existed then. I was dumb. (laughter)

TC: Oh, yes. (chuckling)

PL: Well, I probably did. I shouldn't say that. I didn't know what engineers did. I didn't know what chemistry and physics were, what the words meant, when I first went to high school.

TC: You didn't have to take those courses?

PL: No, I mean, when I went to high school I didn't know.

TC: I see what you're saying.

PL: But then I learned in high school that there was such a course called chemistry. So I took chemistry and physics in high school.

TC: So what you're saying is you didn't have a burning desire to become an engineer when you were in high school.

PL: No, no, because what is it, you know? I mean, you can't have a desire to be something that you don't know exists.
(chuckling)

TC: (chuckling) That's true. In high school I never thought I'd be doing this sort of thing.

PL: No, right.

TC: Well, was it in college that you decided on engineering as a program?

PL: Well, when I graduated from high school, or toward the end of my high school career, I wanted to join the Air Force. It was Army Air Corps then.

TC: Yes.

PL: And two years of college were required. I think you had to study certain kinds of things, mathematics and physics, so that was sort of my goal. And then I changed my mind after a

couple of years. In college I decided maybe I should just study mechanical engineering. Of course, the mechanical engineering aspect came from the desire to be in the Air Force.

TC: What college was that?

PL: Well, I started at Fresno State College the first two years. I could either go to Cal or Fresno State. It's Berkeley--we call it Cal--the University of California, Berkeley. That's where I ultimately graduated.

TC: Oh, okay.

PL: But because of the Depression and the cost, I could live at home going to Fresno State, so I just went there for the first two years. But you couldn't get an engineering degree there.

TC: That was the same thing with UCLA.

PL: Yes, you couldn't get one at UCLA in those days.

TC: Yes. For instance, Larry [Lawrence] Schneider talked about going two years to UCLA and then transferring to Berkeley.

PL: Yes, you don't have to now. You can finish there.

TC: Yes.

PL: Of course, Fresno State University, the thing that I went to was called Fresno State College, and subsequently it was converted to what they call a university.

TC: A state university, yes.

PL: Because they probably have a Ph.D. program in one field or something--I don't know--not very many. (chuckling)

TC: Yes. So you went to Berkeley. So that means you had to pack up and move to Berkeley.

PL: Oh, yes.

TC: That was an exciting time for physics and engineering, I know. There were interesting people there at that time. Glenn Seaborg, I know, was there, and there was some early work on nuclear physics. But I suppose in engineering you wouldn't necessarily be involving yourself in that highly theoretical kind of thing.

PL: No, no. Well, Ernest Orlando Lawrence was there at Berkeley. They built the bomb. I don't know whether you know that.

TC: Oh, yes, I'm familiar with that.

PL: And all that kind of stuff. So he was heavily involved in that, and the cyclotron was there. We knew that. We looked at it. Well, it was nothing to see but metal and things like this. (chuckling) So we knew it was there. But engineering, that wasn't . . . Cal was not a great engineering school. MIT [Massachusetts Institute of Technology] is probably still the great engineering school in this country.

TC: Yes, I'd say.

PL: I don't think there was anything comparable to that. There still isn't.

TC: Well, were they trying to make Berkeley sort of an MIT of the West? Was that the idea that they had in trying to build up their system? I understood that they were wooing top people

in different aspects of engineering to come teach there in the 1930s.

PL: I think you've got the wrong information.

TC: Oh?

PL: Well, maybe so. No, where they got their start is they had one of the greatest chemists in the country, G. N. Lewis, Gilbert Newton Lewis, and he was there when I was there. So he built the Chemistry Department and all the people from the country would flock to the Chemistry Department.

TC: Oh, I see.

PL: And, somehow or other, they got Lawrence, and he got the Nobel Prize for his cyclotron, and he built the Physics Department; so they became chemistry and physics, not engineering.

TC: Not engineering, okay.

PL: Maybe they were trying to woo people, but there were no outstanding engineers. Well, I think maybe there were a handful. I think the Dean of Engineering was probably well-known.

TC: Who was that? Do you remember that guy's name?

PL: A guy by the name of Derleth. He's the guy that, I think, was the chief consultant on the bridges, and he was the chief engineer on the campanile on the campus, which is leaning. (laughter) So he wasn't that great.

TC: That's quite a testimony, yes. So you graduated in 19 . . .

PL: Nineteen thirty-nine.

TC: Nineteen thirty-nine, with a degree in mechanical engineering?

PL: No, electrical.

TC: Oh, electrical engineering.

PL: No, I changed. I neglected to mention that. I started thinking about changing, because I was told electrical engineering was more mathematical than any of the other engineering courses, so that's why I changed. It wasn't that I was somehow or other fascinated by electricity itself.

TC: It was the math.

PL: Well, I was thinking of engineering, but that was the branch of engineering that I thought I would like better because of the mathematics.

TC: Interesting.

PL: And I still like mathematics.

TC: I must admit I always did well in math, but I never quite understood why I was doing these operations. You know, I don't think I ever understood the philosophy of mathematics, and so, once I got out of high school, I never took it again, which is sort of a shame.

PL: Well, you know what I did, just as a sidelight, I took a lot of math after I got out, when I was working for the Department. I was going to get my Ph.D. in math, and I ultimately abandoned it because my son was born. Anyway, I went to the head of the math department at SC [University of Southern California] and I said, "Look, I've been taking mathematics here." I had a lot of mathematics. I took extra math when I was in college and I listed all these courses. I

said, "I still don't know what I'm doing." I said, "I'm getting A's in the mathematics, and there's something wrong." (chuckling) So he said, "I'll tell you what's wrong. You can't learn mathematics that way. You have to take some foundation courses. They're important. You need to take them from a mathematician, a real mathematician, not a manipulator like you have in engineering." He said, "That's one of my troubles here with engineers, they think they can just teach people to manipulate things, and they can't do that." So I took these foundation courses that he suggested I take, and he suggested the professors that were real mathematicians to take them from. And it did, it did make a difference.

TC: That was during the 1950s when you went to SC?

PL: Yes, it was in the fifties.

TC: Okay, so then upon graduating in 1939, you mentioned something about military. Did you go in the Army or Air Force?

PL: Army.

TC: It was Army.

PL: Signal Corps.

TC: Was that during the war?

PL: Yes.

TC: So you were drafted?

PL: I went in, as I recall, in June of 1942. Maybe it was May. I could get these dates if you want. I mean, if they're important. In history it might be, but anyway . . .

TC: No, in general. I think, in general, just to get the general sense here.

PL: Well, this might be important for somebody if they ever read this as a sidelight, you know. I got a commission. I was handed a commission because we were so behind, so inferior in radar. And so the Army was looking . . . wanted to catch up. The only way to catch up, obviously, was to break in all the engineers, electrical engineers, they possibly could, hand them a commission and send them to various schools. There were forty colleges in the country that were given the job of educating these people, these engineers, in ultra-high frequency techniques, which was what radar was about, you see.

TC: Radar, sure.

PL: So I was sent to Cal Tech [California Institute of Technology] to do this for three months, and then after that I went to learn how to salute and a few other things at Fort Monmouth. This was the Signal Corps. Fort Monmouth was the Signal Corps headquarters in the United States.

TC: Where is Fort Monmouth?

PL: In New Jersey.

TC: New Jersey, okay, yes.

PL: Yes, it's right near Atlantic City. I don't know that much about New Jersey geography, but we actually were able to drive to Atlantic City.

TC: Well, in 1942 you went in; and you graduated in 1939, so you had some work experience then prior to going into the service.

PL: Right.

TC: What was that?

PL: Well, I'll go back to where I started. After college, I went to work for PG&E, Pacific Gas and Electric, in San Francisco, and worked there for a little over a year. Then I went to work for the United States Bureau of Reclamation [USBR] at Boulder Dam, which was subsequently renamed Hoover Dam.

TC: What were your duties with PG&E?

PL: I went to work there primarily to help them evaluate or obtain a value for the Sacramento distribution properties that belonged to PG&E, which subsequently became the Sacramento Municipal Utility District. Sacramento voted to buy out the PG&E facilities there. So PG&E hired engineers and I was one of them that they hired to help them establish the value of that.

TC: Oh, that's interesting.

PL: So there were lots of things I had to do, some of it was inventory of properties, and some of it was actually design. Not that they were going to separate it, but you cut away the properties, so you had to design little substations and so forth. Go ahead, you were going to ask me something?

TC: Yes, just a little background point.

TAPE NUMBER: 1, Side B

June 11, 1990

TC: It's funny, I thought that Sacramento Municipal Utility District would be more or less of the same age, vintage, as DWP [Department of Water and Power], that it was a municipal organization going back to the turn of the century. You're saying that it was more like in the late thirties, early forties, that they voted to buy?

PL: They voted to buy it in the late . . . Well, I don't know when the vote was, but I think it was the influence of Roosevelt and that administration, [Harold L.] Ickes, the Secretary of Interior and so forth. But, you know, I was in Fresno, I was not in Sacramento.

TC: Well, you were working for a private company, and this was a private company that a part of it was being municipalized. Was there a certain objection to that on the part of PG&E?

PL: They had nothing to do with it. I mean, by state law, you can condemn anything, any facility. The state constitution allows a city to do all these . . . collect garbage, furnish electricity and water and so forth. So there was nothing . . . Their only objective was to get as much money as they could for the properties.

TC: I see.

PL: I had nothing to do with what you might call politics. I was just counting, finding physical properties, establishing what

the physical properties are and what you would have to do to isolate it and so forth.

TC: So then the Sacramento Municipal Utility District would just buy all of that and take it over, lock, stock and barrel?

PL: Right. And they did ultimately. It's just like going to court, except they didn't go to court. They went to the Public Utilities Commission [PUC].

TC: Yes.

PL: I don't know the details but the Public Utilities Commission was acting as a referee. The PUC had assigned a guy to work with us, actually, so we sort of worked together. So when it went to the hearing, why, we had already pretty much agreed as to what we were talking about.

TC: Yes. Well, I guess it sort of parallels what happened here, with the Department or the City condemning the electrical system of the L. A. Gas and Electric, and that being taken over, some years earlier, of course.

PL: Yes. It wasn't quite the same because this was a municipal utility to start with. Maybe Larry [Schneider] and some of these people probably gave you a little better inkling of this than maybe I could. You know, I wasn't involved, obviously, in those days. But it started being a utility when they built power facilities . . .

TC: Along the Aqueduct.

PL: Along the Aqueduct. So they had a little utility here, but, subsequently, the biggie was, of course, condemning L. A. G&E.

And then subsequently they would take properties from [Southern California] Edison, condemn Edison properties.

TC: That's true, yes.

PL: So some of this stuff belonged to, or used to belong to, the Edison Company, but the big stuff is Gas and Electric.

TC: Yes. And then what were the circumstances of your going over to the Bureau of Reclamation?

PL: Well, because I tried to transfer in PG&E, and it was still hard to get a job in PG&E, and I wanted to get in some other kind of work, and it was hard. So I decided that . . . What I wanted to do, really, was get out and work with equipment. That's really what I wanted to do, to get some experience before I was too old, you know, to get that kind of hands-on experience with equipment. So I wanted to get some test type work at PG&E, and there was really nothing available. They weren't building anything--that was the problem--or building very little, so they didn't need any extra help. But the Bureau of Reclamation was. See, even though the dam was finished earlier--Hoover Dam was finished in 1936--they were still building electrical facilities. Powerhouses were being built when I became available, so they needed engineers there. So that was an opportunity for me to get some hands-on test experience.

TC: So what were your duties there?

PL: My duties there, when I went there, we were installing two generators, A1 and A2, if you . . .

TC: Yes, yes, I've seen them.

PL: The Nevada side generating units are N1, 2, 3, 4, et cetera, and the Arizona side are A1, 2, 3, et cetera. A1 and 2 were basically for the munis. We, the Department of Water and Power, got most of the electricity from them. So I, a government employee, was a test man, one of the test people on those facilities and the bus work and so forth, to connect those into the system. So that was a lot of work. I learned a lot. In school we learned about generators, what makes them tick, but there are a lot of facilities, oil pumps, breakers, and little tiny devices that furnish all sorts of things to the generator.

TC: Right, right.

PL: We were testing to make sure that all this stuff would work. So it was a learning experience for me, because in engineering school they don't have time to go through all those things that are necessary.

TC: You were living then in Boulder City?

PL: Yes.

TC: You had to relocate? You had to relocate to Boulder City?

PL: Oh, yes, yes. I moved into a government-owned dormitory.

TC: Oh, yes?

PL: See, that was a government town.

TC: Yes.

PL: The government employees were all living in government houses. The married ones lived in government single-family residences, and the single fellows lived in a government dormitory.

TC: So did it have a feeling of being in the Army, sort of a service . . . ?

PL: Well, of course, I didn't know the feeling of being in the Army.

TC: That's true.

PL: Oh, I don't know. I would guess not, but it was not . . . It didn't have a city council. It had a government civil service employee. The city manager was a government employee.

TC: Is that still the case for Boulder City, do you know?

PL: No, the government gave that up. Gee, I don't remember now. They gave it up maybe before I left there, but just when I'm not quite sure on that score. See, I had ties, even after I left there to come here [to LADWP]. Well, let me take that back a little bit. I got into the Army from there.

TC: Yes, okay.

PL: So then I came back. They were required, of course, to take me back--not that they wouldn't, I guess--but, anyway, I went back after I got out of the service and was there for awhile and then came here.

TC: On that service experience, you mentioned before you went to Monmouth, New Jersey. Now is that where you stayed for the rest of the war?

PL: Oh, no. No, I went to New Jersey to learn how to salute. I mean, that's being a little facetious, you know. They taught us a little bit about Army operations and so forth. There was a course that's similar, I guess, to the OCS, Officers' Candidate School, where they converted the GI to an officer.

TC: Yes, sure, okay.

PL: Only I already had my commission. So all the people that went there with me were in the same boat. I mean, they were all electrical engineers.

TC: And you were a second lieutenant or something?

PL: Second lieutenant, yes. So we were there, I forget now, maybe six weeks or some such.

TC: Oh, okay.

PL: And then moved from there to Camp Murphy, Florida. It's on the east coast of Florida. It was a Signal Corps radar school. So I got hands-on experience with radar.

TC: You said that radar was a new thing at that point. Was it one of the innovations of the war? Or had they been working on it prior to the war?

PL: Well, I can't tell you what this country was doing, but, apparently, practically nothing. You know, the generals all think that everything that there is is what generals learn, and they apparently neglected this thing. I remember going to an Army Day exhibit in San Francisco when I was with PG&E, and they were telling us about . . . They had these rabbit ears, sound devices that detect airplanes, for criminy sake, while

the war was on. And these guys are bragging about what good listening devices they had for aircraft. And they were way off-base. The English were working on radar. So what we were learning about was English radar. We actually got the first radar sets that came from England; they were English designed and so forth. Well, I don't know where we were. You know, I obviously didn't know. I was not keeping track of what the Army was doing.

TC: Sure.

PL: But apparently not very much. So that was the point. So they collected all these people to do and design and work on the radar real fast, but the stuff that we started with was English.

TC: And so how long did you stay at Camp Murphy?

PL: Oh, I don't remember. Maybe another month. It wasn't too long.

TC: And then you were shipped out?

PL: No, not quite.

TC: You're building the suspense here. (laughter)

PL: We moved across the state to Tampa, Florida. There was a field, which is the Tampa International Airport now. It used to be Drew Field. It was a fighter training base, but also they had facilities there for radar training. The radar was basically attached to the . . . It was Signal Corps, but in the field we were attached to the Air Force, when we went out, and so the training was at Drew Field, but it was not

aircraft, it was radar training. Specifically, we actually went out and did some training with radar, as if we were going to go out in the field and operate the radar. So we formed our company there. Our company was actually people flown in from all over the country. They would get all sorts of people together to form this company, to run a radar company.

TC: Oh, I see.

PL: So you had several radar sets and they would report to a plotting group who would plot where the planes were coming in and that sort of thing.

TC: And then where did you go after Drew?

PL: After we formed our company there and trained as units a little bit, we came to California and shipped out to the Pacific.

TC: Where did you ship out from here?

PL: From Oakland.

TC: Oakland, okay.

PL: I knew how to shoot a gun, so I was designated as a range officer. These guys didn't know how to shoot. And the GIs, I guess they probably felt that if they didn't know how to shoot--I may be wrong--that they wouldn't have to go overseas or some damn thing. But the thing that was hard is the gun discipline. You know, they'd turn the gun any old way and just point it at you and all sorts of things. You really had to yell at them. It was hard. It looked like it would be easy, but it wasn't.

TC: I can imagine.

PL: Anyway, then we had our equipment, too, and so I was designated, because I knew how to shoot a little bit, to watch the equipment across the country. (chuckling) There were four people with me and we were armed, so we rode in the caboose across the country. It took us eleven days to get from Tampa to California.

TC: So this radar stuff was top secret, I suppose.

PL: Well, it wasn't top secret, not the stuff we had. Some of it was. It was secret, but not top secret.

TC: How about the Japanese? Did they have radar by that time?

PL: They had radar during the war. We suspect that they had . . . They had radar but they didn't have enough people. We apparently had a bigger pool of people that could operate it than the Japanese did. But I think they had people who knew how to make it, and they had it, we know that. And they came to shoot at us, too. There were some trees that looked like radar trees, they looked like radar sets, and they would shoot at those. They would strafe them. So they knew we had it.

TC: At this time, when you shipped out, where did you go?

PL: In the southwest Pacific, with [General Douglas] MacArthur.

TC: With MacArthur?

PL: Yes. Well, with him, we didn't join hands. No, I started in New Guinea. From Oakland we went to Brisbane, Australia, and then from Australia to Port Moresby, which is near the southern tip of New Guinea.

TC: Okay.

PL: So we really started in New Guinea. I mean, the whole company went to New Guinea, and then they wanted to have some fighter escort to . . . They wanted to bomb the Admiralty Islands, but they wanted fighter escorts. They wanted to build a fighter base up in the Trobriand Islands which are north of New Guinea, between New Guinea and the Admiraltys.

TC: Okay.

PL: That was my first mission, so I went there. It was just one platoon of our company that went there. Before D-Day, four days before D-Day, we landed there in the middle of the night on a destroyer. That was quite an experience, but anyway . . .

TC: Well, what was the . . . Did you have to get out and wade, basically? I mean, it was the middle of the night . . .

PL: Well, that's the thing. No, that was really difficult because the Navy wanted to dump all the stuff overboard and I wouldn't let them. Here's a damned lieutenant just arguing and the fighter command got a letter about this brash lieutenant.
(chuckling)

TC: Well, they wanted to dump the stuff, in order to transport it or just get rid of it?

PL: To protect the destroyer.

TC: So what did you end up doing?

PL: We ended up putting it on boats.

TC: And taking it in.

PL: Taking it in, yes.

TC: So then you set up the radar station on that island?

PL: Yes. We had several of them, yes, and we set them up on the island.

TC: Well, they were setting up radar stations then all over the place, right, by this time? Or were you pretty much the vanguard of radar?

PL: Well, we were the specific . . . Well, I mean, they had radar sets in this country, but they were for different purposes. The Coast Guard had them. I'm not too acquainted with that, but, see, they had some that they wanted to protect. They wanted to know when aircraft were coming into this country.

TC: Sure.

PL: To avoid another Pearl Harbor kind of thing. But, see, they missed. I don't know what happened in Pearl. We didn't have anything in Pearl Harbor. They didn't know the Japanese were coming.

TC: No, no.

PL: Or at least I'm told they didn't.

TC: I know. You read the revised history of more recent date, when people say that it was known that an attack was possible but we wanted a reason to get into the fray because the isolationist forces at home were very strong. But that's all second-guessing now. I don't know.

PL: Some of that came out in the early days, too, and I think it was second-guessing now, too. I think that, even in our case,

I mean, as brilliant as I am, we failed in doing our job perfectly. Even when we had radar, we still failed for a variety of reasons. You know, you can't introduce a new thing like radar and be able to do a perfect job of detecting every darned thing. Because, you know, you'd have strange things that come on the screen. And we almost got a commendation, not because of detecting aircraft, but because of detecting Japanese ships that came in to attack when we subsequently got to the Philippines, when we first landed on Leyte. And we were on Mindoro, which is on the other side of the Philippines from Leyte. And we detected the Japanese armada that was coming, ships that were coming there that were going to fire on us. So they were able to send the aircraft out there to destroy them. And we were up for . . . to get a commendation or whatever. We didn't because the Air Force was obviously more important. They did it. They actually destroyed the ships, so they got it and we didn't.

TC: Well, by the end of the war, though, in those initial . . . It's true, you know, it's the same thing with any new technology, it really takes a long time to get it so that all the bugs are worked out and that you can have people accepting it, too.

PL: Yes. Well, one thing that bugged us, see, is that the tropics are humid, so that the transformers that we took over there wouldn't work. The humidity got in them; and electrical components, when you have a humid atmosphere, why, they'll

fail all the time. Our radar just kept failing all the time because of inadequate design for protection against humidity. So we reported that and it took months for them to actually change the design and protect those damn things from the humidity.

TC: So what could you do in the meantime? Just try to keep them dry?

PL: Nothing. I mean, you just keep them going. Then we ran out of transformers. They'd just keep failing. The condensers would fail. It was a nightmare. I mean, you couldn't do it. You'd get bawled out all the time. So you had to learn that, you know, plus it was infant technology, really.

TC: Sure.

PL: I mean, radar has improved drastically. It improved quite a bit by the end of the war, too. We had some fairly sophisticated equipment by the end of the war. Of course, we were going to use it in an offensive operation. When the war ended, or just before the war ended, we were training to actually attack Japan, go in and land in Japan. Our mission was going to be to actually direct airplanes in an offensive manner. Instead of defensive, we were going to guide them to their targets with radar.

TC: How though? I can picture with radar, you know, you can pick up something that's moving toward you or moving somewhere around, but . . .

PL: The airplane is. Our fighter, our fighter bomber.

TC: So you'd have the radar set-up in the plane itself?

PL: No, no, we would set it on the ground. It's just like a[n air traffic] controller. We were the controller. The controller now sees the airplanes here and he directs them to land.

TC: Sure, sure.

PL: And he tells them how high they are and where to turn and how to land. And he gives them the order, you know. They circle, they do all sorts of things, but we were going to actually direct them. The bombardier, if you will, was going to be sitting in our radar site.

TC: Oh, I see.

PL: There are different airplanes, you know. The long-range bombers, they have a bombardier with them. But in this case, they were going to be fighter bombers that would go and strafe or whatever; whatever it is would be directed from the radar. So our own planes then would be on our screen, and then we would tell them what to do.

TC: Yes, but the sweep must have been a pretty good circumference to be able to . . . Where would you be in relation to, say, to Japan, if you were going to be invading Japan?

PL: We had a bulldozer, too. We'd go in and . . . just with the troops. We wouldn't fight, hopefully, but we would go in there and set up our radar.

TC: Would that be [Army] Corps of Engineers or what?

PL: Well, we were Signal Corps.

TC: Yes, you were Signal Corps, but the guys on the bulldozers and the construction crew . . .

PL: No, my men.

TC: Oh, that was all your people, okay.

PL: I had a bulldozer operator, and that's what we were doing. The guy was practicing digging the foxhole, if you will, the big foxhole, so that the radar could be put in there and be protected from enemy fire and so forth, see.

TC: What rank were you by this time?

PL: I was first lieutenant then.

TC: Oh, first lieutenant.

PL: I ended up first lieutenant.

TC: So, when the war began winding down, where were you by this time?

PL: In the Philippines.

TC: You had gotten to the Philippines.

PL: I was in Lingayen Gulf, north of Manila. Maybe it was fifty miles north of Manila, or something like that, on Luzon, the main island.

TC: And that's where you were when the bomb was dropped?

PL: When the bomb was dropped. And was I glad. I didn't want to go to Honshu. That's where we were going to go. That was not my goal. I was tired then, too, because I was overseas for two and a half years. That was a long time.

TC: What were the living conditions? You had set up bases and whatnot. Was it tent living or . . . ?

PL: Yes. We would move with the forces. We landed in Port Moresby but we went over on the . . . Well, my first mission was the Trobriand Islands, which are north of there, but that only lasted, I don't know now, just a few months, and then we got back into New Guinea, because we were moving westward on New Guinea. What MacArthur was doing was skipping. We skipped the, if I can recall, the whole sixth army of--I guess it was the sixth--Japanese army between Finschhafen and Hollandia. The Dutch had the western half of New Guinea--I don't know whether it was half--and the Australians had the southern half. So we went from Finschhafen, which used to be German, to Hollandia, which is in the Dutch part of New Guinea. And the fifth or sixth army, or whatever it was of Japan, was trapped in there between the two, and they couldn't survive because our Navy kept them from being resupplied. And, of course, we had air superiority then. So then we went from there and we got another island, Biak. It was the last island we got in the Dutch East Indies, and then we went into Leyte.

And my job then was to train these people, these kids, to go into Leyte, three days before we landed. And we took them in with a sub.

TC: They were sort of an advance team?

PL: Yes, they were there to provide radar information for the landing. By that time, we had little tiny backpack radar.

TC: Oh, I see.

PL: And if the radar didn't work, they were to send signals back to the Navy, so that they would know what they were seeing.

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TC: Anyway, we were talking about the war winding down. When the bomb was dropped, was it fairly short order before you were sent home? I know there was pretty rapid demobilization in some areas. How about you? Did you get reassigned right away, or did you have to stay in for a time?

PL: No, we obviously couldn't all come home at the same time, so they had a numerical system. Everybody got a certain score, depending on . . . oh, I don't know what all the criteria were. But, basically, it was length of service over there. So you were assigned a number, and the ones who had been there the longest, basically, got to come home first. I wasn't there very long after the war ended. As I recall, I came home in November of 1945.

TC: Did you have any contact with any of the native peoples? The New Guineans, the tribal people, like in Trobriand?

PL: Oh, yes, yes.

TC: What was that contact? Was it trading?

PL: Trading, yes. They wanted stuff that we had and they were willing to give us things like bananas and work. They wanted to build things for us, and in the Trobriands, they built our houses. They didn't build houses for us. They built our mess hall, for example. They would make a thatched-roof mess hall, just a roof and poles, like a pole barn over here.

TC: Yes.

PL: And some tables. They didn't speak very good English. We were led to believe that they weren't very smart. Maybe they weren't. I don't know.

TC: Probably in their own ways they were smart, but, here they were facing an entirely different way of living, way of operating.

PL: Oh, yes.

TC: It was heavily mechanized and regimented. It wasn't at all, I guess, like what they were used to.

PL: They were friendly. I mean, I remember when we went to Kiriwina (an island in the Trobriand group) to decide where we were going to site our radar sets. There were maybe two or three natives who were going someplace, maybe fishing, and, I guess, from fear, they would hand us their bananas.

TC: Oh, yes? (chuckling)

PL: (chuckling) Probably they were afraid that we would hurt them or something, I don't know.

TC: Well, you talked about the Japanese planes strafing, did you see any other action?

PL: Well, bombing. I never got involved in shooting. Of course, we were always prepared. We were there alone.

TC: So, when you returned stateside, where was your point of separation? Was it Oakland again?

PL: Well, I think we landed in Oakland. Anyway, it was in the Bay Area someplace.

TC: Yes.

PL: And then they hauled us up to Marysville, [California] for some reason. Anyway, there was an Army facility there, and that was one of the places where California people were . . . Everybody was sent to their state. I was from California, so they . . .

TC: Oh, state of origin. Then you'd be discharged that way.

PL: Yes, right. Although I went into the Army from Nevada. We were asked, I think, where we wanted to go.

TC: Well, did you have any thoughts of continuing on with the Army?

PL: Well, they asked us that question and I didn't. (laughter) No, they tried. They wanted us to stay in the reserves. They had some thoughts. As I recall, you probably could have stayed in. I think we were asked. The important thing was they wanted us to stay in the reserves, so they tried to do that, and I told them I'd think about it.

TC: And you didn't?

PL: I didn't.

TC: So then you came back?

PL: It would probably have been better financially to stay in the reserves but you would have to do some service once in awhile.

TC: Sure, yes. Well, then you went back and reclaimed your job with Reclamation?

PL: Right.

TC: And you were with them for another several years before . . . ?

PL: Not very long. Let's see, I came to the Department in June of 1947, and I finally went back to work for USBR, I think it was February of 1946.

TC: Oh, February of 1946, you went back to Boulder, yes.

PL: Right. But I was out. I think I got back to the States and it was still in November, I believe, or about the end, probably the end of November. I got married in the meantime and I was in no hurry to go back to work. I think we had six months, or something like that, to reclaim our job.

TC: So when you went back to Boulder, you were able to live in a married housing type of situation then?

PL: Yes, only it wasn't one of the good ones. They had nice brick houses, but they were all occupied, so we had low priority. They didn't have any, so we were on the list to get one of these houses. At first, a person had to live in an apartment. Finally, they assigned us a temporary shack.

TC: Had Boulder City changed a lot during the war? I suppose there was probably some growth there.

PL: Very little, very little. It changed, in that they changed the structure of the government operation. They established a region, and I don't remember when this was established. I don't think it was established before I left, but, anyway, there was a regional headquarters. And the dormitory that I used to live in was no longer a dormitory. It was converted

to an office building for the regional headquarters, not that that matters.

TC: Well, what was the social life like there in Boulder? Was it a fairly active social life? Did people go to Las Vegas and things like that?

PL: It was the only place that you could go, Las Vegas. I mean, for that kind of activity. They did square dancing, so my wife and I did square dancing, along with other married people. But before that, when I was single, all the fellows would just go to Las Vegas to the nightclubs and such. There was no liquor allowed on the reservation. Boulder City was . . . There was a place called Railroad Pass. Have you been there?

TC: I've been to Boulder City, yes.

PL: Well, Railroad Pass is still there, about, what is it, four miles toward Las Vegas from Boulder City. Where the railroad eventually passed, they called it Railroad Pass, so there was a place there that had dancing every Saturday night, and the people would go there. It was much closer than going to Las Vegas.

TC: Well, when you got back there for your second stint with Reclamation, did you pick up the same sort of duties of working on the generators?

PL: Well, no, they weren't building anymore then. No, I didn't, I worked in the office in Boulder City most of the time, as I

recall. Well, certainly, I was working there in the office before I transferred, or before I quit.

TC: In what capacity in the office? What was your job there?

PL: They called me Assistant to the Director of Power. The Director of Power was the guy that was in charge of operation of the government part of the whole operation of the Hoover Dam. It was actually operated by the City [of Los Angeles] and the Edison Company, so we had nothing to do with that. But we would do the billing, the government would do the billing. It was kind of complicated, so it required an engineer. We did that, but that was a relatively trivial duty.

TC: Yes.

PL: But I did whatever the Director of Power chose to assign me. For example, they were getting tired of collecting telephone bills. The government had their own telephone system. All the government employees had government telephones, which were hooked up to the Southern Nevada Telephone Company and so forth. So he wanted me to get rid of all that stuff. He said, "Go talk the telephone company into doing all this stuff themselves. Negotiate this deal and get rid of it. We don't want to do it. We're doing work for them." So I did that. So I got rid of the government doing work for the telephone company. (chuckling) And I think there were some other things that he wanted me to work on, some of the maintenance items of the government structures, those big towers that you

see in the lake there, the intake towers. He said, "We're going to have to get those gates out of there. Can you decide and figure out how we're going to do this, without shutting down . . ." I don't remember all the details. There was an exhibit building there that they decided to build. I don't know, it's near the canyon wall.

TC: Yes, it's still there, I believe.

PL: Yes, right.

TC: They have a big, big map and they have lights on different sections of the map and they have either a taped voice or somebody speaking about the thing, and the lights will focus on certain aspects of the map.

PL: Right. So I didn't have anything to do with that directly, but there was not enough power in the area, so he wanted me to decide how to get power there. So I had to tell them where to drill a hole in the upper part of the dam there to get the power there from wherever it was.

TC: Well, did you ever have any kind of contact with the Department of Water and Power personnel who were in Boulder?

PL: Always.

TC: Always?

PL: Oh, yes. Well, as a test man, by the way, I worked for the government. The Department had engineers, test engineers, too. We always worked together on all this. Always, I mean, anything that the Department was interested in, they had their people work with us, so we worked as a team, actually. It

wasn't independent. There were some things that we did that the Department was not involved in.

TC: So how were you approached, or did you approach the Department about transferring or, you know, jumping to them?

PL: Oh, no. The Department was Civil Service. You take a test.

TC: Yes.

PL: You'd just take a test. And several of us decided to take the test. And as a matter of fact, I tried to transfer to the USBR Denver office, to the Design Office. I went to talk to Denver, to the design engineer, and he said, "Sure, just come on if you can." They wouldn't let me go.

TC: They wouldn't let you go? That's where Jim [James L.] Mulloy was, wasn't it? He was in the Denver office about the same time, I think.

PL: Well, he's younger than I am. He probably told me this. I did not know Mulloy in the government, and he might have been there while I was at Hoover, I don't know.

TC: Well, how long did it take for you? You took the Civil Service test.

PL: Right.

TC: And did you have to come to L. A. for that, or did you do that in Boulder?

PL: No, they would do tests in Boulder because they had so many employees there, and they gave this test for Assistant Engineer there. And I'm not sure that they gave any higher ranking, but they would have other tests, operator tests and

so forth, but I wasn't interested in those. I was interested in the engineering series, so I took the test just for the hell of it, really, to see what it's like. I had never taken that kind of a test. I didn't know what they asked. I didn't do all that well, but did well enough to be called, evidently.

TC: Yes, I guess so.

PL: So the people came up there. I think I turned down most of the things that came up, and, finally, there was a job that they came to talk to me about, about relay testing on transmission lines. I thought, gee, that's some area that I am weak in. I should take that, so that I could get a feel . . .

TC: What were some of the other jobs that were offered?

PL: Oh, I think one of them was in the drafting room. I was not built to be a draftsman. I never did want to do that kind of stuff. One of them was, I think, in the rate section. They had engineers in there, too.

TC: So, by this time, it's into 1947.

PL: Nineteen forty-seven, yes. So I don't remember when I took the test, but it wasn't in June, it must have been sometime that spring.

TC: Prior to that, yes.

PL: And it takes them a little while to . . .

TC: Obviously, you said you had contact and you knew people, Department personnel there, how about the Department's

reputation? Was that a factor in your interest in going to work for Los Angeles?

PL: (chuckling) I don't know that I . . . Well, it obviously was. I don't think I would have gone to work for them, if I . . .

TC: Because, I mean, it was quite a thing, I suppose, to have the transmission line from Boulder City to Los Angeles. That was a first in transmission.

PL: It was. It was the highest voltage level. It was big. And the Department did all that work at Stanford.

TC: Yes, right.

PL: The Department built the laboratory at Stanford, actually.

TC: Yes.

PL: So my objective was not to go there because of that. I mean, that's why I'm having a difficult time answering your question.

TC: Okay.

PL: But it did have something to do with it, because I did want to work for such an organization.

TC: Did you have any feelings on the whole municipal versus private competition, or at some points, antagonism that existed at the time? I know somebody like E. F. Scattergood was such a spokesman nationally for municipally-owned systems and spent a lot of time protecting them from encroachment by private companies. Were you very much aware of that difference?

PL: Let me put it this way, I was aware of some of it. But when I was with PG&E, I talked to my superiors there about going to work for the Bureau of Reclamation. Believe it or not, why, they were realistic people. I mean, they told me that probably a good thing to do was to get the experience where you can. I mean, they weren't advising me, really, because it was a government thing and that I should avoid it, you know, nothing like that. So I didn't have that. I didn't get that from PG&E. There was no antagonism with the people I worked with. I mean, there may have been in other . . . you know, lawyers or something like that.

TC: It could be, too, you know, that that antagonism has sort of come down in the history and in the literature as something that was a real factor. And maybe it's an overblown idea. Maybe it wasn't that much of a . . . I mean, maybe, as you say, in certain areas they may have been at loggerheads.

PL: Well, I think it existed. See, the Department and Edison used to fight, and there were people at Edison, even when I was here, that probably felt that way. But, for the most part, they were realistic. There was a lot of cooperation between Edison and the Department, although I think that they would . . . Well, we had a guy that was in a car pool. Edison took over Cal[ifornia] Electric. It was not a private versus public. It was a private versus private, the same thing they're doing with San Diego.

TC: Yes.

PL: But my point here is that this guy in our car pool did an operation, just like in the Army. They went out and built a transmission line--I forget how many miles it was--to serve one customer in Desert Center, [a small town between Indio and Blythe, California], to actually get into Cal Electric territory in there, to help them take over, to break up the Cal Electric system, in effect. He spent, I think, \$200,000 to do that. He didn't tell us beforehand, but after he did it, and he got caught. He had about five more poles to put up, and the deputy sheriff came and handed him an injunction. And he thought that they couldn't get a judge to issue this injunction on the weekend, so they were out to do things like that, anything they could do. They were realistic, is what I'm trying to say. They would do anything to get another private utility. And, no doubt, they're doing the same thing with San Diego now, you know. (chuckling)

TC: Yes.

PL: So it was there, no doubt, but it was just unrealistic to do anything about the Department, so you cooperated.

TC: Yes, yes. Well, you were here only for a matter of months when . . . Well, Scattergood died in November of 1947, but, by that time, of course, he was Advisory Engineer. But, apparently, he was here every day, you know, in the old building every day. He has been one of the unsung, I think, figures in the history of the utility industry. I think he

did amazing things. But were you aware of his stature as a leader in this field and that kind of thing?

PL: Well, I'm not sure that I was aware of everything, in particular, I suppose nationally, but I was aware of the fact that he was the Department Power System. I mean, it was just one man.

TC: Yes.

PL: I mean, he built this thing, if you will, singlehandedly, and I was aware of that before. I met him.

TC: Oh, did you?

PL: Yes, he came to the ten-year celebration of when the first switch was turned on, or whatever it was, in 1946. It was 1936 that Boulder power came to Los Angeles; and then they celebrated the event in 1946 and Scattergood came to Boulder City and visited the place, so I met the little guy. (laughter) The little guy, but he was big.

TC: Well, was he a small man in stature?

PL: Yes.

TC: I've seen pictures of him, but never really with anybody else.

PL: Yes. (laughter)

TC: Yes, he looked something like a professor.

PL: Well, I guess he was.

TC: Well, he was, yes, actually.

PL: He was a professor at--I was told this--New Jersey, I believe, and he came here for his health, because a doctor told him

that he shouldn't stay there. I guess he had some kind of a . . . I don't know whether it was asthma.

TC: Yes. He was in New Jersey, yes. He went from New Jersey as a young electrical engineering professor. He was at Rutgers. He went to Georgia Tech, and then from Georgia Tech he came out to California.

PL: Well, the story is that he came here for his health, that the doctor told him . . .

TC: For his health, yes, yes. I have never found out what it was exactly, but perhaps some mild tuberculosis or something, that he needed to get away from that damp climate back east. Yes, he came from a farm family in New Jersey.

PL: Oh, I didn't know that. I didn't know that.

TC: Yes, a Quaker farming family.

PL: Oh?

TC: Yes, and he kind of broke ranks and became an engineer and went to college. His brothers maintained the farm and he went off into . . . But I think he maintained that Quaker attitude of service, and so, you know, he saw what he was doing with the utility as being a kind of social service that he was providing people. Yes, he had a sort of a social engineering viewpoint, as well as being a technician.

PL: It's hard to understand an engineer going to such great lengths to do what you might call extra-curricular activities, you know. An engineer builds things, and here is Scattergood doing some other kind of building, which is not, strictly

speaking, you know, engineering. He wasn't building a machine.

TC: Yes, that's what I mean.

PL: He was building something here that was entirely different. And I was aware of it. I mean, the people here were Scattergood lovers, if you will. (chuckling) But they knew, they knew this. I mean, of course, we knew it, well, secondhand, if you will, primarily, up there.

TC: Well, as soon as you got offered the relay testing job, then you took it and moved? Did you move immediately to Los Angeles, or did you stay with the facility in Boulder City?

PL: No, no, I came here. No, the job was here.

TC: The job was here.

PL: No, they had people up there, but I did not take the job. There wasn't any vacancy. Well, there was no such job directly. The guy up there, the resident engineer had an assistant or something, but they were doing maintenance testing primarily.

TC: I see.

PL: And they cooperated with the government engineers there, with construction activities.

TAPE NUMBER: 2, Side B

June 11, 1990

TC: So you came here as a relay tester. Now, what is that exactly? Could you define and describe the actual work of that? I know protective relaying is a means of more or less troubleshooting and making sure that nothing is breaking down. Is that correct?

PL: Well, every transmission line that you see out here has relays, what we call relays. They're devices that measure something on each end of the line. And what they're doing is measuring the current flow through the line, basically.

TC: Okay.

PL: It's power flow and current flow. Different relays do different things, but they can detect them. If the same power goes out of the line as comes in, the relays signal back that the line is okay. So, even though you get high currents flowing through the line, the line is okay, and the trouble is somewhere else.

TC: Okay.

PL: So, in other words, they can detect, basically, if the power comes in from both ends. Then there's a problem on that particular line, take it out, so it opens the switches on both ends of the line. Okay? So this is what we were charged with doing in relay testing on the transmission lines. We'd go into a station and we'd take the line out of service. We

would test the relay, each one. We would pass current through the coils of the relay to see if it would actually trip when it's supposed to, and then we would go to the other station and do the same thing. We also had to test the connection link to make sure that the signal was going between the two ends.

TC: Yes.

PL: There's some radio frequency communication on some of those on telephone wires, and we would check the wires and the radio to see that the two ends were communicating and that it would work properly.

TC: Well, would there be somebody there sort of watching this at all times? Or was it an automatic device?

PL: Automatic, provided that we . . . That's what we did. We would actually take this thing out of service, though, so that we could actually make it work the way it's supposed to.

TC: Okay.

PL: Simulate it, if you will, because you can't do it . . . we can't produce what they call a fault, you know.

TC: Yes.

PL: If a wire drops down, large currents flow there and the relays detect that, and they decide where that fault is.

TC: That fault is a short, a short-circuit?

PL: A fault is a short, yes. Wires touch each other or wires that touch the ground, or whatever.

TC: So you were relay testing, in order to make sure that the protective system was in operation. Did you ever have any situations where there was a failure somewhere and you had to be there on the spot or attend to it in order to minimize any of the problems?

PL: Not really, no. If the thing didn't work properly, you know, the wires cook, and just burn up, eventually.

TC: Oh, yes.

PL: And, of course, that could happen and it has happened here and there. But that happens almost instantly, you know. It just takes a few seconds for the wires to disappear. By disappear, I mean, they disappear in the vicinity and you don't get all that much damage. But it's pretty rare that . . . I think we have lost some copper that way, but I don't recall losing any while I was there.

TC: Who was your supervisor in this? Was this Power Operating and Maintenance Office?

PL: Yes. It still exists. It's over on Main Street. My supervisor then was a guy by the name of Walter Arnold, but he's long gone, passed away years ago.

TC: So did you work out of that office at that time, when you first got here, in 1947 or 1948, that period?

PL: Yes.

TC: Was that on Main Street? Were you in the main building or did they have a separate office?

PL: Well, there was a facility there. I don't know whether it's there now or not. You know, they've built up that facility considerably.

TC: Yes.

PL: But there was a building there that was . . . Well, they had what they called Station Test. That was under [Power] Design and Construction. Their job was to do a similar thing to what I did in Boulder City, in new construction. They would test all the stuff that's being constructed.

TC: Oh, I see, yes.

PL: They were in one building and we were in another building at that time. They may be in the same buildings. There was no reason for them to be in a different building, but they just happened to be different buildings that we were in at that particular time. But I very rarely worked in that. I think I did for a little bit, just to get the feel of what we were doing. And I would go out, I would actually go out in the field every day, basically, driving.

TC: I see.

PL: We had a little . . . it was a panel, that had test equipment on it, and we would haul it to a station.

TC: So you were looking at receiving stations, distributing stations?

PL: Yes, everything.

TC: And generation points, too?

PL: Yes, the whole works. But, see, there are more distributing stations than there is . . . Next to the receiving stations, there's quite a few of those, but not as many as distributing stations. And generating stations are relatively few, so you would just do them once in awhile. See, you'd test the relays, and, as I recall, we did it every six months.

TC: Oh, really?

PL: I think. I may be wrong, maybe it was only some that we did, and some we did every year. I don't think we did the distributing stations once a year. But there were several crews. I did receiving stations, generating stations. I did all of them, but mostly distributing stations because there were more of them.

TC: More of them, yes.

PL: But they wouldn't make us sit in a distributing station, you know. They were the simplest and the receiving stations were considerably harder.

TC: Yes.

PL: And they were a different kind, more complicated relays. The relaying system in those days that was the most sophisticated, and I guess it still is, was on the Boulder Transmission Lines. So the big transmission lines have them more. You're protecting a bigger investment, if you will, and it's more important.

TC: How different would it be? More sensitive, you know, to the flow?

PL: Well, I think it would be more reliable, more sensitive, if you will, in that the bigger ones have the radio frequency transmission, which costs more, and things like this.

TC: Yes. Well, if it weren't radio, what would it be? Like some kind of phone line?

PL: Yes, a phone line. They'd actually use telephone line. Pilot wire they called it.

TC: Pilot wire, okay. I've heard of that.

PL: But they're telephone lines. (chuckling)

TC: Well, when failures did occur, what would create those?

PL: Every time it rained, the pilot wires would fail. (laughter)

TC: Oh, yes? (chuckling)

PL: Someplace. And that's what I had to do. For example, there was a failure. They'd get a signal in the distributing station, and the pilot wires were from a receiving station to a distributing station; and the pilot wire would fail and they would get a signal and so you'd have to go and check it. And you'd do that on overtime, six o'clock, anytime, midnight or whatever, depending on what happened. So you were on-call to do that kind of stuff. And every time it rained, some pilot wire would go. So you'd have to go over there and then change it to a good one, and then report what you did so they'd go fix it. Just like a telephone man would go find it, then he would fix it, fix the fault and tape it.

TC: Yes. From 1947 into the fifties, what were the main generation points there? We had the Harbor [Steam Plant] . . .

PL: Harbor, Hoover.

TC: Hoover, Seal Beach [Steam Plant], if that was even . . . Maybe that was decommissioned by then.

PL: Oh, I think Seal Beach, too. Seal Beach was barely used, I think, even in those days, but we did use it some. And so I worked on Seal Beach. Maybe I was the last one that ever worked there, I don't know. I think I was there maybe once.

TC: And you wouldn't have gone up to the [Owens River] Gorge plants. I guess they weren't on line when you were doing that work.

PL: Not the Gorge plants. The Gorge plants came later. There were plants up there.

TC: Oh, there were power plants there.

PL: I went to the ones down here.

TC: Power Plant Numbers 1 and 2, San Francisquito.

PL: Yes, I went to those.

TC: So every six months everything would be checked? Is that the idea? So that you were on this constant revolving kind of . . .

PL: Constantly, yes. But I wouldn't necessarily get the same thing all the time. And then Harbor, of course, I probably went to Harbor more than once. I don't think I went to Seal Beach more than once.

TC: Well, how long did you stick with the relay testing?

PL: Not all that long. Maybe it was three years or so, something like that.

TC: Maybe we could just finish up with talking about where you went next. That was the Statistical Section, right?

PL: Yes.

TC: Of PO and M [Power Operations and Maintenance].

PL: Right.

TC: And you were with that section for how long? A number of years, correct?

PL: I was there quite awhile. That's right.

TC: I have it somewhere. In fact, I guess, even up until, say, the sixties. But I know that the Statistical Section . . .

PL: Right. I was going to say mid-sixties.

TC: Yes.

PL: I stayed there so long that I finally was the head of the group. (chuckling)

TC: You were the head of the group. Well, when you first went in, first of all, what were the circumstances of transfer to that? Was that a promotion?

PL: Civil Service test.

TC: Yes, was it a promotion, though?

PL: Yes.

TC: A promotion. And the job title was what? Can you remember that?

PL: Well, I don't think we had such a thing as a job title. I think there were just Associate Engineers.

TC: Was that Carl Kist's office?

PL: I was under Carl Kist, yes.

TC: Okay.

PL: He had the whole works.

TC: Yes.

PL: When I went in there he had it, and then there were two sub-groups. One was under Wermuth, that I was under. Everett Marine was the other one.

TC: Oh, okay. Two sub-groups. Engineering Studies and Statistics was one, and the other one was Equipment Maintenance Records and Trouble Analysis.

PL: I don't remember the names. Roughly speaking, that's right. I don't know where Statistics is. You see, we were primarily . . . No, wait a minute. Then it was organized in current statistics, basically, the meter readings. All the meter readings flowed to one part. I had nothing to do with that.

TC: Okay, okay.

PL: Nothing whatsoever to do with that. I was involved in the stuff that had to do with operation of the system: Make sure we wouldn't run out of fuel.

TC: Oh, okay. Well, when you talk about statistics in this way, what statistics? Were you generating statistics or strictly interpreting what . . . ? You know, I don't quite understand what the statistical aspect of this section was.

PL: Well, I'm not sure that . . . I think it's a misnomer. It used to be called that, it's not anymore.

TC: I see, okay.

PL: It's called Operating Engineering.

TC: Oh, I see.

PL: But the statistics were just the practical stuff, the meter reading. They would read the meters, every generator . . .

TC: Okay. So it really would be gathering and keeping account of the use.

PL: Yes, the operator reads the meters and all that stuff. They put them on a sheet of paper and they read it every hour.

TC: Okay, okay.

PL: All the meter reads. They do this on all sorts of things, on water reservoir levels and meter reads and failures. If a circuit breaker fails, or whatever . . . I don't know why, I probably missed a lot of these things, but all the generation readings went to one group. The equipment records went to another group, which was under . . . What was the name you gave?

TC: Equipment Maintenance Records?

PL: Yes, those things. Those things went to another group.

TC: Okay.

PL: See, they're statistics relating to equipment and maintenance and failures and things like that.

TC: I see.

PL: So we were able . . . Well, we needed that stuff. We actually, my group, actually used that stuff to decide or determine, or help us determine, how much generation we would need.

TC: Yes.

PL: We would know from the failure rate of the generators. That's the main thing that we were interested in. If certain types of equipment were failing, they would come in there and look at that stuff and decide whether they'd want a different design of circuit breaker or whatever it was.

TC: Okay, yes.

PL: And the records were all there, but I didn't have anything to do with that kind of stuff. The designers wanted to know that. But my job when I was there, or part of my job, was to help decide how many generators we'd need, you know, because that is a probabilistic thing. It's a mathematical problem that you solve and you decide. (chuckling)

TC: Well, did that have something to do with your going to SC? I mean, because you have to know something about probability and combinations and permutations, I guess . . .

PL: Yes, right, but not directly. I went to SC because I love mathematics. I should have been a mathematician. But when I was in college, all the mathematicians there wore baggy pants, and I said, Jesus, I didn't . . . (laughter) I didn't want to do that.

TC: You didn't want to be associated with them.

PL: Yes, right. (chuckling)

TC: Well, I know it's a complex subject, but you must have been in on just getting some of the numbers, the hard facts, for how many generators to put in at the Valley Steam Plant and the new thinking that was going on in the fifties as to how to build up the generation capacity for this system, because it was mostly hydro prior to that. In the late forties, early fifties, DWP started getting into more steam.

PL: That's right. See, there was a tremendous difference in what we call outage rates. An outage rate of a unit is basically the fractional part of the time that it's not available for service. That's a simple, not very technical definition.

TC: Well, that's good, yes.

PL: Roughly speaking, that's what it is. In other words, if you want it and it's not there, it's out. A forced outage, that's what they call it. We used that to calculate what level of generation. I say level. It ultimately turns into . . . You build something, I mean. But see, it also depends on the size of the generating unit, because, for example, if you had one unit supplying the whole thing, if that's out, the whole city is out. Well, if you had two, then if one goes out, well, the other one is still working, you see. So it does depend on the size of the unit, it depends on how often the thing is out. And this is the problem in combination with probability theory, and so you have to solve that, and ultimately you'll get an answer to help you decide what unit sizes you're going

to choose for the system. So we were growing. We had little units at Harbor and then we had bigger and bigger and bigger units. Because as the system grew, we could tolerate larger sizes.

TC: Yes.

PL: Of course, it's better to put little ones, but then they cost more. The unit cost of the little ones is more than the big ones, so we would sort of compromise between them. And we were doing all that stuff. Our people were doing this, and they're still doing it here.

TC: Well, would some sort of instruction come down from the Chief Electrical Engineer's office saying, "Okay, give us these figures," and then you'd do that? Or how was it that you got your assignments?

PL: Well, it was different as time went on. But the instruction basically got broader and broader. Of course, I was the head of this [System Development] Division when I left.

TC: Right, right.

PL: And my instructions were pretty general. I mean, the instructions to me. But let me go back a little bit, getting back to the history of this whole thing, using probability theory for this purpose. The hydro units are much more reliable than steam. There's a lot less to go wrong. They just stay. They're almost never sick. The steam units seemed to be sick a lot, so there's a difference, and people knew that. So people in the East, particularly, I think,

Consolidated Edison New York, or one of the utilities that pioneered in this, and our Chief Engineer at that time of the Power System, Bill [William S.] Peterson, heard . . . He was at an AIEE meeting, American Institute of Electrical Engineers, heard what he thought were some excellent papers on using probability theory for this. And he knew we were going into steam generation, so he came back and issued an order that we study this business. And the job was given to the then Statistical Section, to study this and give a report back. And I think, just as an aside, I mean, the first answer was that we're doing fine the way it is. (laughter) We don't need to do that. And he said, "That isn't what I asked you to do. What I asked you to do is: How should the Department adopt this probability method in its future generation?" Which is a little bit different from what they interpreted.

TC: That's funny. So it fell to you then to . . .

PL: Well, I wasn't there. That preceded me, but not by much. So they were working, other people were working in this area then. They had decided how to do it and I was involved a little bit. And Carl Kist wrote a paper on this, on the way we were . . .

TC: Oh, I ought to try to track that one down.

PL: I think it was published in 1956.

TC: In the proceedings of the . . .

PL: American Institute of Electrical Engineers.

TC: Okay. I'll see what I can find about that.

PL: There's a guy by the name of Jerry [G. J.] Thomas who was working on this, in this area, and he actually worked on it before I ever got into the Statistical Section. And he was working on Carl's paper, as a matter of fact, and Carl Kist said that he couldn't communicate very well with Jerry Thomas. So he asked me to get involved in reviewing what Jerry was doing. And he said, "Whatever you guys decide, I know it will be okay." So that was my first inkling or first exposure to the whole business of using probability theory in power generation. So I reviewed that, and so the paper was published and does exist. So the paper was basically Jerry's thinking, with my help, if you will. (chuckling)

TC: And Carl Kist's signature.

PL: Yes, right.

TAPE NUMBER: 3, Side A

June 18, 1990

TC: Last time we spoke, we left it at a brief discussion of a paper that Carl Kist presented or published in the *Transactions of the AIEE*. And you talked about having been associated with that paper, which was entitled, "Probability Calculations for System Generation Reserves." I found that paper. We mentioned last time that it was authored by Kist; but, as we see here, and as we were mentioning off tape, it was also co-authored by Jerry Thomas. So my first question is, was this paper the one you were referring to? And I think off tape you mentioned that it probably is the one.

PL: That is correct. This is the one, co-authored by Jerry Thomas.

TC: In the intro, the authors mention that . . . You could even look at the intro there if you want, it's just the first sentence. The authors mention four papers presented in November 1947 on the application of probability methods presented to the AIEE meeting in 1947. Then they say that this motivated a study at LADWP to investigate the use of probability theory. Now was that where and when Bill Peterson would have gotten turned on to this, as it were?

PL: That is correct. Actually, Bill Peterson attended this AIEE session and he brought back, I believe, all of these four papers. I was not there.

TC: You weren't there at the time?

PL: I was told by Carl Kist, as a matter of fact, that he brought back papers from that convention, and I believe that these were the ones.

TC: Okay. And those four papers were written by [Giuseppe] Calabrese, [W. J.] Lyman, [Howard P.] Seeley and [E. S.] Loane and [C. W.] Watchorn. I am wondering if we could generally summarize what this paper is dealing with. I know that there are a lot of calculations and whatnot that we can't really go into in any detail. We touched on it last time without going too deeply into it, but, just in terms of the main argument, what was the upshot of this?

PL: The paper actually discussed basic probability theory, and the purpose of that was simply to lay out the foundation, which would be used later in the calculation and the use of probability in power system reliability calculations.

TC: They said, again, in the introduction, that this was a product of about eight years of . . . or looking back at eight years of statistics that had been gathered on . . . was it outages? The frequency of component outages?

PL: The purpose of looking back at eight years is that we know that it's impossible to design a perfect system. So in the use of probability theory, nothing is perfect; you're dealing with chance, there is a certain chance or probability that the system will not perform at any given time. So you have to assign a probability, if you will. It's not called that.

It's called an index of reliability. You want to know what your objective is going to be, how good are you going to be. You'd love to be perfect, but that's impossible, so you want to assign a number which is called index of reliability, actually introduced by some of these other papers. And that eight-year study was a study to determine that number. That number was then determined, or they said, they concluded that we wished to operate the system as well. We wished to have a reliability that is as good as we have accomplished in the past eight years. So that's what they were doing, is establishing that number. And, see, we were going from a hydro system, which is basically good, basically reliable, but not perfect, into a steam system where you're going to have more outages of steam units and units that are less reliable. And you want to have some way of measuring how many of those units do you want, so that the system would satisfy certain reliability criteria. And this then reduces to a number, and this is what they were looking for: What should that number be?

TC: Yes. And was this then actually applied to what was happening here?

PL: Yes. It was applied here to determine how many, for example, steam units we were going to require at Harbor [Steam Plant] and when they were going to be installed.

TC: In 1947, this probability thinking is introduced, or at least I know it existed before within mathematics, you know, as a

field; but this seems to be a watershed date, 1947, of it becoming discussed in utility gatherings or electrical engineering gatherings. Now were other utilities, to your knowledge, beginning to think in these terms? Or how unique was this work that Kist and Thomas and yourself were doing?

PL: Well, these other four authors are from four different utilities. I've forgotten . . .

TC: Yes.

PL: I think Calabrese was from New York. The others, I think there was one from Pennsylvania.

TC: Yes. So, in other words, this was . . .

PL: There were a few utilities, not all.

TC: I guess I'm trying to get at, this was kind of a revolutionary thinking? Was it the latest thinking on the matter?

PL: Well, certainly, it was. It was new.

TC: How were the calculations made? You're dealing with eight years worth of numbers. Did you have any kind of computing device to help you calculate?

PL: Not really. It was primarily done by hand. I wasn't involved in that. Jerry Thomas and some of his . . . I think he had an assistant that was working on some of this stuff. We did have an IBM . . . I've forgotten the number, but it was 604 or something.

TC: Oh, one of the 600 series, yes.

PL: It was a card machine that you could actually keypunch a lot of the information and then summarize it in whatever way you

wanted. It wasn't really much of a computing machine. So they did use that kind of . . .

TC: Was that acquired after you came here?

PL: No, no, that existed in our Accounting Division.

TC: Oh, okay.

PL: The only machinery we had of that kind, IBM machinery, was in the Accounting Division.

TC: Okay.

PL: And that was all keypunch, card machines.

TC: That was one of my next areas of questioning here, the early computer uses in the Department. In my reading, I've come across discussion of system analyzers, of how automated information was applied in Power Systems. And I was wondering what, in fact, a network or system analyzer is? I've seen pictures of these huge banks of meters. Is that what we're talking about?

PL: That has nothing to do with this.

TC: Nothing to do with this, okay. Okay, fine.

PL: You'll want to defer that a little bit.

TC: Okay, fine.

PL: I can discuss that, but it might confuse this. It's an analog device. This is for another purpose. It's for transmission lines and . . .

TC: Oh, okay, okay.

PL: But this, basically . . . The computations for this early work were done by hand. The gathering of data was done on IBM

cards and so forth and summarized, but the actual computations that were shown in this paper, or done for this paper, or that were done, actually, in the Department, were done by hand. By hand, I mean, desk calculators.

TC: Yes, okay, adding machines, yes.

PL: Desk calculators have been around for a long time.

TC: Yes.

PL: Electrical mechanical desk calculators.

TC: Well, when did the more widespread use of computers come into engineering, and the Department, specifically?

PL: We started using computers here--I'm guessing now--in the mid-fifties, probably, or slightly before that. The Department acquired an IBM . . . Not acquired, they leased it. They were all leased at this time. IBM, subsequently, was required to sell because they were violating the anti-trust laws. I don't know whether you know this.

TC: No, no, I don't.

PL: It's probably not relevant here, but they used to lease all of their equipment. I don't recall when we got our first digital computer, but it was obtained by the Accounting Division, not Engineering.

TC: Okay.

PL: Well, let me back up a little bit.

TC: Fine, please do.

PL: A Computer Committee was organized by the Power System of the Department of Water and Power, and Carl Kist was appointed

chairman of that committee. I was a member of that committee. And I don't remember the date, but that committee was probably established . . . I may be able to find the date, if that's important to you. And it may be important, I don't know.

TC: Yes, I may be able to find that, too, so we can leave that.

PL: But that's the way to find this: When was the Department Computer Committee established? I was in the Operating Division and a guy by the name of Fujimura was in our Transmission group. That organization is now in this [System Development] Division; but at that time it was a part of the Design and Construction Division.

TC: Yes.

PL: But, anyway, it was felt that the Operating Division needed a computer and the Transmission Design Studies Group needed one, so Fujimura and I were sent to IBM's school. IBM provided schooling for all of their customers free of charge, so we were the first ones in the Department--other than the Accounting Division people. The Accounting Division people were, of course, schooled by IBM before. But the application of computers to accounting and engineering are miles apart, they're different, so, anyway, we learned to do that. The first use, we used the Accounting Division computer, but it was really too small to do anything. The next thing we did was we got a contract with the RAND Corporation. I don't know whether you've heard about the RAND Corporation.

TC: Yes, I know it.

PL: Yes. So they let us use their computer--of course, we paid them for it. But computer use was in its infancy then. They just let us go over there and they walked out of the room and said, "Here it is." (chuckling)

TC: Well, this was after you had taken the IBM training?

PL: Oh, yes, yes. Oh, you couldn't go over there and walk in and use the computer. And even with the IBM training, why, it required a little bit of help from the people, to know which lever to push, which button to push or whatever.

TC: With the IBM training, was that here in town? Did they set up something here or did you have to go out of town for this?

PL: No, it was at their offices on Wilshire [Boulevard].

TC: On Wilshire. And was it several days training or several weeks?

PL: Oh, no. I don't recall, but it was probably a month or so. You know, it was on that order or something like that. It was a pretty good course.

TC: And did that cover everything from programming to . . .

PL: Well, it wasn't anything to do with designing a computer, but they told you basically how the computer worked. Fundamentally, it was a computer programming course.

TC: So then it was up to you to take that information and figure out how it was going to be applied here?

PL: Yes. The first thing I did with it was to use it to operate the system economically.

TC: How so? I'd like to discuss how, actually, what steps you had to take. So you had to monitor what the system was doing. Is that correct?

PL: No, we know that.

TC: You know that.

PL: Let me back up a little bit on this again.

TC: Please do, yes.

PL: See, we got a little bit out of sync here.

TC: Well, it's one step forward and two steps back, as they say.

PL: But, see, they're different. You have no way of knowing what went on and I don't know what you're going to ask me.

TC: Yes.

PL: We put in a device in the dispatcher's office, which was called a load and frequency control. And that device did that: It controlled . . . We're getting into a technical area. It did not control frequency of the system, but it, in effect, did. It provided a mechanism for doing it. And I don't know that it's relevant. If you want to ask more questions on it, we can get into it.

TC: Okay.

PL: But this device did the load control; and, as the name suggested, it would actually order automatically each generating unit or each station to generate power, which the dispatcher previously (before the controller was installed) told the operator in the plant to provide. But this device actually did that automatically, you see.

TC: It actually did that, okay.

PL: And I actually went to each of the stations and told them that things were going to be different; and people rebelled, really, because they thought they were the only ones on earth who knew their station and that the dispatcher didn't know what they knew. So I had to explain to them how things were, that their knowledge and so forth was not lost, but the signals would automatically go there and change the output of the units, as required by the system.

TC: Yes.

PL: Okay? But there were things to set in that device, so that this would happen. The dispatcher needed a schedule. So what we did here was we made computations in the Operating Division and sent the dispatcher a piece of paper that told him how to set this device so it would operate the units for maximum system economy.

TC: Yes.

PL: There were different prices. We paid different amounts for fuel at Harbor, compared to Valley Steam Plant, for example, and the efficiencies of the units were different and all that. So, for the dispatcher, it's a big chore to calculate that, how to load these machines; but you could do it with this device, if somebody would tell him how to set the device. So we did all this stuff by hand. And the problem there was, if a unit would get sick, then you needed a different schedule. So it was hard for us to keep doing that. What we wanted was

a computer to be able to compute a schedule quickly, so that he would have a better mechanism, see. As the load increased, for example, by 100-megawatt intervals, what you would do is give him a schedule to show him how to set the things, and a bell would ring when the load increased and he'd change his knobs a little bit in accordance with what we told him. So we used the computer to calculate the settings of the controller. And I wrote a paper on that, how to use an IBM computer, a big IBM computer, to do the scheduling. And that paper was . . . I didn't consider it as *Transactions* material so, therefore, I never pressed it. I got criticized for that, incidentally, by a lot of people in IEEE for not actually getting that published in the *Transactions* because it provided the basis for using a computer. See, it's out of date now. I understood that, I knew it would be. They're dispatching with a machine, with a computer that is in the dispatcher's office. It does all this stuff.

TC: But it was the first step towards that.

PL: It was the first step towards it, yes.

TC: Where was that paper published?

PL: It wasn't.

TC: Oh, it wasn't published at all. So it was prepared but not published.

PL: I was going to present it. I forget where. I think I probably presented it in Buffalo, New York. I don't know, I presented one. I don't even remember where I did it. I did

one in Seattle, Washington. That might have been it, I don't know. It was like this. This paper, a paper with this title, a conference paper means that it was not published.

TC: Okay.

PL: But this was upgraded to a *Transactions* paper and was published subsequently, you see.

TC: You're citing the Kist and Thomas article that we were talking about earlier.

PL: Yes, right.

TC: Well, this may again be off the subject, but I did find a conference paper that you wrote in 1956, about the same time as the Kist and Thomas paper.

PL: Yes. This was a *Transactions* paper.

TC: That was a *Transactions* paper, yes.

PL: It was changed.

TC: Yes.

PL: But, see, you have to work for this kind of stuff.

TC: (chuckling) Let me just cite the title of this . . .

PL: When you present a paper, very often they schedule it as a conference paper because it looks like something that the people ought to hear about. And then the committee later decides whether it should be a *Transactions* paper or not.

TC: Okay.

PL: And, very often, you have to do something, or somebody has to beat you, to make it into a *Transactions* paper. And so that's why I say I did not think that that scheduling paper . . . I

figured that tomorrow it would be out of date. You know, it wasn't of the quality of that. That paper will be good for 100 years, you know.

TC: This one is "Penalty Factors from Power System Equations."

PL: Yes, right. That's a fundamental paper. If anybody ever understands it, why . . . (laughter)

TC: Well, I must admit . . .

PL: It's kind of a hard paper. (laughter)

TC: Yes. I wasn't going to pretend that I knew anything about it. What was the problem that this was addressing, if we could just say that?

PL: The problem that it was addressing was how to set devices in the dispatcher's office, basically, so that transmission losses would be taken into consideration. The stations had different efficiencies, so you had all these different variables to take into account. And how to introduce the effect of the transmission losses into your computations, that's tough. What other people had been doing at that time, they were approximating. They approximated the problem away. (laughter) They simplified it, but the stuff . . . it wasn't very good. This was practically an exact method of doing it, really, using some more complicated equations. It's impossible to do without a computer. So what they did, what somebody did--a guy by the name of Gabriel Kron did that--the approximation, was so that you could do it by hand with hand calculations. But the problem sort of evaporated almost, you

know, and simplified it so much, that it wasn't very good. I said, "Well, the computer is just around the corner, why not publish a paper that does it more exactly." So this was the first paper that was . . . Well, somebody else wrote one about the same time; but it was somewhat similar to this, but not . . . Of course, I'm bragging here.

TC: No, it's absolutely proper for you to brag about this because it is a . . .

PL: But it was hard to understand. Nobody understood what I was talking about.

TC: Well, it's an obscure thing but I think its consequences are very noticeable, and being able to make that distinction is important.

PL: But it's in the Tensor Society of London, England.

TC: Oh.

PL: They asked me for it, so I gave it to them.

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PL: The London Tensor Society, I believe it's called. Maybe Tensor Society of London or something like that. Well, you don't know mathematics, I guess.

TC: No, not like you know mathematics. But I think one of the ideas here is to present something in relatively lay terms, if that's even possible, at least to show its implications.

PL: It's kind of difficult.

TC: Yes.

PL: Actually, the ideas of tensor calculus, a lot of people call it, are used in there. I was not the originator of that. A guy by the name of Gabriel Kron was the originator of adapting or using tensor calculus in transmission networks. A transmission line is . . . Just one line is kind of hard to do numerically by hand, the calculations of how it's going to behave. To use a whole network of these lines that exists, for example, around the city--the big lines, I'm talking about, not the distribution lines.

TC: Okay, yes, the big lines.

PL: But when they're tied together, you've got power poles all over the place, and this gets difficult.

TC: Yes.

PL: So it's convenient to use tensor calculus to do this.

TC: Well, had Gabriel Kron applied this to electrical systems? Or was this more of an abstract or pure math kind of . . .

PL: No, no, no, he was not a mathematician.

TC: Oh, okay.

PL: Well, he didn't consider himself as a . . . He wrote me a note. I wanted him to comment on my paper--this is customary--and he wrote me a note and said, "I never comment on papers." But he regarded himself as a man with a machete going through, clearing a path through the jungle. There's a lot of things that he said he just left for others to do.

TC: How did you hear about him in the first place?

PL: He published a book, as a matter of fact. I read it. It was in the Department library and I assume it's still there. I don't know, they throw away books after awhile.

TC: Yes. They put them in storage, the books that aren't needed on a regular basis.

PL: I can tell you, I reference him . . .

TC: Yes, in the introduction you say that "the desired parametric equations of the Power System actually follow from Gabriel Kron's network equations."

PL: Yes.

TC: And then the book is referenced.

PL: I don't remember what all I said, but I know I referenced him there, and I also reference some other people. See, I used a little bit different approach to some of these things, the so-called modern algebra. I think I referenced a modern algebra

book, which I went through some of the stuff here in the appendix. Yes, *Survey of Modern Algebra*.

TC: Algebra was not so much used in these kinds of . . . You said you had a sort of different take on it.

PL: Different from what Gabriel Kron did.

TC: Oh, I see, okay, yes.

PL: The same stuff, but I had a little different, modern algebraic approach, and he didn't do it that way. It gets involved here.

TC: Yes. I'm just trying to absorb some of this.

PL: I think that's probably why it's in the Tensor Society, because they were interested in how to get this approach in their record.

TC: Was this approach taken up by other utilities, that you know of?

PL: As far as I know, nobody ever understood this. If you write something that nobody understands, why, it'll take maybe fifty or one hundred years before they . . .

TC: Well, it's really something to be before your time, too.

PL: I don't know. People didn't understand it here [at DWP]. But I studied mathematics for a long time, just at night school. I was pretty good at it in school. I took extra mathematics, but that was rather small. I took a lot of mathematics at SC and some at UCLA also, so I got a better feel for it than, I guess, practically all engineers. I can't say all, because there are other engineers who switched from engineering and

got a Ph.D. in mathematics. Claude Shannon is one. I don't know, you never heard this name, I guess.

TC: No.

PL: The guy that invented information theory. This is somewhat irrelevant, but the point is he graduated as an electrical engineer, and ultimately got his Ph.D. in mathematics. And in the process, because of his electrical engineering training, he visualized, or whatever you want to call it, this so-called information theory, a theory on information. You know, that was his thesis.

TC: That's the Shannon Theory. Yes, I know that, where you have the basic input and the noise being something that will break up that . . .

PL: Yes, right. Yes, Claude Shannon. He graduated in electrical engineering and subsequently went . . .

TC: I didn't know he was an electrical engineer.

PL: Yes, well, most people don't, I guess, or they think it's irrelevant. But I think, from an historical perspective, I think it's relevant.

TC: Very much so.

PL: Because you see how people do things. You don't do it just simply because you're an electrical engineer or a mathematician. This Claude Shannon was an electrical engineer turned mathematician, and he couldn't do that, obviously, without becoming a mathematician. That's what I'm saying. Most people don't. They thought this just came out of a clear

blue sky. Well, it didn't. I mean, these ideas just can't come out of a clear blue sky. He would have to know a little bit about transmission lines and how impossible they are in networks to handle. And then you read Kron and you find out what he did . . .

TC: It's interesting. I don't know how to put this. In the Computer Committee, say, you know, you're talking about what your computer needs are. You have a group of people . . . How many people on the committee, by the way? Do you recall?

PL: I think there were six of us. They tried to get people that represented different areas. In the Operating Division, I think we had a couple. Maybe Design and Construction had two or three, I don't remember. I think we had one from Station Design and one from Steam Design, so five or six.

TC: Well, did you have disagreements as to what the needs were? In other words, I guess you were trying to pool all the needs and come up with one item to fill all the needs.

PL: Well, I don't think it was quite that way. I think our objective or goal was to decide how we should get into the computer business. It wasn't a question of all the needs. Back up, I'll comment on that.

TC: Yes, please do.

PL: Some of the people, and I think this is quite general throughout the power industry, but the Station Design person on this committee felt that Station Design had no use for computers, you know. And I think that even the mechanical

engineers were almost of that opinion. And, yet, at the very same time, there was work going on. The committee visited a variety of local manufacturers. There was Burroughs in Pasadena, there was Calcomp down on the Santa Ana Freeway. They're still there. They belong to the Germans now, a German outfit bought them. But, anyway, these people were involved. There was somebody else, too. I've forgotten who it was. But the point is that they were involved in actually making a machine, a computing device that would run mechanical processes, refineries and things like that, and monitor the whole electrochemical process, and then do something, do whatever was necessary. And we were thinking that the steam units could be done that way more efficiently. Well, I thought that--I guess some of us did--but not the particular guy that was representing mechanical design on the committee. He thought it was not necessary to do that. They knew how to do it, they knew how to monitor and all that stuff, see. So you had this kind of stuff. So for us to get a consensus--two people on the committee--I was one of them and Fujimura was the other in the Transmission Studies Group--felt that we had inadequate computing capacity to actually do what should be done in our areas. You know, we actually used computers. And there are a lot of things that came later in computing systems, you know. You have automated drafting and things like this; which, incidentally, I think Calcomp went into. The Germans took over there, I guess, because this was a

primary . . . I guess they're the world leaders. If they're not, they're very close to the top in that area.

So, anyway, those things came later. Well, at first they used vacuum tubes and, you know, they weren't sufficiently reliable to do some of these functions until the transistor came along.

TC: Yes. Did you ever see any of the old vacuum tube models at work?

PL: Oh, yes. Yes, that's what the IBM 704 was.

TC: Was it? Oh, okay.

PL: Yes.

TC: So transistors came in in the sixties, then?

PL: I don't know when they were first used. They were first used in the large computers. With the computers, instead of growing, they got smaller and smaller as time went on.

TC: Yes.

PL: But, roughly speaking, you're right. I can't remember the exact date.

TC: This has to do, too, with when you met with rebellion at the stations and the committee people saying, "No, we don't need this kind of new thinking." Was that just basically the way people tend to respond to new technologies? Do you know what I'm getting at here? You know, it takes time . . . Several people can have an idea, but it seems to take a lot longer for everybody to get the idea and to move along. I mean, you turn around and you see the terminal and the computer keyboard

right behind you, and it's just so ever-present, and it's hard to think of it as one time people being very much opposed to any kinds of . . .

PL: Oh, yes. And I think there are still a lot of computer jokes, you know. Everybody blames the damn computer. And it wasn't the computer that made the mistake; it was the person that made the mistake. But they still blame the computer.

TC: Yes. Were you an anomaly, then, in your group, or in the profession? You know, that you had such an interest in and understanding of this, or is it just the case that some do and then there's a lag and others come along over time?

PL: Well, a little of each, I suppose. I think in the plants there was a fear of, you know, losing jobs and all kinds of things. I never worried about that. I'm not sure that the people were. I don't think that the engineers within the Department had that type of concern, that somehow or other this thing is going to take their job away from them. I don't know now. It's hard to look into somebody's psyche. But it certainly is, when you're talking about non-engineers who were the operators in the plants.

TC: Were those guys in the union, the IBEW [International Brotherhood of Electrical Workers] or the Architects and Engineers?

PL: Architects and Engineers was engineers.

TC: The engineers, okay.

PL: But they [the operators] were in the [IBEW] Local 18.

TC: Yes.

PL: So I can't speak with great authority on that.

TC: Well, you said you faced . . . You know, you had to explain to them what the . . .

PL: Oh, yes. Well, that was the purpose. I didn't go out voluntarily. I mean, I was told to go out.

TC: Who told you to go out?

PL: Well, the boss. I was in the Operating Division, and the Operating Division decided that we needed training. That we had to go out, that I ought to go out. See, I was the guy that was involved in it. As a matter of fact, even to get this Leeds and Northrop load and frequency controller, there was opposition here. People thought we didn't need it. I'm not sure about the genesis of that, but, ultimately, I was asked to write the justification for the thing. But, see, I didn't start the action on that. I think the manufacturer comes and discusses what he has available, or several of them come and they discussed it with the Design and Construction Division, basically. So this was initiated there, and I think that they were unable to produce any kind of a document that the Operating Division, even the head of the Operating Division was satisfied that we needed the darned thing. And I was asked to actually produce something which justified such things, so I did. So that document still exists, I assume.

TC: Well, no, I'd like to track that down. I haven't seen it myself. Was it in the form of a memo or something?

PL: I believe. See, I was a little boy then. I was associate engineer when I was doing this sort of thing, you know. So I wrote a memo for . . . It has my initials on it, but I believe it was a memo from Kist to [T. M.] Blakeslee.

TC: Okay.

PL: I guess Blakeslee was the head of the Operating Division when we bought that device.

TC: Okay, yes.

PL: I may be off, though. No, I'm sure that's right.

TC: Yes, that seems right.

PL: So that probably occurred in the mid-fifties.

TC: When did the formation of the Computer Studies Section occur? Was it a section? In the organizational chart you see Computer Studies within Power Operating and Maintenance.

PL: I'm not sure that we . . . I don't remember these names.

TC: Yes. What I'm trying to get at is within the Statistical Section a group called Computer Studies was put together. That was your group, right?

PL: Well, I didn't recall that it was called that. Maybe it was and my memory isn't . . . (chuckling)

TC: Yes, right.

PL: You want the date, I suppose.

TC: No, not the date, just the circumstances. It seems like a natural step, where you have a committee talking about all these things, and the Division management begins to see that,

well, this is here to stay so let's designate a group that's going to lead that.

PL: Yes, well, I guess that's when I got my promotion from an associate engineer to electrical engineer. You can't be an electrical engineer without being a head of a group.

TC: Okay.

PL: Oh, maybe there was. For some oddball reasons, I think there may have been. But it's hard. This is a Civil Service type of organization; electrical engineer is a head of a group. So they established this . . . Instead of getting me out of this, they wanted to continue to use these types of services in the Operating Division, so they established a group. You know, you take exams here, and I was on the electrical engineering list and they decided that that's the way to do it, instead of letting me go off and get a job as electrical engineer in some other group.

TC: I see, yes.

PL: And they'd lose all of this experience and ability in this area.

TC: Yes.

PL: So that's when it was. It was established when I became electrical engineer, and I don't remember the exact date.

TC: Yes. I have it somewhere around . . . probably around 1959 or so.

PL: Somewhere in there, maybe a little earlier.

TC: Yes. So that group's function would be, basically, to continue on developing the use of computers within the Power System?

PL: Well, not really.

TC: No?

PL: See, that was the committee's job. And I felt that what we should do is get some mechanism for having each activity do its own, because it's pretty hard to solve somebody else's computer problems. I mean, why should an electrical engineer spend his time, his training and so forth in solving non-electrical problems. There were differences within the committee--I know that--but I wanted to concentrate on problems of an electrical engineer. There are so darned many problems in electrical engineering and in operating in particular, that I shouldn't go solve mechanical engineering problems. And that basically was what some people were advocating at the time, was that the computer group should do this kind of stuff. Well, my thought was that the best way to do it--and I argued with some of the committee--was to train the people within the group in mechanical engineering, get somebody there to learn computers. It's easier to learn computers than it is to learn the sophisticated mechanical engineering that computers could be applied to.

TC: Sure.

PL: That was my philosophy. And this is what was adopted within the Power System. And we, meaning my group, actually, had a

training program within the Power System. We let Water System people come in, but it was my assistant Lee Schmidt who actually ran the course within the Power System. We trained people in various areas and we really relied on them once they got in there. We felt we would find somebody that would be enthusiastic and do the problems in that particular field, and that was a more efficient way to do it than the other way around.

TC: Yes, that makes sense.

PL: So we did that.

TC: And, of course, you guys were, you know, learning yourself and coming back and sort of spreading the knowledge.

PL: Well, Lee Schmidt got his Master's degree at Cal Tech and he loved computers. We were fortunate there. He baby-sat the computer at Cal Tech that they had, so he knew which buttons to press. It was a different computer from the IBMs that we were using, but nonetheless it was sufficiently similar in the programming and so forth. He knew about programming languages that he learned at Cal Tech, so I didn't have any trouble training him at all in the idea. I mean, IBM computer languages and so forth, it was very, very easy because we were just adapting, and he knew all this stuff. So, anyway, that's what we did. We went that way.

TC: I am trying to get a general shape of the development of computer use, from the early period when very few people understood what the applications were, you know, to a point

where it was standard operating equipment, not only in utilities, but in just about anything.

PL: Well, just to make an aside here. I was on the Computer Committee of, I guess, it was IEEE [Institute of Electrical and Electronics Engineers]. We converted from AIEE to the IEEE in the process, but I was on the Computer Committee of that organization. Other utilities were struggling with the same thing. The computers were in the wrong group. The computers were in the accounting division of all . . . of whatever they called the group, accounting group, in all utilities throughout the country. And there was a struggle in the utilities, you know. A lot of them were behind. That was one of the problems, and I guess it still is, to find out how to get this computer so that it's accessible and so forth to the engineers. But it's this kind of stuff, you know, which came later, these terminals and such.

TC: The PC, yes.

PL: Yes. So it wasn't only here that we had problems.

TC: Well, in the AIEE and the IEEE, what percentage of your time would you devote to this? Were there monthly meetings or, you know, yearly meetings?

PL: Oh, no. We would have only one or two meetings a year, one meeting.

TC: One meeting, yes.

PL: We had more than one, but I don't . . . Well, the functions of that, it wasn't necessary for us to meet that often,

normally, unless I'm horribly mistaken. We might have had a special meeting of some other . . . It seems to me that we probably did, but I don't recall. But, basically, we had one meeting per year. It was the winter meeting in New York, so we met there. But that wasn't our only duty. We had other duties. All those committees had other duties which were related to reviewing papers and things like that, and what to do with them. And the standards. We had definition of terms and these kinds of things. These committees actually did stuff like that. You don't do that every day, but they needed . . . I don't even remember all these things. But I remember stewing about standards. But, see, that was all done by mail, primarily, but we would probably finalize it in the New York meetings. But, see, that wasn't something that you needed to come up with instantaneously.

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TC: Well, what other utilities were on the same wave length? What representatives of other utilities were on the same wave length as you? Can you recall who, you know, got it like you got it? In some of my reading, I saw Detroit Edison was early on one of the computer application utilities.

PL: Well, I think the biggest one that I remember is what they called American Electric Power [Company].

TC: Back East, yes.

PL: Yes, back East. I think that was the biggie. I don't remember Detroit Edison being . . . Well, they might have been, you know. There were several of them. I think they were all in the East someplace, east of California. I know [Southern California] Edison wasn't on this committee with me, at least when I was on it. You know, you didn't serve forever on it.

TC: Well, how long did you serve?

PL: I served several years. I think I probably served from early on, when I became a member of the Computer Committee, or shortly thereafter, I don't know, until . . . I think I got off of it when I got this job.

TC: This job being head of System Development.

PL: Yes, right.

TC: Did you have other duties and tasks besides working on the computer side of things? I know that you said when you went to meetings, it wasn't necessarily computers that you would be concerned with. Certainly, there are other areas, where you'd want to go and listen to papers or get involved in the argument. But here at the Department, was it strictly your bailiwick?

PL: At that time?

TC: Yes. Yes, this is 1959, 1960, that period.

PL: See, the dates are hard for me to fix in my mind. I was off of routine operating problems, if you will.

TC: That's what I mean, yes.

PL: We had people who would schedule generation, do a number of things.

TC: Well, I guess I'm asking you if there were other kinds of internal committee type work.

PL: Internal committee?

TC: Yes. I know that there were certain committees that were established, that would . . . well, like the Computer Committee, for instance. There were other types of committees that would be a lot more fluid than a section or a division.

PL: I don't recall being on any internal committees. I served outside the Department, but I don't even remember when I did that. (chuckling)

TC: Okay. Well, I'd like to move along a little bit here and get at that period of the early sixties, 1964, when you got into

Operating Engineering as a section. Or was that a name change?

PL: That was a name change.

TC: Name change, okay.

PL: That was the Statistical Section.

TC: Statistical Section.

PL: You know, the section was evolving.

TC: Yes.

PL: So the name change took place prior to my time, prior to the time that I took it over.

TC: Okay.

PL: When Howard King took over the section, he was brought in from Design and Construction. And if I remember correctly, well, I don't know whether it was simultaneous with his arrival that it was changed, but Floyd Goss actually had it changed.

TC: Okay, it was Floyd Goss. One of my questions is where that change came from. Was it Floyd Goss's idea?

PL: Yes, Floyd Goss was the guy that did it. But the name wasn't quite appropriate, and I don't know why it was ever named Statistical Section, but it was.

TC: Yes, it's hard to know why it was tagged that early on, and I guess, because that's what it was, it stayed that way.

PL: Yes.

TC: So, in Operating Engineering, you were Engineer then Senior Engineer.

PL: Well, that's the head.

TC: Senior Engineer is the head?

PL: The Senior Engineer was head of that group.

TC: Okay, okay. Well, with Operating Engineering, you became involved in some of the power projects that were coming up, then.

PL: Well, that's what I was going to say. Actually, I think that preceded it--some of it did. For example, when we got into Mohave . . . You may be acquainted with it.

TC: Oh, yes, yes, I know Mohave.

PL: It's the coal-fired plant.

TC: Yes, it's the coal plant out in Arizona.

PL: Okay. I was involved in the recommendation for that. Well, I had to decide how . . . I wrote the letter or memo, or whatever it was, recommending the amount of capacity that we'd get out of Mohave, whether it was 20 percent . . . If you look in the files, you'll find that the memo has my initials on it. But I think that probably occurred before I became head of that section. I believe that took place before.

TC: Okay.

PL: But, in fact, I can't swear . . .

TC: Well, how about the nuclear projects? You were associated with some of them, weren't you?

PL: Yes. Yes, I was associated with every one of them in one way or another.

TC: Well, that's interesting.

PL: [Eugen] Koffmann was our nuclear specialist, if you will.

TC: Yes.

PL: I mean, he did that. The stuff that I did had something to do with the sizing of the thing. See, that's probability theory there.

TC: Okay.

PL: Well, I was involved in the Mohave project, and that was basically a sizing kind of a problem. The initial one, the Malibu nuclear plant that was a problem that I was involved with, can we tolerate that size, can we go bigger or shall we limit it to roughly 500 megawatts.

TC: Okay, yes.

PL: And we concluded that we're not big enough for any bigger than that. But these kind of questions I was involved in.

TC: Okay. You didn't have to go to the hearings and all of that?

PL: No.

TC: Well, you were also associated with Bolsa Island [Nuclear Power and Desalination Plant] following Malibu, I guess.

PL: Yes, the same way.

TC: The same way, okay. I'm kind of fascinated with the Bolsa Island idea. On paper it seemed so good, you know. You have power generation and purified, desalinated water.

PL: Yes.

TC: And everybody's happy. When you first heard of that, I suppose it was Bechtel [Corporation] that came along with a feasibility study sometime in the mid-sixties. Did you think it was a possible or reasonable project?

PL: Well, it was a good project for the reason you mentioned, and maybe I should say a couple words there. I personally worried about an area that--of course, Koffmann was more concerned and involved than I was--but they weren't allowing . . . I was reading about what the Atomic Energy Commission was doing and so forth. It looked to me like that was an ideal place to put such a plant, but, at the same time, there was too damn much population. Because the plans have always been to evacuate, you know. It was the danger, it was the imminent danger to people. They weren't going to get killed, necessarily, but they had to be evacuated. They had to clear a certain area, and how do you clear people from the area? I mean, it didn't seem to make sense to me, frankly. But I worked on it, you know. I wasn't an expert in that area. But it seemed that that's the way the Atomic Energy Commission was doing, putting these things so that if anything happens, any leakage, why, you'd clear out the people until they took care of the situation and then let them come back when it was safe. (chuckling) Well, I just didn't see how you could do that there. A lot of people blame Edison for pulling out. Edison used to do those kinds of things, so that kind of killed it. But, technically, it was an excellent idea, because nuclear plants are basically inefficient, you know.

TC: How is that?

PL: You don't know that?

TC: No, I don't know that? How so?

PL: They're low temperature devices. You get greater efficiency the higher the temperature in the thing. So the higher the temperature you operate the thing, the greater the efficiency. So our steam units, the later ones, operate at about the highest practical temperature that you can do it in. They're pretty efficient.

TC: I didn't realize that nuclear generators were significantly less so.

PL: Oh, yes, they're a hell of a lot less. There is a high temperature gas-cooled reactor, so-called, that is more efficient. I think there's only one. I don't know what its status is. I don't read this stuff any more.

TC: Yes. But at the time you were following it pretty closely.

PL: Yes. Not as closely as Gene Koffmann, but we'd have discussions with Gene. If I had a question on some of this stuff, Gene was a good guy to discuss these things with, concerns or whatever.

TC: Yes.

PL: Well, this is true of any of these things. See, what you're doing, basically, is discharging a lot of stuff. The cooling water is useless. I mean, you waste heat, if you will; and especially when they're at low temperatures, you're discharging a lot of this. And to desalt, you want low temperature stuff. It's a source of low temperature heat, low quality heat that's useless. So it is an opportunity and there are other reasons. I mean, once you build a facility,

you know, you have common facilities, the land and all this stuff is involved, the capital expenditures, and so on. So if you build a joint facility that does two functions, basically, it's cheaper. To build just a desalting plant is not very . . . It costs a lot, even desalting water that way. Even that water was going to cost a lot, too. You are actually using some of the higher quality steam. As a practical matter, they do use that, but it is a more efficient way of desalting than just to have a single purpose facility.

TC: Well, just as a comparative point. I have read that Santa Barbara is looking into a desalination plant up there. What would be the economics of that? It would seem that that would be an awfully . . .

PL: Terrible. But they're happy with that. They're a slow growth county and so is San Luis Obispo. You can't get elected to office unless you're a slow growth advocate. The difference between San Luis Obispo County now and Santa Barbara is that Santa Barbara tried to get out of their state water contract. You know they signed a contract to get state water.

TC: I knew that they had been approached or they took a vote on it, but I didn't realize that they had actually contracted for it.

PL: They signed the contract for state water and they voted to get out of it. The state told them, "You have a contract." I mean, "Vote all you want, you're going to make the payments. We don't care, just make the payments. You have a contract

and you make the payments." So that's the status of the thing. But now they're going ahead with that pipeline. At least they have an environmental statement that's in progress. They may be going over my land, by the way, that's why I know about it.

TC: Oh, a pipeline from where?

PL: A pipeline from the State Water Project.

TC: They're just going to have it feed or something?

PL: It taps the state aqueduct from somewhere near, oh, I guess, south of Kettleman City. They send me this stuff because I'm directly involved. I have a contract with the DWR [California State Department of Water Resources], by the way, to permit them entry to my property, to count rattlesnakes and these things, whatever they do there.

TC: Oh, so you permit them entry and they'll come in.

PL: Yes.

TC: I see.

PL: To make environmental studies.

TC: And then, ultimately, that will become a right of way?

PL: Well, if they choose, if that's the ultimate. If they go through my property, then, of course, they'll have to pay me a couple of bucks. So that feed is going to feed Santa Barbara, too. And I don't know what Santa Barbara is doing. And I don't know whether this process will ever be completed, but it is going forward. And I think San Luis Obispo is favorable to this. Well, I've not heard that they're

objecting to it, but I don't know about Santa Barbara. I don't know too much about it. I don't go to the meetings because I told DWR--they talked to me periodically when they wanted access--that I'm not against this thing. I don't go to their meetings. Maybe I should. I probably will one of these days.

But getting back to desalination . . . That's expensive and the problem with that, of course, you need a lot of energy.

TC: Yes.

PL: So in Santa Barbara, they have good air quality there, and to destroy that air, to burn coal or to burn any amount of available resource, gas, you know, oil and so forth, to pollute the atmosphere for desalting, you're burning a hell of a lot of oil, coal or whatever it is, it just doesn't seem in the cards. I don't know what they think they're going to do. And nuclear, of course, nobody wants nuclear now.

TC: Yes.

PL: In particular, Santa Barbara. My guess is they'll let the state go ahead and build this pipeline, and that will take care of them for a little while until you get another generation of Santa Barbarans. (chuckling)

TC: Yes. Well, Bolsa Island died, you know, because it never . . .

PL: Edison pulled out. Physically, that's what happened. And if you look at the record, why . . .

TC: I know that the Department pointed to cost overruns and problems that were coming up, and a discrepancy with the original planning, to what was then being added onto it, and they stated that they were somewhat jittery about the incredible cost overruns. That may have been just something that was said because a reply had to be made.

PL: Yes, that's right.

TC: So then the next nuclear project was, of course, San Joaquin. There was a short-lived project in Porterville. So were you involved in the same capacity?

PL: Well, Porterville and San Joaquin were the same thing.

TC: Yes, I know that was the same, just different sites they were looking at.

PL: Right. Porterville was a better site because the site was useless, I mean, for other purposes.

TC: Yes.

PL: It was really a beautiful site. Yes, I was involved in that, but my involvement was not from a nuclear point of view. My involvement was water "expert." (chuckling) What I was looking for was the water supply. So I went up there to talk to the water people and got acquainted with all the water masters.

TC: Well, okay, that's a whole story though. It was Bakersfield water people you were talking to. Is that right?

PL: Well, a lot of them. Originally, in Porterville I was talking to the people that dealt with water in the Porterville area really.

TC: Okay, okay.

PL: It's a different group.

TC: Yes, okay. I think I was mixing that up with San Joaquin water negotiations.

PL: When I talked to the Bakersfield people, they came to us. Their consultants came to us, but that was in connection with San Joaquin.

TC: San Joaquin, okay. Well, the cooling water for Porterville was going to be taken from, purchased from the Porterville water supply.

PL: Well, we were discussing that. We never finalized anything, but we were discussing with them ways that we might do this. We never finalized anything. It looked bad. Well, what we were ultimately going to do, and which we ultimately did, we got a letter of intent with the Metropolitan Water District [MWD]. We were going to use Metropolitan Water. We can get water from MWD anyplace we please, if we really need it. And MWD feels the same way. If we demand water in Porterville, they're going to give it to us in Porterville.

TC: Oh, okay.

PL: So it wasn't their water, but physically it was going to be out of the Friant-Kern Canal, in getting their entitlement.

It would be through an exchange agreement. This was the area we were discussing.

TC: Okay, okay. And then when the water question came up with San Joaquin, was that some sort of swap plan that was put forward, where [California] Aqueduct water would be . . . I'm not sure how it would work, but I know . . .

PL: Not Aqueduct water.

TC: No?

PL: Well, the Water System . . . I shouldn't put this . . . You talk to the Water System about Aqueduct water, not me, okay?
(laughter)

TC: Oh, the California Aqueduct water I'm talking about.

PL: Oh, California Aqueduct, okay.

TC: Yes, not Owens Valley Aqueduct, no. Now I understood that there was some sort of swap thing where Bakersfield water would be used but it would be replenished through some deal with the California Aqueduct.

PL: No, no. The Bakersfield water really was another element. Actually, Tenneco owned the water rights there.

TC: Oh.

PL: Tenneco is interested in oil.

TC: Yes.

PL: They have lots of cattle, they have lots of farming and so forth. I don't know whether they own International Harvester still. Or did they dump it?

TC: Oh, I don't know.

PL: So they have lots of peripheral things that are not profitable. Well, I talked to Tenneco because Tenneco sent . . . Well, I don't know whether they came down here, but Bakersfield consultants were down here. Tenneco was trying to peddle their water.

TC: Okay.

PL: They inherited the water rights of the Kern . . . What do they call it? Kern County Land Company? Well, they had a lot of land in the Bakersfield area, so they had a lot of water rights from the Kern River that belonged to Tenneco. Tenneco wasn't interested in farming, they wanted money. (chuckling) So they wanted to sell their rights. So they were dealing with the city of Bakersfield consultants. Well, they [the consultants] came to see me.

TC: Okay.

PL: And so we went out and discussed this with Tenneco and we were working in that area. In that deal, of course, we would buy the water so that Bakersfield wouldn't have to bond themselves so much. That was the whole theory, the City of Los Angeles would buy the thing, or as much of it, or whatever. Anyway, we were working on this concept of buying it and then holding it for Bakersfield and giving it back to them as they needed it. That was the idea. And, of course, we would probably end up paying for the whole thing. They were getting together a water supply in perpetuity for the city of Bakersfield, so it was a good deal for them, it was a good deal for us.

TC: Oh, okay.

PL: We didn't need to keep it in perpetuity.

TC: Yes.

PL: So we were agreeable to that. Well, that fell through because we stole the Owens Valley water, you know. That fear was in the . . .

TC: As Gene Koffmann called it, "the ghost of Owens Valley."
(chuckling)

PL: Yes, the ghost of Owens Valley, okay. So that fell through for that reason. They ultimately bought it, as I understand it. I didn't follow that too closely. They decided to bond themselves.

TC: Well, how did the waste water part come in? That was another plan, I guess, to purify some of the agricultural waste water and use that for cooling. Was that simply an alternative that was being discussed?

PL: Well, I think that idea came up from discussions we had up there--that I had. An attorney from here, Ralph [G.] Wesson, and I talked to all these people, because of a lot of legal aspects of this thing, it was better to have an attorney along to discuss these items.

TC: Sure.

PL: There's a waste water problem up there in the San Joaquin Valley. The west side of the San Joaquin Valley is salty, so they have tile drains that drain the salt out of the soil, and then you have to dispose of that water someplace. It's pretty

good water still. We could use it for cooling and concentrate it some more, but ultimately it would have to be disposed. But the idea is that we would concentrate it more. It required smaller reservoirs and so forth. And we would take over and they were happy about that. We would do that chore for them and pay them besides.

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June 18, 1990

TC: So the Bakersfield officials that you spoke to must have liked this.

PL: This isn't Bakersfield.

TC: This is not Bakersfield?

PL: The Bakersfield thing fell through because, basically, the Bakersfield consultants were prohibited from talking to us anymore. I don't remember all the details, but, you know, we were, in effect, told that the deal was off because they can't do it.

TC: So who were you talking to regarding the waste water?

PL: Oh, Kern County Water Agency.

TC: Oh, it was Kern County Water Agency, okay.

PL: That's not Bakersfield, it's Kern County. They're farmers, basically. It's an agency for the farmers.

TC: Okay, got it.

PL: And so the Kern County Water Agency are the people who had the water from the Friant-Kern Canal, they had the contract with the State Water Project; so they had water, but they were also concerned with disposing of the waste water. So we were talking with them. We never approached them with the idea of trying to get any water from them, because we always had . . . Well, we had the MWD thing in mind all the time. And as a matter of fact, Dave Kennedy, who is the Director of the

Department of Water Resources--I guess he still is now--and I negotiated this contract between MWD--it was a letter of intent--and ourselves. But MWD would furnish us water for the San Joaquin Nuclear Plant. Both of us were kind of busy working, so we'd do this after work and have meetings. He and I and our attorney, his attorneys . . . I guess that was [Carl] Boronkay, who is the general manager [of MWD] now. Anyway, this was a relatively simple letter of intent, but I wanted it in my pocket so that I could tell those people that we were not going to use their water, to see if we could get rid of this ghost of Owens Valley, so that I could go up there knowing we had rights. In fact, we had this letter of intent from the MWD. And the letter of intent said something which we sort of wanted. MWD did, too, it was mutual. We provided in it what we would get out of this. We would pursue the waste water. We would just use this water, MWD water, just to get started. We needed a water supply to satisfy the AEC. They would never give us a license if we didn't. So, basically, the purpose of this was to get licensed. Come hell or high water, we'd still have water.

TC: Yes.

PL: And we got that letter and that letter exists. But that letter says that we would pursue the waste water that's available, that we would use waste water as it becomes available, and, as soon as we could, we would get off of the MWD water supply. So that's where that came from. This is

what we were doing with the Kern County Water Agency. We were going to sign a letter of intent with them, that what we would do for them with the waste water, we would actually construct facilities to get the waste water and we would pay them for the waste water. And we would build an evaporation pond and so forth in these areas we were requesting of them.

TC: Well, was this waste water technology, or whatever you want to call it, was that an innovative thing or had it been used elsewhere, that same sort of using waste water for power plant cooling?

PL: As far as I know, no.

TC: No? Oh.

PL: I don't think there is any such thing anywhere. The only place there is waste water--in this country, I mean, there may be in other places--is in Imperial and Coachella. They have to put tiles--and it's very expensive to put tiles--and they drain it off. Imperial drains it off into the Salton Sea. These people have a hell of a time. They don't know where to put it. They were fearful at that time, and the government won't let them put it in Kesterson Reservoir because it poisoned a few birds, and it concentrates all these pesticides and one thing and another and kills birds, eventually. I don't know what they're doing with that problem right now, but I think they all have to do their own. And see, we were going to take over that. Maybe it's a good idea we didn't.
(chuckling)

TC: (chuckling) Yes. But it shows something about the innovative thinking of the Department and the talent that it had in its engineering to come up with that and to develop that idea. It's too bad that, well, ultimately, with San Joaquin it was a local vote that opposed it.

PL: Yes, we told them--maybe by mistake--that we would go along with the wishes of the local people. That was to make them feel better. And so we did that and so they took us up on it. They decided to have a vote, and we lost 2 to 1, so we got out.

TC: Yes. Well, was it just a fear of some new technology, again, that brought that vote around?

PL: Well, I can't speak for them, but I think everybody had fears of nuclear. There was a professor at one of the junior colleges there who pretended to be an expert and he gave them all kinds of loony prospects of the thing, that it increased the rainfall and all kinds of things.

TC: Yes, that's right. That would create some kind of permanent fog bank there, yes.

PL: So I don't know how it affected these people. It was all bad, anyway. I don't know that the urban people cared much one way or the other, but maybe it's just the fear.

TC: Since we're on nuclear projects, I guess the last one that the Department was involved in was Sundesert. That was in your period as head of System Development, I guess?

PL: Yes.

TC: Would you have had anything to do with that?

PL: Well, it wasn't exactly the last one. We were involved in Palo Verde, and we still are.

TC: Palo Verde, that's true, too. Yes, my mistake.

PL: But I guess that was more or less simultaneous. Well, I don't know how you want to do these, but that's right, we were involved in Palo Verde and still are.

TC: I thought that since we were on the nuclear subject it would be good to follow that one out. But, of course, with Sundesert, the whole thing was the state referendum came in, which pretty much, you know, closed the door on anything of a nuclear nature in California. Obviously, I can guess that your response would have been negative towards the referendum, but how . . . Well, first of all, do you see still a need for nuclear power in the Department system or in California?

PL: Look at the smog.

TC: Yes, yes.

PL: I mean, I know this is due to the cars, primarily, but it's kind of ridiculous to use, in my view, a limited supply of gasoline and oil--basically, fuel oil, if you will--or gas--that is, natural gas--for generation of electricity, and particularly in a place like this. And then there are other problems, of course. I understand that people are worried about carbon dioxide, and I think they probably should be. Scientists have said we should worry about it, but the utilities should start worrying about it. This is what we

thought a long time ago. I mean, carbon dioxide in the atmosphere is not a new worry. We knew about it. We were trying to get off the hook years ago. That was one of the reasons for going into nuclear. There were other reasons, fuel and so forth, but one of them was we were just dumping a heck of a lot of carbon dioxide into the atmosphere.

TC: Yes.

PL: And so, if you get off of it, why, it's easier for the utilities to get off of it than these cars. We're not ready to substitute something else for cars. In the utility industry, you have that alternative, the nuclear alternative. Nuclear doesn't put all that junk in the atmosphere.

TC: I guess the biggest fear in California is the possibility of earthquake and nuclear waste handling. And I don't know if that's been discussed by the nuclear industry or by the utilities as it perhaps should be. The technology is there, for sure, but it seems as though people don't believe it.

PL: Well, I may be wrong, but all you have to tell them is that this stuff is going to live for a few thousand years and then there's nothing else you can say.

TC: Right. Do you see a return in nuclear power? I know that the nuclear industry now is presenting the utilities with a different, scaled-down, sort of streamlined reactor. I don't know if any utilities have purchased any of these yet, but there's a kind of a . . .

PL: Well, we use as sort of a social argument that small is better than big, and I notice that these people here are scaled down in their design of the coal-fired plants to smaller units because of perceptual problems, I guess--perceptual problems that bigness is bad.

TC: Yes. Well, anyway, that's sort of in the area of prognostication more than anything else, but it's still an interesting point and, I think, germane to talking about the needs and desires of power systems. You know, the Department needs to provide power service to the people here, and, at the same time, there are so many obstacles put in the way to doing that.

PL: Right.

TC: And, yet, by law they have to do it, and so it creates an almost impossible situation in providing this.

PL: Right. So we tend to do everything wrong, as I say. I mean, everybody wants to get rid of the smog, but they don't want to use anything that mitigates it. (chuckling)

TC: Well, you ran up against a big problem there with Scattergood 3, didn't you?

PL: Yes.

TC: That was the Air Pollution Control District [APCD], I guess, at the time, that slapped you with . . . I don't know what it was. You couldn't get it up and running once it was ready to go. Is that right?

PL: Well, we went to court and lost.

TC: Yes.

PL: The judge said that there was no problem, we don't need it. I mean, that was one of the conclusions, but, really, basically, that was it, that we don't need it.

TC: Well, how did they ascertain that you didn't need it?

PL: Well, all he does, he reads, you know, the testimony, presumably. That's the way they make up their minds. That's what somebody testified to, that we don't need it.

TC: Yes.

PL: That was the county attorney. Well, he presented witnesses who said that, I guess. In the judge's mind, that was evidence. We decided not to appeal. I thought it was . . . I don't see how he could come to that conclusion, but he did. It looked like it was on his own, that he made that decision.

TC: Well, ultimately, it did get put in operation.

PL: Well, yes, because we went through and we had to do a lot of things in order to mitigate it. I think they changed their rules. I don't remember all these details, but they decided . . . I guess the EPA [Environmental Protection Agency] was doing this, too. You had to provide trade-offs. If you would provide trade-offs that would work, you were allowed to do this.

TC: Okay.

PL: So we went into the operation on gas only, and I don't know what it is now. But, see, theoretically, if you chop your vehicles, you can get along with half the number of cars and

present evidence that we're not going to use these cars anymore, and therefore we want to substitute the power plant. You know, it was a trade-off.

TC: Yes.

PL: But I wasn't involved in that.

TC: Oh, you weren't? Okay. We have a little bit of time left here. Maybe just to finish it off, you mentioned a little while ago about being associated with Mohave. Now, was that through WEST Associates?

PL: No. No, I wasn't associated directly. The only thing I did, with respect to Mohave, was to make a recommendation as to what our participation in the plant was going to be.

TC: Okay, okay.

PL: Our participation, our invitation, as far as I know--I mean, it didn't come to me, none of these came to me--it came through the top management.

TC: Yes.

PL: And you can call it WEST Associates, but, really, it was mandated by the [United States] Secretary of the Interior, that Edison, in order to let them use government water in that project, which came out of Nevada's entitlement, actually, but the Secretary had to approve it. So the condition that he imposed there, was that Edison allow participation to public agencies.

TC: Oh, I see.

PL: For certain ones. I was just told, and this is sort of a customary government condition. You can't give a resource that supposedly belongs to the people to a private utility without, at the same time, giving general offering, you now.

TC: Sure.

PL: It's kind of an anti-trust law concept. So that's why, whether they liked it or not, they were required to. And WEST Associates takes credit for it, but that's not true.

TC: But that's not true? Oh, that's interesting. Did you periodically go to the WEST Associates meetings?

PL: I don't recall going to WEST Associates ever. I think Howard [King] did, but I didn't. I might have gone. You see, I was Howard's assistant for awhile, but I might have gone, you know, as an alternate or something. I attended meetings that Howard was a member, but I don't remember whether I did for WEST Associates. I don't recall attending any WEST Associates meeting, but that doesn't mean I didn't.