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BIOGRAPHICAL SUMMARY

PERSONAL HISTORY:

Born:	March 19, 1934, Portland, OR		
Education:	Portland public schools		
	Oregon State University	BSEE	1960
	University of Southern California	MSEE	1968
	University of Southern California	MBA	1972
Married:	1958, two sons, two granddaughters		

CAREER:

1952-1954	U.S. Navy
1960-1964	Electrical Engineering Assistant, Power Design & Construction Division, LADWP
1964-1968	Electrical Engineering Associate, Power Design & Construction Division, LADWP
1968-1972	Electrical Engineer, Power Design & Construction Division, LADWP
1972-1976	Assistant Rates Manager, Financing and Accounting Division, LADWP
1976-1984	Rates Manager, Finance and Accounting Division, LADWP
1984-	Principal Power Engineer, Conservation and Planning Division, LADWP

Los Angeles Department of Water and Power

POWER SYSTEM ORAL HISTORY PROJECT

POWER RATES AND RESOURCES:

AN INTERVIEW WITH DENNIS B. WHITNEY

Interviewed by Thomas Connors

The Bancroft Group

Dates: January 28, February 5, February 12, and March 4, 1992

TAPE NUMBER: 1, Side A

January 28, 1992

TC: Let's start at the beginning, as it were. Could you just tell me where and when you were born?

DW: I was born on March 19, 1934, in Portland, Oregon, and spent my early life in Portland. I went through grammar school and high school there.

TC: Let me ask you, were your parents from there, were they transplanted people, or are you true Oregonians?

DW: Both my mother and father were born in Oregon, although not in Portland. My father was born near Coos Bay, Oregon. I'm sorry, my mother was actually born in Alaska, and then immigrated down to Oregon.

TC: How interesting. What brought her family to Alaska?

DW: Her father was a gold prospector. He made a very adequate living but didn't ever become wealthy doing that.

TC: Actually panning for gold?

DW: Yes, panning gold, a little bit of hard rock mining, just a whole variety of things. Her family lived in Alaska probably for about seven or eight years total.

TC: Oh, so he had gone there with the gold rush of the 1890s?

DW: Yes, something in that general range. He went there and then got married and brought his wife there, and then they had three children. My mother is the youngest of three children. Like I said, he never became wealthy, but he accumulated enough that he was able to open a lumberyard in Oregon, and that was his livelihood then after he quit prospecting.

TC: How about your father's family? Were they long-term Oregonians?

DW: They lived in Oregon for a long time, like I say. Down in Coos Bay my father's father was involved with the railroad and worked on the Union Pacific Railroad in a variety of different jobs.

TC: How about siblings, brothers and sisters?

DW: I have three brothers and two sisters, a total of six children in our family. I'm the oldest.

TC: You're the oldest? I was going to ask you where you fit in.

DW: Yes, I'm the oldest. I almost hate to say this but both of my younger sisters and one of my younger brothers have already retired. (laughter) That's not necessarily good. One of my brothers was working for Lockheed. They sold the part of the company he worked for to IBM and then he retired. I have another brother that owns his own computer company up in Washington and a third brother that works on environmental issues, most recently in Henderson, Nevada.

TC: Having to do with what out there?

DW: Well, he was just working on their compliance with federal laws.

TC: I see, Henderson being sort of a suburb of Las Vegas.

DW: Las Vegas, right.

TC: Well, you started to mention your education. So you went to grade school in Portland?

DW: And high school.

TC: And high school in Portland?

DW: Yes.

TC: Was it the public school system?

DW: Public school all the way, yes.

TC: When you were in high school, did you have any sort of inkling that you would be involved in engineering? Did you take the kinds of courses you might take if you had an engineering bent?

DW: Yes, very early I realized that my skills were with mathematics, not with English, and so I took all the math courses that were offered through the school, and all the science courses, also. I actually had thought I'd be a civil engineer, because friends of mine had fathers who were civil engineers. I didn't know anybody that was an electrical engineer.

TC: So that's what you were thinking of. After high school, then--I was looking at the bio statement you filled out for us--you went into the navy?

DW: That's correct. That was during the period of the Korean War, and I went into the navy and was there for four years. I spent the first year in San Diego going through a variety of schools. I was a sonar man. I don't know if you saw the

"Hunt for Red October," but sonar is one of the primary plots in the movie.

TC: Exactly, sure.

DW: And there's a lot of electronics associated with that. So I got heavily involved with electronics through sonar school. I then went back to an advanced school later on and got additional education and spent the majority of my time in the navy on destroyers, both on the West Coast and on the East Coast.

TC: You were mentioning last week when we were having a preliminary interview, you were stationed in New London, I think you said.

DW: New London, Connecticut.

TC: Yes, New London, Connecticut. Now, was that someplace you were ordered to go or was that sort of part of this electronics further training? How did it work out that you went to New London?

DW: Well, upon graduation from basic sonar school in San Diego, I was assigned to a destroyer in New London, Connecticut, which had experimental equipment on it, and operated there with the submarine fleet extensively. While I was on that ship, I was sent to an advanced training school. I returned to that ship, and then when the war was heating up some, they wanted to transfer some ships from the East Coast to the West Coast, so there was an opportunity to transfer and so I transferred to the ship that was sent to San Diego. So I returned back to San Diego, which was a lot closer to home.

TC: How did you find the East? Had that been your first time back East?

DW: It had been my first time back East, and then, very frankly, it was somewhat amusing; having spent the summer, fall, and winter in San Diego, I was transferred to New London in the spring, and I thought I'd died and gone to heaven. It was just beautiful there in the spring, but then the summer came and I realized it wasn't heaven that I had arrived at.

TC: (chuckling) Right, the humidity is something.

DW: High humidity, yes.

TC: You forget about that, don't you?

DW: And having grown up on the West Coast, there's just no place with humidity like that. You know, Oregon, even though it rains all the time, it's not humid, not like the East Coast.

TC: So then you came back and finished out your navy term in San Diego. Is that right?

DW: In San Diego, that's correct.

TC: San Diego has changed much since that period, I gather. I have some friends who were stationed there, and it was a very different kind of town in those days, they say.

DW: Yes. I've always enjoyed swimming and water sports, and so all the time I had free I was just down at the beach in a swimming suit. You know, there were a lot of people that were prejudiced against the service. I never saw that, but I didn't walk around in a uniform very much.

TC: So then you returned to Oregon on your discharge, right?

DW: That's correct.

TC: And you started college then?

DW: I started college. I initially went to Portland State College, which from the standpoint of engineering is really like a junior college. They do offer four-year degrees in a variety of subjects but engineering isn't one of them. Then completing the two years there, I went down to Oregon State College.

TC: Where is that?

DW: That's in Corvallis.

TC: In Corvallis, right.

DW: I finished my bachelor's degree at Oregon State. My sophomore year I was married, and my junior year our first child was born. Corvallis was really kind of nice. It was a small town, and in that time period almost half the engineering students were veterans. So there was a good support group, because a lot of the veterans were married.

TC: Yes, so you had sort of an age group that was similar. That can really help.

DW: That's right.

TC: So you went into college with the thought of getting a degree in electrical engineering?

DW: No, I actually went in thinking more of civil, and just along the way it seemed to work out that electrical was . . .

TC: Why was that? How was that?

DW: Well, I'll have to say it probably wasn't a conscious decision on my part. You know, I'd sign up for the classes that sounded interesting, and then I found out I was getting more electrical than I was civil with those classes, so I just continued in that vein. You've got to realize this is a long time ago. Transistors were brand-new devices back when I was in college. We studied all circuits, both with tubes and then studied them again with transistors. ICs [integrated circuits], which are kind of the common building block of electrical circuits now weren't even yet available, so there was a big transitional period.

TC: Yes, it was almost a revolutionary period in electronics.

DW: In electronics, yes, very much.

TC: Well, did you have any association with, say, Bonneville Power [Administration] or any of the power systems up in that part of the country?

DW: The summer of my junior year I worked for Portland General Electric on a student engineering program, but I never worked for Bonneville. Of course, Bonneville is one of the big generators in that area. At that point in time, they generated virtually all the energy used in the Pacific Northwest.

TC: Well, now, what was the name of it, Portland General . . . ?

DW: Portland General Electric.

TC: Was that a privately-owned company?

DW: It was a privately-owned company, that's correct.

TC: And they would buy the power from Bonneville and then distribute it in the city?

DW: Yes, well, they serve about half of the city of Portland. The other half of the city of Portland was served by Pacific Power and Light Company. So they had two privately-owned utilities in Portland. Then Portland General Electric also served essentially the Willamette Valley down to Salem.

TC: Down to Salem, okay. Those companies are still in existence up there?

DW: Yes, they are. They're both in existence. Like everybody else, they have reorganized, but they're both in existence and they both still serve approximately the same service territory. Portland General Electric did have some small hydro of their own, in addition to the energy they purchased from Bonneville, but the majority of the energy was purchased from Bonneville. Of course, this was before the existence of the Pacific Intertie line, so there was no connection with California at all at that point.

TC: You know, I seem to remember in my research that even in the fifties, and even earlier, there were some tentative kinds of explorations of linking up in some way with the power systems, especially Bonneville, up there. In fact, Sam [Samuel B.] Morris, who was General Manager here, on occasion went up there, and I think we have a speech--this is in the historic records collection--where he starts out saying, "I'm not here to take your water . . ." You know, it was some utilities industry meeting he was at. This is maybe stretching it, but did you experience that sort of north-south antagonism?

DW: Yes.

TC: You still get that if a Californian travels up through Oregon and Washington. We've gotten grimaces when we've driven through there with our California plates. Was that sort of attitude prevalent at the time, did it exist noticeably?

DW: Well, yes, I think it's like everything, it kind of comes and goes. I remember one of the governors of Oregon, one of his favorites sayings, talking about Californians, was, "Please come and visit but please don't stay." (chuckling) So it's always been some antagonism there.

Back in the late fifties and early sixties, Bonneville had a surplus of generation. So they really were looking for additional markets and they did a lot of promotion to bring especially high-use customers into the Pacific Northwest. A good example of that is the aluminum companies. You know, aluminum ore isn't in Oregon and Washington. The only thing that's there is cheap electricity for extracting aluminum from the ore. In some of my classes at school and in discussions with the professors, we did talk about an electrical interconnection with California so that the Pacific Northwest could have California as a market for some of that surplus energy. But it wasn't till the late sixties that that actually happened.

TC: How was it that you hired in at the Department of Water and Power?

DW: Well, at that particular point in time, the Department of Water and Power interviewed at Oregon State for both electrical and civil engineers--perhaps mechanical, I don't know for sure. So Jim [James L.] Mulloy came up as part of the interview team and made an offer that sounded attractive to my wife and I, so we thought we'd come down to California for five years or so. That was in 1960.

TC: So thirty years later, you're still here. At that time, Jim Mulloy . . . what would his position have been?

DW: He was what was called an Engineering Supervisor in the Underground Design Group. That's what he was at that point in time.

TC: Now, did various engineers at his level go out and do this kind of recruiting?

DW: Yes, that's correct. In fact, it's virtually that way today. The engineering recruiting is done primarily by Engineering Supervisors, you know, what we call the first level supervisors. There are a few Engineering Associates that do it also, but mostly it's Engineering Group Supervisors who go out and interview at the college campuses where we still recruit.

TC: Some of the other men that I've interviewed, for instance, Howard [R.] King and Larry [Lawrence] Schneider are men who grew up in Los Angeles and they knew well what the Department of Water and Power meant to the community. So the reputation of DWP was sort of instilled in them from an early age and they in some ways aspired to work here. Had the reputation of DWP made its way into your thinking at all?

DW: No, not at all. I was impressed with Mr. Mulloy when he interviewed me, and my wife and I both thought it would be fun to kind of get away from Portland. We both grew up in Portland and thought it would be fun to get out of there and do something else for a short period of time.

TC: Did the thought of working for a municipally-owned power agency play any role? Was that part of the attraction?

DW: Not really. In Oregon and Washington--and actually more so in Washington than Oregon just because of the way tax laws are set up--there are a lot of municipal power agencies, so it's a very common method up there. I didn't really give it a lot of thought as to whether it was public or private at the time. It just didn't make a lot of difference.

TC: Well, the reason I asked, I think that the antagonism between private and public by the time you were coming along was probably fading into the background. I think that was much more of an issue . . . well, certainly in the thirties and forties.

DW: Yes.

TC: It seems the methods of doing business pretty much began to intermingle.

DW: Yes, and I think part of it was the boundaries were fairly well established by then and so there weren't territorial fights, as many as there had been earlier.

TC: Now, did you have to take the Civil Service exam or did you have to take a test to get into the Department?

DW: At that time--and I think it's still true for Electrical Engineering Assistants, which is the entrance level--the interview is the examination. It's the only exam, the interview, so I did that. Back then we used to have to pay a dollar to take the Civil Service exam. After I became employed, I had to pay that dollar to clean up all the records.

TC: I see. So, soon after the interview then, you moved down here?

DW: That's correct.

TC: So the interview would have been, say, in your senior year?

DW: The interview was during my senior year, and I'll say it was probably in the spring, and then in June I graduated, and my wife and I and my son moved down here.

TC: Okay, and when you moved down here, just out of general interest, where did you move to, what section of town?

DW: We moved to West Covina. That might sound really weird, but after I decided to move to the Los Angeles area, my wife and I would get a copy of the Sunday *L. A. Times* and look through there in the real estate ads, kind of looking at areas that looked like the prices were right. So we moved to West Covina. We looked at some other areas after we came down, but that was one of the areas we wanted to look at, and at that time it was still quite rural. There were still orange groves and some dairy farms at that time. So we found it very comfortable and we lived in that area essentially for thirty years. We've had three different homes, but they're all in the Covina, West Covina area.

TC: At the time, was the 10 Freeway up and running?

DW: The 10 Freeway was there, but it was only a two-lane freeway and didn't have a bus lane. Of course, the 60 Freeway and the 210 Freeways weren't even in existence then. I'll have to say that for the next thirty years the traffic really kept getting better, you know, because as more homes moved out there they'd add freeways or add lanes to the freeway. The traffic never seemed to be getting worse to me because they either expanded the freeways or added freeways along the way.

TC: So, in any case, you had say, a thirty- or forty-five-minute commute?

DW: Oh, it was closer to forty-five. Yes, forty-five to an hour, almost from the beginning.

TC: Interesting. So, when you hired in, what was your title?

DW: Electrical Engineering Assistant in the Design and Construction Division and I was assigned to the Transmission Design Group. That's the group I was in right from the beginning. Very early we started to talk more about a Pacific Intertie, you know, the Intertie connecting us with Bonneville. So, finally by . . . oh, it must have been about 1968, we actually started designing that line then, so that was kind of fun.

TC: Who was your supervisor at the time?

DW: Alfio Bissiri was my original supervisor. Then Maurice Landau was the supervisor later on. George Elder and Army [Armando] Galindo were both my supervisors at other points in time.

TC: When you first hired in, what were your specific tasks? Can you recall that?

DW: Yes, well, the main thing we were doing at that time was building the transmission lines for the Haynes Steam Plant project. Those were 230 kv multi-circuit towers, so we started the design and then followed on through the construction of those lines, plus then the modification of most of the rest of the belt lines up to 230 kv.

TC: Just going back a minute, DWP at the time . . . GOB [General Office Building] that we're sitting in now was not here.

DW: It was a parking lot.

TC: This was a parking lot?

DW: Yes, in other words, the Department had already acquired the ground and was using it as a parking lot for their employees, but there was no building here.

TC: No building here. So you were going downtown to . . . was it Second and Broadway?

DW: No, the building I was in was at Fourth and Hill. It was the Black Building, it's subsequently been ripped down.

TC: And that's where Design and Construction was?

DW: That's where a portion of it . . . I think the Department probably had five or six buildings in downtown, and there were some people in the Wright & Callender Building. I think most of D and C [Design and Construction] was in the Black Building, though.

TC: Okay. The Department was so spread out down there, it's nice to learn what particular buildings had what particular staff. At the time, Sam [Samuel B.] Nelson was the General Manager, right?

DW: Well, [William S.] Peterson was the General Manager when I first came on board. Then I think Mr. Nelson replaced him.

TC: Yes, okay, Peterson retired in about 1960.

DW: Yes.

TC: Did you have any opportunity to meet him?

DW: No.

TC: He was quite a man, from what I've read.

DW: Yes, and he was actively involved in transmission. Mr. Bissiri knew him very well.

TC: He was also from the Northwest. I think he was from Montana. He grew up in Montana and worked for Anaconda Copper and various things.

DW: Yes, that's where he started in the wire business.

TC: Yes, it would have been interesting to interview him. Unfortunately, he's gone. And Ivan Bateman was the Chief Electrical, right?

DW: Yes.

TC: What sort of man was he?

DW: I never really dealt with him either.

TC: As a youngster, you weren't . . .

DW: I wasn't involved in that.

TC: And the Engineer of Design and Construction was Mr. [Edgar L.] Kanouse?

DW: Yes.

TC: How about any dealings with him at the time?

DW: I dealt with him a little bit later on in the early seventies, but back then I had no dealings with him at all.

TC: Okay.

DW: In the sixties I had no dealings with him.

TC: Okay, now getting back to . . . you started speaking about the Haynes transmission lines. The Haynes plant was . . . I guess, just as you came in, it was under construction. Is that right?

DW: They were just starting construction on it. That's correct.

TC: And even as it was being built, you were planning the route for the transmission lines?

DW: Actually, that started before the plant was built, the route was essentially selected by the time I went there. First of all, you want the transmission line to be built before the plant's built, you know, because you need construction power.

TC: Oh, I see.

DW: The construction power initially came out of the Seal Beach Generating Station, off a 115 kv line. So we started building four-circuit towers, and we strung two sets of conductors initially and then went back and strung two more sets later on as the fourth, fifth and sixth units were built at Haynes. But that was planned . . . Like I say, the right-of-way had actually been selected before I even came into the group in 1960.

TC: Was that plant larger than the Valley Steam Plant?

DW: Oh, yes.

TC: Because I guess the Valley plant had been up and running for some time.

DW: In order, it went Valley, Scattergood [Steam Plant], then Haynes.

TC: Oh, so Scattergood was up.

DW: And then after Haynes was completed, then Scattergood Unit 3 was built, following the construction of Haynes.

TC: I see, okay. In planning for the Haynes lines, what did that mean in lay terms, if you will? Did the receiving stations have to be modified in particular ways to handle the new power?

DW: Yes, they did, but I didn't work on the receiving stations. But part of the power went into what we call RSF [Receiving

Station F], which is in the southeastern part of the system. Some of the power came up to the Marketplace Station, which is about Sixth Street in downtown L. A. Some of it went up to RSA [Receiving Station A], which is about where Main Street crosses the L. A. River. Then we also took circuits on up to [Receiving Stations] G and E, so we took that energy and distributed it pretty well throughout the eastern side of our system.

TAPE NUMBER: 1, Side B

January 28, 1992

TC: So how long were you working on the Haynes lines?

DW: Well, I worked in Transmission Design for a total of almost twelve years. The first major project was the Haynes lines. Then we upgraded the voltage on several of the 138 kv lines around the city up to 230 kv, and then I became involved with the Pacific Intertie DC line and worked on a variety of the design features for that line and most extensively on what we call the electrode for the Sylmar Converter Station. The electrode is actually located in the Santa Monica Bay, but there's a line from Sylmar out to Santa Monica Bay for the electrode.

TC: Where is it in the bay?

DW: Well, if you just went from the foot of Sunset Boulevard and just kept going out about a mile and a half, that's where it's at.

TC: It's on some sort of an island type of thing?

DW: No, it's underwater.

TC: It's underwater?

DW: Yes, about fifty feet down, and there are some concrete structures down there to protect the electrode from boat anchors.

TC: What is the function of the electrode?

DW: It provides a zero point for the line. You know, a DC line, at the time it was built it was plus-400,000 volts and minus-400,000 volts, but you have to have zero in the middle, and so this provided the zero. Also, if you lose one of the conductors, you can operate with one conductor and a ground return. They had a similar electrode up in Oregon and so the electricity just flows through the earth and comes back out up in Oregon.

TC: Why was the location put out there in the bay?

DW: It started out at 1800 amperes. When you have a large ground current, it's very, very important you have a very low ground impedance, and either that or it has to be remote from other facilities because it causes corrosion. When we looked in southern California, there were no remote areas left. We investigated installing the electrode at the bottom of an oil well or something like that, and it just didn't look practical, so we thought that the sea electrode was by far the best. The ocean water is an extremely good conductor, so it gives you very, very low impedances. So that's why that was selected.

TC: Now, had other power companies done the same sort of thing, say, PG&E in any of their projects. How did you get the idea to put it out underwater?

DW: The early DC lines in Europe were primarily what we call one conductor with a ground or sea return. And that was a lot of the economics initially: the fact that you have to run a lot less conductor because you can use the sea as a return. So, in those areas they had a sea return--an ocean electrode in other words--but it was usually in a remote area. So they didn't have to worry about corrosion, so the electrodes were rather primitive. There are gas pipelines running right along Pacific Coast Highway, so we had to be very, very concerned about corrosion, and we had a much more elaborate design than anyone else I'm aware of at that time.

To go back in history again, the Pacific DC Intertie was the first DC line in the United States. It was the longest line in the world at the time it was built and it had the highest voltages and highest currents of any line in the world at the time it was built, so it was a unique line for a lot of reasons.

TC: There was some discussion about whether this kind of thing, a DC line like this, would be really feasible and economical for the Department. You were a very young engineer, and I suppose you did what you were told to do and didn't get involved necessarily in that kind of controversy . . .

DW: No, we did get involved with the economics. The line was originally justified on a capacity energy exchange contract with the Bonneville Power Administration. That was essentially a fifteen-year contract and that's what provided the economics. Bonneville gave us . . . I think it was 512 megawatts of capacity in exchange for 2,400 kilowatt hours for each kilowatt of capacity. So that was the original economics on it. After the line was built . . . I'm sorry, I guess I should probably go into the history a little bit.

TC: Yes, that would be good.

DW: As I said, in the fifties and early sixties, the Bonneville Power Administration had more generation than they had load, and they were actually out cultivating new loads. By the end of the sixties, they were starting to run out of generation. They were starting to become generation-insufficient and so they were looking at ways to get low-cost energy. It's the nature of a hydro system on a large river like the Columbia River that there's lots of capacity. You can always put another generator in at a dam, get more capacity, more megawatts. However, the amount of water flowing through doesn't change when you do that, so you don't get more megawatt hours, all you get is more megawatts. So, from their standpoint, changing megawatts for megawatt hours was a real good deal, and so that's why they got into the line. That's why it was a good deal for them; the opposite of that is why it was a good deal for us, because ours was a predominately thermal system and we didn't have any significant storage.

Hoover Dam was by far our largest hydro resource, so the thought of having the hydro units, which you can run up and down and adjust to any load much better than you can with a thermal generator, looked very economical to us. And the Intertie project was two 500 kv AC lines plus the ±-400 kv DC line. In order to get those projects built, the federal congress actually passed a new law which regulated the use of energy out of the Pacific Northwest and created among other things what they refer to as regional preference, which means the energy from the Bonneville System has to be used in the Pacific Northwest first. If there were surpluses to regional needs, then it could be used outside of the region. The exchange contracts were viewed as not a sale of surplus energy, it was just an exchange of capacity for energy, so that wasn't affected by regional preference. But the line was built, it was dedicated in the early seventies, and then we had the Sylmar earthquake and the Sylmar converter station had to be rebuilt.

TC: Where were you at the time of the Sylmar earthquake? I guess you were getting ready for work or you were on your way to work. It was early in the day . . .

DW: No, it was early enough I was still at home. I was getting ready for work. And living in West Covina, it was just a nice rocking sensation.

TC: (chuckling) A nice rocking sensation.

DW: It wasn't the urgency that the people downtown had.

TC: Yes, in my short time here I've witnessed, I guess, about two major shakes, and I don't know if I'll ever get used to it. Californians or people who have been here for a long time talk about, "Oh, that was a nice one," or, you know, "That was a nice roll." But it's hard when you're from the East to get used to it.

DW: It's not as bad as humidity. (chuckling) Anyway, we then had to rebuild the Sylmar Converter Station. But then, during the seventies, there was enough surplus energy available because of higher than normal water in the Pacific Northwest that we paid for the total cost of the DC line within about a two-year period just from the surplus energy we obtained over and above the capacity energy exchange that was in existence. So it turned out to be a wonderful resource for us.

TC: Well, just a couple more technical points on the earthquake. When you felt it, you probably didn't know where the epicenter was, so . . .

DW: Well, the radio had indicated it was near Sylmar.

TC: Did you think immediately of the facility up there?

DW: Well, again, I didn't work on the stations as much as I worked on the transmission lines, and transmission lines are very immune from earthquakes. Transmission lines just aren't damaged much from earthquakes. Now, the stations at the end of the lines were badly damaged, but that was really a different group within D & C that worked on that stuff.

TC: With the lines themselves, when they're built is that sort of consideration built into the whole system, where if there is that kind of earth shaking that it will compensate or have enough of, say, a sag or enough of a resilience to overcome anything?

DW: And it's not so much a conscious design, it's just the idea that the wires provide a lot of flexibility. You can shake the towers around a lot, and as long as they don't fall down they're designed for very, very heavy wind loads and ice loads, so that they're very strong structures. And the existence of the conductors between the towers allows them both to move independently and it just doesn't create the types of stresses that cause more rigid structures to fall down. There's a lot of flexibility both in the towers and, of course, the conductors between the towers.

The big problems at Sylmar occurred from broken porcelain, the insulators breaking, and transformers and valves being shifted off their foundations, that sort of thing. But the lines themselves weren't really badly damaged. Of course, without the station equipment at the end, it couldn't be used.

TC: So how long was it out of service for?

DW: It seems to me it was about eighteen months.

TC: So it has been rebuilt, I suppose, to withstand anything of the same magnitude or probably higher magnitude?

DW: That's correct, and the design changes that were incorporated because of the earthquake at Sylmar were carried over and were used on the DC line associated with IPP [Intermountain Power Project], you know, the STS [Southern Transmission System] line. Those same features were designed into that line. So it's, we hope, pretty immune also.

TC: I'd like to talk some more about the Intertie, but what I want to do is go back into some of my notes and get a better chronology. This will give us some of the general features, the general contours of the project, but I want to get at some more specific features. But let me just ask, and again this may not have been your bailiwick, but it seems to me in my research that the issue of Unit 3 at Scattergood was a very big issue in the period of about 1965, or maybe later than that.

DW: That's correct. Well, it was actually later than that, 1968 to seventy-ish, yes.

TC: What was that about? I know it had to do with the Air Quality Management District [AQMD].

DW: It was actually the Coastal Commission originally, and AQMD secondarily. The first of the environmental laws were starting to be passed in the late sixties. Up until then, we engineers never thought of us as being anti-environment; it's just that we did what was most economical. In some cases that meant draining swamps or whatever else you had to do to get the job done. So the first generating unit that we built that came under these new environmental laws would have been the Scattergood Unit 3. I was not directly involved, but I remember a lot of the talk at the time about what was involved. Mr. [Floyd] Goss, who was then the Chief Electrical Engineer . . .

TC: That would be Floyd Goss.

DW: Floyd Goss, that's correct, felt that the plant had been started long enough before those laws were passed that it did not come under those laws. Of course, some of the regulatory jurisdictions didn't have the same viewpoint, and so there were significant conflicts. His response to the AQMD essentially was: all right, even if they had jurisdiction over Scattergood, they didn't have jurisdiction over what we refer to as peaking units. So he said, "I'll just build a bunch of peaking units. It won't be under your jurisdiction and there'll be far worse air quality as a result of that." So we put four 18 megawatt gas turbine peakers down at the Harbor [Generating Station] site as kind of his . . . "This is what I can do and this is what I will do if I don't get a permit for Scattergood Unit 3." And like I said, the unit was well along, a lot of work had been done already. In a compromise we were given a permit to operate Scattergood Unit 3 at about two-thirds of its rating. We weren't given a permit for the full rating and so that unit was allowed to continue. It would become the last [L. A.] basin generating unit we ever built, the last steam boiler unit, anyhow.

At that point in my career, I was in Underground Transmission Design and we built the 230 kv lines from Scattergood up to RSK [Receiving Station K] to get the energy from Unit 3 at Scattergood into our system. The Units 1 and 2 at Scattergood are connected to the 138 kv system, so it's quite a different system. At that point in time, they weren't connected to each other at Scattergood. Just recently, within the last two years, we've connected Units 1 and 2 and Unit 3 together at Scattergood, so we transfer energy back and forth between the 230 kv system and the 138 kv system.

TC: You mentioned about the upgrade from 138 to 230? Can you explain that? What made that upgrade possible and what made it desirable?

DW: Well, the upgrade was desirable because the higher the voltage the lower the current could be for any given amount of energy transfer, and the lower the current, the lower the losses. So that's why it's desirable: you can transfer larger and larger blocks of energy to have higher and higher voltages. By using new insulator designs and some creative engineering, we were able, in many cases, to modify existing 138 kv towers and put 230 kv on them and still have the legal clearances and not have to change out the towers, which, as you know, an expensive part of transmission design is the towers. So a majority of the city was changed out from 138 kv to 230 kv. The whole eastern belt line was changed out and 230 kv was also taken over into West L. A. As the energy loads in Los Angeles continued to grow, that was an important feature in getting those loads met with the lowest possible losses.

TC: We've got ten minutes or so, but I wanted to get into a little bit about your continuing education.

DW: Okay. Almost from the time my wife and I finally got moved in in L. A., I started going to night school at USC [University of Southern California] and in 1968 obtained a master's degree in electrical engineering. When I finished that, I went on and got an M.B.A. also from USC. I graduated with that in 1971. In 1970, for a period of about four years, I then taught in the graduate school at USC the types of courses that most of the power engineers were taking at that time.

TC: Did the Department or does the Department have some sort of institutionalized program with USC Engineering School? It seems that a number of engineers have gotten higher degrees from that program.

DW: Well, first of all, the Department has a very aggressive tuition reimbursement program, so it reimburses employees for almost all the costs for any classes they take that lead to degrees in the general subject area that they're working in. Mr. Rupert Bayley was kind of the liaison with USC in the sixties to get power type courses taught. With the aerospace industry here in L. A., the schools were drifting away from power type classes and getting much more involved with electronics. There's a lot of overlap between the two. You know, the equations are the same but the results don't look the same. So Mr. Bayley was very instrumental in keeping a master's program in power available as an option at USC. Part of the requirements for the Department doing that was Mr. Bayley had to find teachers for the classes. That's why in the early seventies I was one of the people he selected to help teach those classes. The Department has continued to do that, and currently we actually have classes that are taught through television. They have television monitors here in the Department and teachers on campus and students . . .

TC: Oh, I didn't realize that. So you can go to some conference room or something and just hook into the lecture?

DW: Yes.

TC: Well, that's fantastic. What were the courses that you took for the master's degree in engineering?

DW: I can tell you the ones I taught. I taught transients in linear systems and then also a class on transmission line design, both overhead and underground. Those were the two I taught.

TC: Would they just be a basic upgrade, sort of what you'd take as an undergraduate electrical engineer?

DW: Well, yes. I remember one of the classes . . . well, we got much more into transient conditions rather than the steady state conditions. That's one of the things that you study more there. Solid fault problems. You have a system that's running, then you impose a fault on it, you use symmetrical components to solve those equations. But this is the sort of thing that we studied more in the master's program than we have in the undergraduate program.

TC: Was it immediately applicable to what you were doing?

DW: When we first became involved with the DC line, of course, that brought a whole new bunch of theories that we had to start using. Then I think the master's work helped me to get a leg up and be one of the first people who really understood how the DC system was going to operate. I think it was very helpful in that.

TC: I see. It was the math that you were given was able to . . .

DW: The actual math that we had, yes.

TC: Don't mind if we shift from point to point here.

DW: No.

TC: When you were first faced with this DC technology, did you say to yourself, "My god, I don't know if this will work," or "Will this work?"

DW: Oh, we knew it would work.

TC: You knew it would work? Because of the European experience, I suppose.

DW: Sure.

TC: But you were doing it on such a larger scale.

DW: It was a larger scale. Dr. [Uno] Lamm, the person who developed all the DC systems in Europe, actually came here and sat for days and days and days in the meetings with us going over different operational issues. The integration of the AC system and the DC system together was an important part of the whole process. You know with engineers, if you can write a formula they can always solve it. (chuckling) So Dr. Lamm could write the formulas and we always solved them.

TC: That's good. Now, with the M.B.A., what possessed you or inspired you to go after that?

DW: Well, like I said, when my wife and I moved to California, I hadn't intended to stay here thirty years. So one of the reasons we decided to come to California was the fact that if I had gone to work in Portland there was no graduate education available to me at that time. I would have had to take correspondence courses from Corvallis or something like that. So we thought that coming here to southern California, we knew that both SC and UCLA [University of California, Los Angeles] would be available, and we knew it would be easier to continue my education. When I finished the master's in electrical engineering, of course, there was some thought about going on and getting a doctor's. That didn't really look that appealing to me and so I thought that the business background would become useful, I didn't know how. So I took the M.B.A., and about a year after I finished that there was a position available in the Rates Group, the Assistant Rates Manager here. So I thought that was a good marriage of my M.B.A. background and my technical background in electrical engineering. So for virtually twenty years I have been involved with rates in one shape or another.

TC: And that, of course, is going to be, I think, the core of this conversation we're having.

DW: Right.

TC: Which we'll probably get into next time after some other further discussion on the Intertie. I just wanted to finish up with a general question. In the period we're talking about, say, the 1960s into the seventies, you know, the nuclear program was instituted here, and, of course, the

Department never built a nuclear plant. You were not involved in this, I know, but what did you think of nuclear technology at the time that all this was going on, the Malibu Project and the ones that followed?

DW: Well, first of all, there was a Nuclear Design Group in D & C at the time I came to work in 1960. Again, as an engineer I have told a lot of audiences that my personal choice is I'd rather live next door to a nuclear plant than a junior high school. Now, everybody makes their own choices, but that would be mine.

So I think almost the only problem . . . Well, there are two significant problems with nuclear that I see: one, is the disposal of the waste fuel. The Department of Energy has the responsibility to determine how to do that, they haven't done it yet, for more political reasons, really, than technical reasons. But the nuclear fuel has to be stored for probably 30,000 years, and it's just hard for an engineer to say, "I am certain that this will last 30,000 years." You've got to give people probabilities. As soon as you drop back from being certain, then some people are very uncomfortable.

The other problem is the whole public perception of nuclear. I think the industry has a lot of work to do there. I think that in order to have a future the nuclear industry has to go to what we refer to as a modular type construction, where the nuclear heart of the system is manufactured in a factory where you have factory quality control over the product, and then the conventional part of the plant, the steam turbines and generators are just like any other plant, that would be manufactured on the site. But I think the nuclear part of the system has to be a factory type of construction where you have far, far better quality control.

One of the problems that got the state of Washington in trouble with their WPPSS [Washington Public Power Supply System] plants is they were building five large nuclear plants and they just didn't have a work force that could handle that. So they had people, they'd bring them in and send them to school for two weeks to make welders out of them. Well, you aren't a very good welder at the end of that period of time. It was just a far bigger undertaking than the work force allowed them to complete.

TC: With the end of the nuclear program, I guess the nuclear group was dismantled. Do you see that coming together in the future in the Department? Or is nuclear pretty much out of the picture as far as the Power System is concerned?

DW: Well, with the Power System's resource plan, we wouldn't need another big unit at least for eight years and maybe for fifteen years. So obviously one of the big concerns right now is the greenhouse effect, carbon dioxide. I personally don't believe it's a viable problem. I think there's a lot of research scientists that need work and so this is a way to generate work. But if the continuing studies show that greenhouse gases really are a problem, nuclear might be the only option that we have. So either for the Department or the nation as a whole, I think that we have to continue to study nuclear. I don't think we can stop looking at it.

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February 5, 1992

TC: I wanted to just go over a couple of the points we got into last time. Some of them may be relevant or not, but I just wanted to check to make sure. You mentioned you were in Underground Transmission for a time there.

DW: Yes, that's correct, for four years.

TC: For four years? What years would those have been?

DW: I'll say 1968 to 1972, that general time frame.

TC: Oh, okay. So that would have been long after the overhead to underground conversion process was going on.

DW: Yes, most of that process was really distribution lines, not transmission lines; existing overhead pole lines were converted to underground. That was going on prior to that. I was working on the Transmission side, which is higher voltage.

TC: Okay, I see. Well, what was involved in that? Where were these lines and why were they put underground?

DW: Well, they were primarily put underground for two reasons: one, we could not get a right-of-way to put them overhead; the other thing is because of the nature of the terrain, it wasn't appropriate to use overhead. For instance, coming out of the Scattergood Steam Plant we go overhead for approximately one mile to Imperial Highway, then the lines have to go underground because of the vicinity of the airport. So we then have lines that go underground more or less due north into RSK [Receiving Station K], the 230 kv, and we have lines that go underground more or less east to RSN [Receiving Station N], all underground.

TC: What are the technological issues that you face in designing that kind of underground? Because I imagine you have to compensate for heat buildup and that kind of thing.

DW: That's correct. In other words, an overhead line, the resistive losses, what we call i^2r losses, are pretty well dissipated by the air movement, and there are upper limits to the amount of current they can carry but you have a lot more leeway. For an underground cable, all the heat has to be dissipated into the street--we normally put them in the street--and so in order to compensate for that we use special back-fill material that has good heat conducting characteristics and we have to space the lines. You can't put too many lines in any one street, you have to get rid of the heat.

Like on the Scattergood 230 kv cables, they were designed for two 230 kv cables coming out of Scattergood if it was rated at roughly 450 megawatts. When the unit was first put into service, we had restrictions on how much energy we could generate there, and so consequently with the restriction we only built one line. That one line was sufficient for our then operating permit. Since then, the operating permit has been increased and so that was starting to overload the cable, so we have to monitor the temperatures very closely at manholes to watch how much that temperature swings. The underground cables are typically insulated with paper impregnated with oil, and that's very sensitive to temperature.

TC: Okay.

DW: Another issue on underground cables--I'll just throw it in--is with AC currents there's a very specific length, there's a maximum length you can go, and for 230 kv it's around twenty-five miles. That's as far as you can go and then you have to have a station.

TC: And bring it up?

DW: Bring it up. So, when you look at these lines across the desert and you say, "Oh, those are ugly, we ought to put them underground," you can't put them underground.

TC: You can't put them underground?

DW: Not unless you're going to have a whole series of stations.

TC: Returning to the [Pacific] Intertie matter, we talked in sort of broad terms about it last week and pretty much covered the history of it. I want now to get a specific picture of your association with it. How were you associated with it? I know you were involved in Transmission Design.

DW: Yes, the two areas that I was very heavily involved in were what we call the lightning prevention, and this included overhead ground wires and, depending on the soil resistivity, conductors buried under the towers in order to dissipate the current from lightning. We call them counterpoise. We didn't do that the whole length, only just in areas where the soil conductivity was poor. That was one area that I worked on for the entire length of the line.

The other thing that I spent a lot of time on was the ground electrode. It runs from Sylmar out into the Pacific Ocean off Sunset Boulevard, like I said, and that was a combination of overhead conductors that were put in the ground wire position on the existing towers, and then we went underground from Kenter Canyon, which is . . .

TC: What canyon?

DW: Kenter Canyon. It's just off the 405 Freeway north of Sunset Boulevard, and went from Kenter Canyon down Sunset Boulevard to the ocean underground, and then about a mile out into the ocean. This was the first undersea electrode that was designed and built in a populated area. Most of them were in non-populated areas, so there were a lot of design considerations that were somewhat different than what other electrodes had used. Most of the electrode design was primarily concerned with the amount of metal that was eroded off of the electrode during current flow. In this one, we had to worry about the current gradients and voltage gradients at the shoreline.

TC: Did you have to get out into the field at all and travel along the route of the Intertie?

DW: During the entire period of time that I was in Transmission Design we were in the field a great deal. A lot of that work is in the field--you're exactly correct--and I did drive the entire length of the line at least on two different occasions clear up to the Oregon border. That was when we were making the soil conductivity measurements once, and then the second time it was when they were doing the layout of the counterpoise at actual tower sites.

TC: Now, did you have to drive overland or is there some sort of Bureau of Land Management road that might run along, because much of it goes through the Nevada desert, right?

DW: You're right. The first time we went out, we hadn't yet built the construction roads, so we used state highways and BLM [Bureau of Land Management] roads that more or less paralleled the route of the line. The second time I went, by then the construction roads had been built, and again those are just dirt roads, but they went virtually directly along the line. Now, in some areas . . .

TC: Now, did the Department build those construction roads?

DW: Yes. In some areas, like in the area of the Owens Valley, the highway parallels the line within about a mile, so you just stay on the state highway. Some of the individual tower sites we drove into, but most of the time you don't drive on the patrol road--we didn't anyhow. But there is a patrol road the entire length of the line.

TC: What sort of soil tests did you do? Would you just take samples and run current through it? (chuckling)

DW: Well, that's exactly what we did. The civil engineers go out and take soil samples because they want to tell how much compaction there is and those sorts of things. What we do, that's exactly what it is: We take like an old hand-crank telephone and drive stakes in and turn the crank and measure the amount of current that flows through, which is a function of resistance because it's a constant voltage, and that's exactly what we did. There were areas through the Owens Valley that are very volcanic. It's very high resistance. We wanted low resistance, so in some of those areas we'd need to do special things. There were areas of almost straight pumice that we had to do other things to.

TC: Well, how did you get into the geology of this? Did you have geologists working with you or did the engineers have to sort of bone up on what it was all about?

DW: This is a function that engineers have been doing. In retrospect, if we'd had geologists we may not have had to stop and make as many measurements, maybe they could have told us. This is just something that engineers have historically done for the Department.

TC: Oh, interesting.

DW: On the Boulder lines which were built back in the thirties, the engineers did it then, too.

TC: You must have been out for days on end.

DW: Yes, sometimes.

TC: In the old days they set up these wonderful camps.

DW: The camps, yes. Well, they did during construction, and I wasn't there during construction. So they did have construction camps, not as many as we did on the Boulder line because there were communities adjacent. Those communities had the hotels, and some of them had what we call contract hotels where we could send people in and they just signed their employee number. So, when I was out traveling it wasn't during the construction period, we didn't stay at camps.

TC: Okay. I ask because Larry Schneider talked about the living conditions in those camps and I'm just trying to see if there was sort of a . . .

DW: No, I didn't ever live in the camps.

TC: Because it must have been quite a different sort of existence, in the heat of the desert, you know.

DW: The heat of the desert and nothing but men around. Yes, right.

TC: It's really something. I guess those days are gone.

DW: Yes, well, with the modern highways you can drive fifty or a hundred miles, so the work location is not a big deal anymore.

TC: Were you involved at all in the right-of-way . . .

DW: Acquisition?

TC: Yes, the acquisition of rights-of-way?

DW: No.

TC: In terms of your general knowledge of it, was it a fairly proforma kind of activity?

DW: It really was. The big right-of-way battle was getting the first line down from Owens Gorge. You know, there was a lot of work done on that. In that case, we were wise enough to acquire a wide enough right-of-way that we didn't have to increase it. You know, we already had enough right-of-way to build this line, so we built it on some existing right-of-way. By far the majority of the line was built on BLM land, so you have to go through a process with BLM to get your right-of-way, but it's not like acquiring land from a private party or trying to get severance from a private party to cross their land.

TC: Okay. So the line comes down sort of a straight shot from the Oregon border down to, say, around Mammoth--not Mammoth but Mono [Lake]--and then cuts down and follows the gorge, follows the river?

DW: It actually comes into Nevada fairly close to the California-Nevada border, within a hundred miles of the border, and then it comes kind of straight down Nevada. It passes quite a bit east of Mono Lake and then comes into California about where California doglegs over, and it's pretty well north and south the whole distance. When it gets like to the Bishop area, it parallels the existing gorge line all the rest of the way down.

TC: Oh, I see, okay. When they were designing the Boulder line back in the thirties--I got this through looking through Bradley Cozzens' papers that he had in his garage that ended up coming over here--he was involved in this incredible process of testing equipment, testing cable, testing hardware, testing things. They set up these ingenious fog environments to see what fog would do and that kind of thing. Did the same sort of . . .

DW: No, we've come a long way since then. You've got to realize with the Boulder line there are two really unique things. First of all, that was the highest voltage and longest line that had been built in the world up to that date, it was incredible. The other thing, it was in the middle of the Depression where labor was cheap compared to material, and so you've probably seen what we call the HH conductor, that hollow-core conductor, and so you use that type of conductor to get a larger diameter to reduce the electric field at the surface of the conductor, which reduces corona losses and electrostatic noise. But by using the hollow conductor, first of all, it uses less copper, and second, it makes it lighter. So, for that special conductor, there were a lot of special problems that that conductor caused. And you're right, we set up lots of tests on that.

For instance, one of the things that happens to transmission overhead cables is what we call aeolian vibration. As the wind blows across the wire, it acts in a similar way as an airfoil on an airplane wing and it lifts the conductor up. Of course, it lifts it a little bit and then gravity says, "No, don't lift it," and it comes back down, so it starts vibrating. This is a very common occurrence, and so we have to have something that reduces that vibration so that it doesn't fatigue the conductors to the point where it breaks. So they tested a variety of vibration dampeners and one developed by Floyd Goss was used originally [Goss balls]. Later on, we changed that and went to another kind. But there were a lot of things like that. The hardware, since it was hollow conductor, you couldn't use the normal compression fitting to splice it. You had to have something inside it to compress against, and so there were a lot of very unique things associated with that conductor. Nowadays, we wouldn't even think of using that conductor, it would be far too expensive--the labor would be--because the splicing is very slow compared to the aluminum which we use nowadays. But back then it was, like I say, in the Depression, dollars were tight and labor was cheap, so there were a lot of things that were done on that line that just aren't done anymore.

We also had the advantage that most of the length of that line was parallel to the gorge line so we had really good data on what kinds of problems we had on the gorge line. The biggest problems associated with the DC line had to do with ice and snow and then heavy winds. You're probably aware of the lines blowing down twice.

TC: No.

DW: Well, it's blown down twice.

TC: When did that happen?

DW: Well, when I say it blew down, five or six spans blew down, you know, not the whole length of the line, obviously. I think most recently was in the early eighties, and then another time in the late seventies, so it's happened twice. Both times we made design changes we thought were going to fix the problem; apparently the most recent design change did fix it because the line hasn't blown down since. It's one of those things that's ironic . . .

TC: So service is cut when that happens?

DW: That's right. That's correct. It's ironic since it happens in the winter, since ice load in addition to wind load caused it, this happened during periods when we weren't using the line a lot.

TC: Right, sure.

DW: You know, because we tend to use it in the spring and summer more. So it's not something you're happy about but it didn't cause a big . . .

TC: Disruption, sure. So what happens is that the ice forms on the towers or on the conductor . . .

DW: Ice forms on the conductor and on the towers, and so it makes a bigger cross section. So the wind blowing against that larger cross section exerts a larger force, and it was in excess of what those towers were designed for.

TC: Now, you said you redesigned things after that.

DW: Yes.

TC: In what way, how did you do that?

DW: Well, the structural engineers . . . The majority of the towers on that line are what we call guide towers. The Boulder line, for instance, is what we call free-standing towers. The structural steel holds the tower up. On guide towers, you have guy wires, similar to what you might see on a big antenna to hold the tower, take the transverse loading so the tower only holds longitudinal loads. So in both cases it was a change in the design of the guy mechanism.

TC: Now I wanted to talk a little bit about the upgrade. By the time the Intertie was upgraded, you were in a different section?

DW: I was but I was still involved some. Well, actually, we had two different changes to it. The first one, we increased the voltage on the line, and in order to do that we had to raise a few of the towers in order to maintain clearances. Primarily, it was only work at the station to add another bank of conversion equipment. The second time, we increased the current. When we did that, because as conductors heated, and the higher current heats the conductor more, as the conductor is heated it elongates, it gets longer and so it increases the sag. So there were a lot of towers that had to be raised at that time.

TC: So, when you increase the voltage, that's the pressure?

DW: That's the pressure, that's correct.

TC: But when you . . .

DW: Increase the current, that's like the gallons per second.

TC: Okay, so it's more . . .

DW: More gallons per second.

TC: More is going through the line.

DW: And a larger current increases the temperature as a result of the i^2r losses. Since i is current, and since it goes up as the square of the current, if you double the current the losses go up by a factor of 4 and the temperature increase in the conductor as a result of those losses is what elongates the conductor. So we had to go back and raise a lot of the towers there and change the insulation in a few cases.

TC: Was an upgrade sort of built into the project to begin with, when the whole thing got going in the late sixties?

DW: It really wasn't. It's just the nature of overhead transmission line construction that there's a lot of flexibility, and then you can go back and make changes if you use a conservative design. We hadn't really intended to ever do that, but it was the sort of thing that was necessary to do. The design was conservative enough that by sometimes adding insulators, sometimes raising the towers, or a variety of things we had to do, we could accommodate the higher voltages and currents without putting it all in the towers and into a conductor.

TC: What was the reason for upgrading in the first place? Was it that there was more surplus up in the Northwest that they could sell down here?

DW: That's exactly correct. I think I mentioned before, when the line was originally built, the economics were justified on a capacity energy exchange between the Pacific Northwest and the Pacific Southwest. However, during the mid to late seventies, they had a higher than average runoff almost every year, and the consequence of that was a great deal of surplus energy available. Also, by then the cost of running the fossil fuel plants here in Los Angeles had increased very substantially.

Throughout the sixties, residual oil, which was our primary boiler fuel, cost about $2 a barrel. Sometimes it got up to $2.10 a barrel and we thought this was terrible price gouging back then. In 1970 the price of oil went from about $2 to $2.50 a barrel clear up to $5 a barrel, primarily as a result of the first Federal Clean Air Acts. For a lot of the Eastern coal burning generation, the cheapest way to meet the new Clean Air Acts was to convert to oil, which raised the demand for residual oil, which raised the price. That's Economics 101.

TC: That's right.

DW: Anyway, when the oil embargo hit in 1973, it went from about $5 up to about $15, and then over the next ten years just continued to escalate until the early eighties it was almost $40 a barrel for oil. So oil had become so expensive that building a line to capture the surpluses, even though the surpluses weren't all year long, they were only for a short period of time in the spring, it became economically viable to increase the capacity of the line to take care of those surpluses. Now, coming out of the sixth year of a drought, we haven't had surpluses for several years.

TC: Yes. In the little bit that I have on the upgrade, I noted a certain issue in and around access.

DW: Transmission access, yes.

TC: Yes, transmission access. What was that all about? Was it who was getting what or who was entitled to . . . ?

DW: When the Intertie was first built, the DC Intertie, the partners were Southern California Edison, the Department of Water and Power, Glendale, Burbank, and Pasadena. Edison, in turn, because of the California Power Pool, shared part of their ownership with PG&E and San Diego [Gas and Electric]. On the two AC lines that were part of the Intertie, it was a similar thing with Edison, PG&E and San Diego, plus the Western Area Power Administration [WAPA] participated in portions of the line. So those were the owners of that line. Back in the sixties when the line was planned, those were essentially the only people who wanted to participate. By the time we got ready to expand the line and upgrade it, we had the expansion and the upgrade--the expansion was voltage and the upgrade was changing the current--a lot of the other southern California municipals wanted to become partners, and this included Anaheim, Riverside, Azusa, Colton, Banning, essentially the people who are in SCPPA [Southern California Public Power Authority], who by then had started to supplement the energy they bought from Southern California Edison with their own supplies.

TC: SCPPA being Southern California Public Power Authority.

DW: That's right, yes. And so there were people who wanted to come into the upgrading process, and in essence the existing partners said, "There isn't excess capacity. All the capacity that's there we intend to use," so no new partners were brought in. Several of the California municipals then sued Edison, PG&E, and San Diego--and I throw San Diego in, I don't really know how much involved they were in it, because they didn't supply energy to any of those other cities--and sued under what was a suit that was assigned the number of 7777. So that's referred to as Quad 7 in some of the literature as an anti-trust case because of the restrictions on who could use the Intertie. Los Angeles was not involved in those suits in any way, shape, or form, other than watched them with some interest.

TC: I see, okay. So we didn't have anything to do with that.

DW: No, we didn't even do an amicus brief or anything, just watched with interest.

TC: Why? Why not even a . . . Because we owned a portion of it?

DW: Well, yes. In other words, we felt our own needs were being taken care of because of our ownership shares and we felt that we were kind of accommodating . . . In other words, we have a lot of friends . . . A lot of the other municipal agencies that were entering into the suit through APPA [American Public Power Association] and other associations are kind of friends of ours. However, as an owner of transmission, we didn't feel it was fair for somebody to come in twenty years after something is built and say that they want a share of it. So, like I said, we watched with interest, and depending on the day of the week, we probably had a different opinion as to whose side we were really on in that case. So that's why we didn't do anything other than just follow it.

TC: What was the outcome?

DW: (chuckling) Well, it's one of those great court cases. The municipal utilities prevailed, they didn't get any damages, and essentially the investor-owned utilities had to promise to try to work them in, and to date they haven't.

TC: They haven't? (chuckling)

DW: You know, so it's one of those things, they won but it's not clear that they got anything as a result of it.

TAPE NUMBER: 2, Side B

February 5, 1992

TC: Well, let's just summarize your career moves thus far. I mean, we're getting into the rates matter, so I wanted just to sort of locate you chronologically. So you came in as a . . .

DW: Engineering Assistant.

TC: Engineering Assistant. In 1964, you became Electrical Engineering Associate.

DW: Associate, that's correct.

TC: And then in 1968, Electrical Engineer.

DW: Full Engineer, yes, what we call Full Engineer; Engineering Group Supervisor, I guess, would be a more accurate term.

TC: Okay. Now, those promotions, those advancements, were they based on tests or was it a simple . . .

DW: That's right, Civil Service tests and then interviews after the tests to be hired in specific locations. The Department was considerably smaller back then than it is now, so recently, for instance, on the Electrical Engineering Associate list we've hired sixty or a hundred people off of one list. Back in the early sixties, we would hire eight or ten people off the list. Things have changed a lot.

TC: Well, what accounts for that change?

DW: The growth in the Power System, and primarily in the Design and Construction Division, where there are a lot more facilities being built now than there were back in the sixties. In the sixties, other than the Boulder lines and the [Owens] Gorge lines, we didn't have any transmission lines outside of the L. A. basin and we didn't have any generation outside of the L. A. basin other than the hydro associated with the Gorge and Hoover Dam. So, as we started to build coal projects and become partners in nuclear projects, things just expanded a great deal.

TC: Okay, so in 1972, you became Assistant Rates Manager.

DW: That's correct.

TC: Okay, where was that, first of all? What division was that located in?

DW: Well, at that time, that was located in the Power Executive Office. I think I mentioned before I had obtained my business degree from USC. I thought, "Well, gee whiz, what's a better way to marry my engineering background and the business degree other than to go into the Rates Group. So, when an opening occurred there, I applied for it and was selected.

TC: Oh, you applied for it.

DW: It was what we call a sideways transfer, it wasn't a promotion. I was still the same level of Electrical Engineer.

TC: I see. Now, at that period, the Power System had its own Rates Group and the Water System had its own Rates Group?

DW: That's correct.

TC: Is that still the case?

DW: Well, it's the case now but it hasn't always been the case in between. Lloyd [B.] Adams was in charge of the Power Rates, and Lloyd [A.] Nystrom was in charge of the Water Rates, and both of them retired in 1976. Mr. [Louis H.] Winnard was the General Manager and he felt it might be more appropriate to reorganize and have all the rates under a single organization and that that organization should be in Finance and Accounting. They took the staffs from both the Water and the Power Rates and combined them, and I was put in charge of both the Power and Water Rates at that time, and that stayed true until . . . I'll say 1984, though I might have to check that date, when I got promoted to Principal Power Engineer. They then decided that since I wasn't there running rates anymore, maybe rates should be put back into the two systems. Because both Duane [L.] Georgeson and Norm [Norman E.] Nichols, who were heads of the Water and Power Systems at that time, were very involved with finances, and they wanted to have more direct control. Rates were separated again at that time. Water Rates went to Water Executive Office again, where it had been, and Power Rates were shifted to what was then System Development, which is Conservation and Planning now. Ralph Carlson has been in charge of the electric rates since it was moved back to the Power System.

TC: Okay, when Mr. Winnard combined the two offices, was the response positive? Did it seem to be: "Well, this is a good consolidation"? I know sometimes you get this: "Wait a minute. We're on the Power side and they're on the Water side, and let's keep these things separate."

DW: I'll have to say that other than just the normal concerns that anybody has when they get transferred from one spot to another, I don't think there was any concern about it from anybody. The electric rates were on a very rapid escalation throughout the seventies. First it was the cost of the fuel and later on the cost of borrowed funds, and so . . .

TC: Yes, it would be good to get into rate history, just in general terms. I know that for some sixty years rates were relatively stable.

DW: Declining, they were declining costs then.

TC: They were declining.

DW: And it was declining nominal cost, not just declining real cost. For instance, in 1916, 1920, in that general period, we were probably charging 10 cents a kilowatt hour for energy. That was the nominal cost. By 1969 and 1970, that was down to less than 2 cents a kilowatt hour. You know, that's nominal cost again, a real decline.

TC: Oh, so the customer would notice this over time.

DW: Absolutely. Almost all the rate actions which the Department asked the City Council to take were rate decreases. There were a couple increases during World War II, but for practical purposes all we did was go in and say, "Well, our costs are down again, we'd like to reduce rates." One reason was economies of scale. As people started to use more energy, we built bigger generating plants, and bigger generating plants are more thermally efficient and require fewer people per kilowatt to watch out over them. The other thing is the distribution system was being used to a greater extent. That is, when you put up a pole and run the wire, whether you run a big wire or a little wire doesn't make much difference. Putting the pole in the ground and running the wire is the big expense, so as the system became larger to supply the increased electrical needs of the customers, the costs just came down. It was just that simple.

People started using a lot more electricity. Back in the early 1900s, electricity was used almost exclusively for lighting--that was by far the primary thing--and then a little later on people started getting radios and started to use electricity for cooking, and so it just grew.

TC: Yes, that's true. The Medallion Homes Program was instituted in the fifties.

DW: That's right, following World War II, the Medallion Homes were . . . We had both Bronze Medallion and Gold Medallion. In a Gold Medallion Home, essentially all energy functions were done with electricity--water heating, space heating, cooking, lighting, everything. Then, a little later on in the late sixties, we started getting air conditioners. In the fifties, early sixties, people used fans, they didn't use air conditioners. We forget, you know. We're so comfortable in air-conditioned offices now.

TC: Exactly, I know. You walk in and you flip the switch, or you don't even have to, it's automatic.

DW: And until the Department moved into this building, the Department's offices were not air-conditioned.

TC: Oh, my lord.

DW: Yes, this was the first air-conditioned office the Department had, and that was 1965. Prior to that, you just opened up the windows on both sides and put paperweights on the papers so they wouldn't blow away.

TC: (chuckling) I can see that. In Los Angeles in the summertime, that must have been pretty . . . It could get pretty hot, I suppose.

DW: It was pretty hot but I don't remember anybody becoming ill or anything. You just worked through it. I was probably better off than some people because we were out in the field a lot, and when you're out in the field it doesn't seem to bother you as much as when you're in an office.

TC: How are rates arrived at in the first place? Is it a matter of . . . I mean, I know there's certain basic economics, of course: How much does it cost to generate it, and then what's a fair return?

DW: Sure. Let's take a little bit of time and go through that. I find it's easier to contrast what the Public Utilities Commission [PUC] does for investor-owned utilities with what we do, because I think most people have a little bit better understanding of the way the PUC does it. The first thing in rate setting is to determine the revenue requirement, determine how much money you need. And for an investor-owned utility, they have allowable expenses plus a return on investment. That constitutes their revenue requirement.

Allowable expenses, and I'll just give you an example of this, for instance, in the seventies at least, the PUC determined that coach airfare was an appropriate business cost. However, Southern California Edison allowed their employees to fly first class if the flight was over three hours. Their rationale for that was because in first class you can take along your books and work during the trip, where in coach you're going to have a more difficult time doing that. On the longer flights they thought that was worthwhile. The PUC said that the difference between first class fare and coach fare was a non-allowable expense, so someone went through and for every first class fare subtracted the difference between that and coach and came up with how much was attributed to rates. So the difference between first class and coach was a non-allowable expense.

Another thing that's normally considered a non-allowable expense is what I'll call institutional advertising. Edison takes out an ad that just says what a great company Edison is, you know, either come work for us or buy our bonds or something like that. This is considered institutional advertising and that would not be an allowable expense. So they go through and determine allowable expenses, and allowable expenses include virtually all the salaries of the employees. Again, there are some employees with a salary above a certain cap, part of that salary was considered a non-allowable expense. Then they determined what an acceptable rate of return is. The rate of return is typically based on what interest costs, what bonds would carry, it would be based on what stocks of major corporations, what kinds of returns those stockholders had obtained, kind of come up with something that's considered a fair return for investment.

Then they argue about how much money is invested. You know, they look at the plant and then, for instance, one of the things that's historically used in utilities is that, in order to be included in the rate base, a facility has to be used and useful. In other words, if you build something and then don't need it, then that doesn't go in the rate base. You don't get to earn a rate of return on that, even though you invested the money. They'll just say, "Gee, that was kind of dumb to invest in that."

And very frankly, this first became a big issue when the nuclear plants started coming on line, especially some of them that were coming on line and the energy wasn't really needed. They were determined not to be used and useful. For instance, you're probably aware that El Paso is in bankruptcy. At least part of their bankruptcy problems were the result of facilities they built that the PUC decided were not used and useful. So they weren't allowed to earn a rate of return on those facilities.

So, anyway, with the investor-owned utility, you have allowable expenses, you have the investment, the rate base, and you have a return on your rate base. Those things are all multiplied together and added, and that comes up with the total revenue requirement. For a municipal utility, we're usually considered on a cash basis. In other words, there's no such thing as a non-allowable expense. If it's non-allowable, who's going to pay it? There is no stockholder to pay it. All the expenses, they may be imprudent but they're all ours.

TC: They're all allowable, okay.

DW: And there's no other choice. There's no other place to get the money from. So we do the same sort of thing, we look at all of our expenses, which include fuel and all those kinds of things, and then instead of having a return on rate base, typically for a municipal utility a certain portion of the capital investment comes from retained earnings, which is money over and above actual operating expenses, and a certain portion comes from borrowing.

We've determined, the Department has determined, in the long-term around 50-50 is a good mix on that. Now, it's not always 50-50, but that's a pretty good mix. So you take approximately half of your capital program and all of your expenses, add those together, and that's your revenue requirement. Now, in looking at the operating expenses the Board reviews the budget, a lot of people review the budget, and then adjust that as low as they feel is prudent, but whatever the budget comes out, those operating expenses, plus about half of the capital program, are then considered to be our revenue requirement.

After you get the revenue requirement, then you have to decide who's going to pay that, and that part is virtually identical for both the PUC regulating utilities and the Department of Water and Power. They do cost of service studies, and under the cost of service study, for instance, the secondary distribution, which is 120/240 volt lines that go out to the residential customers, the large industrial customers don't use those facilities, so they shouldn't help pay for them. That's an example.

TC: Sure.

DW: So you go through and figure out who's using a facility and how should you pay for that. Rate designers have all sorts of different ways. We do it on coincident peak demand methods, or you do it on an average and excess demand method, and there's a whole lot of different methods for allocating costs. But when you get all done, they all come out about the same, there's not a great deal of difference. But you go through and allocate the costs to each of the customer classes, and typically the customer classes are residential, small commercial-industrial, medium-sized commercial-industrial, and very large commercial-industrial. For instance, in the Department we have almost 1,400,000 customers. The large commercial-industrial customers are about 1,500, about 1,500 customers out of that 1,400,000 come in that classification, yet that group supplies 35 percent of the total revenue. There aren't very many of them, but they're large users. In Los Angeles, the oil refineries obviously are in that category, some of the aircraft facilities . . .

TC: Like Rockwell.

DW: Rockwell would be in that category, and the major office buildings are all in that category. Right on the verge between large commercial-industrial and medium-sized commercial-industrial is a supermarket. Supermarkets are either at the very high end of the medium or at the very low end of the large. It depends a little on the type of store.

TC: Because of the lighting, twenty-four-hour-a-day lighting and refrigeration, I suppose.

DW: Refrigeration is a big part of that. Yes, that's correct. On the residential side, that's our highest rates, the highest rate per kilowatt hour, and that's because they use more of the system. Residential customers use a portion of the generation, a portion of the transmission, a portion of the 34.5 system, a portion of the 4.8 system, and then they use the secondary distribution on the 120/240. So they use all of those facilities and so they have the highest rate because they have to pay a proportionate share of all those. The very large commercial-industrial customers only use generation and transmission and the 34.5 system, they don't use anything below that, and so they pay their proportionate share of those systems.

Reasonable people disagree on exactly how to allocate, but again, like I said before, it comes out fairly close. Prior to the mid-seventies, the Department, and almost all utilities, used what we call historical or accounting costs in this cost allocation process. In the seventies, as the cost of energy really started to skyrocket, a lot of people thought that part of the problem was the rate design. We ought to change the rate design. That will keep rates from going up too much. And that was faulty thinking, because if you remember we talked about revenue requirement and rate design. The revenue requirement was going up--it didn't make any difference what the rate design was--the revenue requirement kept going up. But there were other ways to look at rates, and so some people had been discussing it earlier than this, but in the mid-seventies marginal cost pricing, you know, the economists' view of how things should be rather than the accountants' view started to come into vogue. And there were several things happened all at once. In 1975, here in Los Angeles Mayor [Thomas] Bradley appointed a Blue Ribbon Committee to look at rate structure to see what could be improved in that regard. At about the same time, the Public Utilities Commission instituted a generic rate-setting process. Normally, they have rate-setting hearings, Edison, or PG&E, or San Diego comes in and says, "We need a rate increase," and they go through a hearing on that specific rate. This was a generic rate structure case called 9804, where they didn't have a specific rate to look at but they just discussed generically how rates should be designed. In other words, in essence they said, "Let's leave this revenue requirement issue alone. Don't talk about that. Let's just talk about it after we have a revenue requirement. How do we spread those costs to other customers so that those costs give a customer a signal as to how they, when they make changes in their energy use, how that affects the utilities costs?" Also, at the same general time, under President [Jimmy] Carter, the federal government got into developing a national energy policy which resulted in five acts, one of which was PURPA [Public Utility Regulatory Policies Act of 1978], and set up several standards on rate structure. All three of these things were going on at the same general time. Also, in response to this, the Electric Power Research Institute, EPRI, was requested by NAURC, National Association of Utility Regulatory Commissioners--I'm pretty sure that's it.

TC: Yes, I think that's right.

DW: To investigate rate structure. So they set up a rate task force made up of people on PUC commission staffs, made up of investor-owned utilities, and I served on it for APPA to look at rate structure. They had a lot of consultants come and talk to us and write papers. So, during that period from essentially . . .

TC: Like 1975 to 1979 or . . . ?

DW: But it really started with the oil embargo in 1973, and it took a couple of years to get everything kind of together. Like PURPA was passed in 1978, so between 1973 and 1978 there was just a lot of turmoil and investigation and going back and looking to see what could be done with rate structure to ensure that when people made their own decisions that their economic best interests were similar to the utilities' economic best interests. And so the result of that was a lot of new rate structures.

Time-of-use rates became very popular as a result of that. There were very, very few time-of-use rates prior to that. The time-of-use rate costs more for kilowatt hours during the middle of the afternoon that it does in the middle of the night. It makes sense. But up until then, and partly because the energy was so cheap, why bother making those distinctions.

TC: Well, would time-of-use affect the large users, you know, the big manufacturers? If they are running during the day, then they're going to be paying more unless they run all night.

DW: That's exactly right. The first time we had time-of-use rates was in 1978. We put them in in 1977, and there was an injunction and they never went forward. We got the injunction lifted in 1978 and put time-of-use rates into effect.

TC: Who filed the injunction?

DW: California Manufacturers Association.

TC: So it was the manufacturers that were saying . . . Were they arguing it was discriminatory or something?

DW: That's exactly what they were arguing. And it's the sort of thing . . . because in the 1978 time frame, a normal kilowatt hour meter on a person's home would have cost about $25. A time-of-use meter for the residential home would have been about $400. So it doesn't make economic sense to run out and put these expensive meters on somebody whose electric bill is $15 a month. You're never going to get your money back. So you start out with the very largest customers first. And you're exactly correct, someone who has a manufacturing process that runs one shift, their bills went up very, very substantially if they didn't modify the way they use electricity. But the purpose of the time-of-use rates was to get them to modify the way they used it. You know, not try to do it the way the federal government does with CAFE [Corporate Average Fuel Economy] standards to increasing car mileage. It's obvious to me what they should do is raise the tax on gasoline and let people get whatever kind of mileage they want. Like why worry if somebody wants to get ten miles to the gallon as long as they're paying for it. Most people will make the right economic decision. And someone who drives ten miles a month, why would they care what the gas price is?

TC: Sure.

DW: Somebody that commutes 100 miles a day, they're going to make a big difference. Anyway, some types of businesses just inherently benefitted from time-of-use rates. I'll give you two examples: oil refineries and hospitals. Their loads are almost constant twenty-four hours a day. With hospitals, the same number of lights are on at night as there are on during the day. It doesn't make any difference to hospitals, so their loads are very, very constant.

So just inherently the time-of-use rates designed by the Department had about 24 percent of the hours during the on-peak period and the other 76 percent of the hours during the off-peak period, and the rates were such that those types of customers all received big discounts, their rates went down. Because on an average, instead of charging an average cost per kilowatt hour, we charge two different amounts per kilowatt hour. Some other companies, and I'll use Price Pfister as an example--you know, they make plumbing fixtures--their big electrical use is in the plating, the chrome or brass plating on the fixtures. So they found that by moving the plating function only to off-peak, their bills went down very substantially. They still did their assembly and packaging and all that stuff during the normal daytime hours, but those weren't big energy-intensive operations. So there were some companies, like Price Pfister, that found it fairly easy to move part of their production into off-peak hours and end up with a lower total bill than they had before they restructured. Other facilities--and I think office buildings are the biggest example of that--don't really have much choice. You know, there aren't very many offices that are going to run twenty-four hours a day.

TC: That's right.

DW: So they didn't have nearly the choices on how to deal with time-of-use rates, but even they had some things they could do. For instance, a lot of the office buildings would do what we call pre-cool. They'd cool down in the morning, probably below 70 degrees--you know, be a little cold. The secretaries probably had to wear sweaters during that period when the energy was cheaper, and then they'd coast through the day and do as little additional air conditioning. So, during the middle of the afternoon, the temperature might go from 70 up to 75 or 76 before they'd start cooling again. So there were some things that they could do in that manner that allowed them to reduce their electric bills. But at the same time they were doing that, it was also reducing the Department's costs because it was reducing the demand on our system during that critical mid-afternoon period.

TAPE NUMBER: 3, Side A

February 12, 1992

TC: Well, last time we started getting into the whole business of rates, rate making and rate restructuring. In that conversation you mentioned in passing--and I meant to go back to it to get a definition--marginal cost based rates. I was wondering if we could start with some definition and discussion of what that means.

DW: Sure. Engineers tend to call them incremental costs, which are very close to marginal costs . . . The marginal cost is the cost of producing one more unit, and in the case of kilowatt hours, that means it's the kilowatt hour that comes from the least efficient unit that you have on line--that's the short-run marginal costs. The long-run marginal costs would be the costs of building a new resource to produce the additional kilowatt hours. In addition to the marginal costs of production, there are marginal costs in the distribution system and everything else, too. But the production costs are the most important.

TC: Okay. Now, we also mentioned last time--we just got into it without fully describing what went on--Mayor Tom Bradley's Blue Ribbon Committee [on DWP Rate Structure] that he put together in 1975, and it reported in 1977.

DW: That's correct.

TC: This was the Blue Ribbon Committee to . . . I don't have the formal name of it but it was to . . .

DW: It was to look at the electric rate structure.

TC: Yes, (reading from notes) "a citizens' committee to study and recommend changes in Water and Power rate structure." Now, John R. Phillips was the head of that committee. Who was he? Who is he?

DW: He was an attorney. Is that what you mean?

TC: Yes, that's what I meant.

DW: He was the executive director, I guess you'd say, of a public interest law firm. Law in the Public Interest, I believe is the name of the firm, but it's a public interest law firm, and so he was the chairman of the committee. It was made up from housewives to English professors to . . .

TC: Yes, that was my next question: Who composed the committee?

DW: All segments of our customer base were included. One of the real active people was a man by the name of Jan Acton, who worked at the RAND Corporation. He was a Ph.D. economist, he was very active. Roy Schwendinger was plant manager for Anhaueser-Busch's brewery in Van Nuys. There were people on there representing small and medium business. In addition to that, the City Council member who chaired the . . . back then it was called the Water and Power Committee, it is now the Commerce, Energy, and Natural Resources Committee, that committee chairman was on the Blue Ribbon Committee. The councilmen didn't come often but they almost always had one of their staff members there.

TC: Now who was that? Was that John Ferraro?

DW: No, originally it was Joel Wachs, and later on it was Zev Yaroslavsky.

TC: So this committee was picked by the mayor? I mean, obviously some people would have had maybe some background in economics and maybe other people wouldn't necessarily. So there would have had to have been a sort of a crash course that they had to take in how a utility works.

DW: That's exactly right. We spent at least six months, and we started out meeting one night a week, and then we went to two nights a week a lot of the times, not all the time. I meant to say that our own Board of Water and Power commissioners were represented by one person, Patricia [C.] Nagle was the one who was on the committee most of the time. There was always one of our board members on the committee. For about six months, we went through describing to them the various types of facilities that are needed for a power system and which of those facilities different types of customers use. In other words, all the customers use the generation facilities, for instance. Some customers use various pieces of the distribution system, other people do not use those, and so we went through giving them a crash course on all the building blocks that it takes to make up a utility the size of the Department of Water and Power. And this is just on the

Power side, we were just talking about power at this time. Then we gave them a good background in the way our accounting system worked to gather those costs.

We then had a series of guest lecturers, if you want to call them that, come and talk to the group. Typically, they had three hours. In some cases, these were people we paid to come and talk to the committee. One of the fellows was Charles Chigetti, who was head of the Wisconsin Public Utilities Commission at that time, and he'd written a lot of articles on utility economics. So we paid for him to come out because they had no other source of funds. The large industrial customers, through a group called ELCON [Electrical Consumers Association], sent one of their consultants to come and talk, giving the Blue Ribbon Committee the types of things that they felt a rate structure should do. We had people from NERA [National Economic Research Associates] . . . I'm trying to think of all the groups that came. Anyway, we had many different groups come and talk about the types of things that they felt should be included in the rate structure.

Like I said before we started last time, this was all happening because both at the federal and the state, and here at the city level, people were very concerned about the rapid increase in the cost of electricity and they were looking at rate structure as perhaps a way to solve that problem. Or if you can't solve the problem, at least make sure everyone is paying their fair share.

So I'd say we spent another four months or so with these outside experts coming and talking. They generally made a presentation and then answered lots of questions from the committee. We never had two experts there on the same night, but the committee would ask the expert, "Well, the last guy that came in and talked to us said this, and now you're saying this. What's the difference?" type of thing. And then our own staff went through some of the methods that we use. The energy costs are easy to allocate because you have a kilowatt hour meter and you know how many kilowatt hours somebody uses; you adjust that for losses, depending on the voltage level of the system they're being served from. But when you get to the main costs, there are a whole variety of ways of allocating those costs, and so we talked about a lot of those. We talked about probably eight or nine of them.

One of my main functions, in addition to supplying data and answering questions, was whenever anybody made a suggestion on a cost allocation method, I'd go through and compare the revenue by rate classes. The rate classes are the different . . . Residential is obviously the largest numerically; industrial and commercial, it's usually large and small commercial. So I'd go through and show what these different theories would do from the standpoint of allocating revenue for the different classes. Of course, those people on the committee that were representing residential people like to see things that will reduce the residential rate requirement, and conversely for the industrial customers, so there was a lot of discussion.

TC: So committee members had definite biases, if you will. I don't know if that's quite the right word, but they saw themselves as representing some sort of . . . possibly representing a constituency?

DW: I really believe they did. They really believed they did, especially early on. They were very much looking out after . . . Well, one of the men that was there owned two or three Baskin-Robbins franchises, and he was looking to see what he could do to reduce his cost of electricity. After the better part of the year of this background information gathering, they then realized that they had to move forward and come up with some of their own issues. Partly because of Dr. Acton and the other experts that we brought in--Dr. Acton was a member of the committee--they felt that especially during that period when prices were really rising very rapidly, that using an average pricing scheme tended to undervalue additions to the system. So it was decided that a marginal cost pricing scheme should be used, and so we've really used that ever since.

If you're going to use marginal cost pricing, then you must decide on using long-run marginal costs or short-run marginal costs, or how you divide cost up between the two. In

1977, when their report was finished, the cost of oil--we got about 80 percent of our energy from oil-fired generation at that time--was so high that if you charged the short-run marginal cost, that pretty well collected the total revenue we needed. We didn't need much other revenue. So we settled at that time that short-run marginal costs were the most appropriate margin costs to use.

Now, the rate structure that was developed that way was very good, in my opinion, up through 1986, when the price of oil and natural gas fell. You know, it went from probably about $35 to $36 a barrel down to $11 a barrel in a two-week period, and that shifted a lot of costs around. So, since then, since 1986, we've been going more with long-run marginal costs because the short-run marginal costs alone didn't collect the total revenue that was necessary.

TC: I see, okay. One of the areas that the committee recommended some kind of change in was in lifeline rates, and I'd like to discuss something about lifeline rates. I know that there was a certain amount of controversy about that because it would mean preferential treatment for certain groups.

DW: And there was a lot of discussion on this. In fact, we were actually sued over the lifeline rate that resulted, because the city charter indicates that rates should be . . . I think the quotation is "fair and reasonable among other things." (chuckling) Well, when you throw "among other things" in on "fair and reasonable," it gives you a pretty big latitude.

I think I mentioned last time that our senior citizen lifeline rate, which was for persons sixty-two years of age or older on moderate income--we used HUD's [Department of Housing and Urban Development] moderate income guideline for a family of two for qualification--that rate was started in 1975, so that rate already existed. We have just about 10 percent of our residential customers qualifying for that rate. Since that rate has been in in 1975--so that's over fifteen years--it's been very stable, the number of people on that rate is somewhere between 95,000 and 105,000 customers. And that checks very well against the census data we have that the right people are qualifying and there aren't a lot of illegal people getting on. When I say illegal, people who don't qualify getting on that rate.

But the Blue Ribbon Committee looked at that rate and they looked at other forms of lifeline rates, which presumably would give especially low-income people a basic amount of energy at a discounted price. From the economic theory standpoint, as long as the block of low-cost energy is below the average use of the group, when they're making a decision to use one more kilowatt hour or not, they're making that decision on the same cost per kilowatt hour that other customers use. They are given a discount, but their decision to use one more or one less has the same economic value. That doesn't really distort the economics very much. One of the things that was looked at, the PUC had just put in what we refer to as an inverted block rate, where the first block is so many kilowatt hours . . . about 240 kilowatt hours, although the PUC had a variety of climate zones that made a difference as to how many kilowatt hours you were allotted at the lower rate, and that was, I'll say, at a rate that was two-thirds of the standard rate. That was available to all customers, regardless of income or age.

The Blue Ribbon Committee looked at that type of rate, they looked at rates with a low first block and a high second block, and then a medium-sized block for all consumption over the second block, and a whole variety of other issues, and came up with the fairest thing to do would be to eliminate the customer charge. I might state, and this is kind of going backwards but . . .

TC: That's all right.

DW: The rates that we had in effect prior to the Blue Ribbon Committee had a customer charge which covered the cost of meter reading, billing, the cost of bringing the service into the home. Then it had a declining block rate structure, where as you used more kilowatt hours the charge per unit decreased. In other words, your bill never went down, the bill kept going up, but the charge per unit decreased. And a lot of people felt that that type of rate structure encouraged needless consumption because the last block was fairly inexpensive. During the period of the late seventies, with the high fuel costs, that wasn't good for the power system, it wasn't good for the nation, and it was just kind of a bad idea. So, before they considered lifeline, the Blue Ribbon Committee had come up for residential customers with a customer charge and a flat energy charge. In other words, the same charge per kilowatt hour regardless of the number of kilowatt hours you used for residential customers.

The universal lifeline feature then that they arrived at as being most consistent with economic theory and still provided a discount for low users was to eliminate the customer charge. So then, instead of having a customer charge, you just had a charge per kilowatt hour. There was a minimum bill to ensure that we gained enough money to cover costs of meter reading, but there was just a flat energy charge with a minimum bill. About three years later, the PUC modified their lifeline rate to eliminate the customer charge, the same sort of thing that the Blue Ribbon Committee had already done. So that always made us feel good that our rate structure was a step in the right direction.

TC: Yes, right, sort of started the trend.

DW: Yes. Now, as long as we're talking about lifeline rates, I thought I'd mention that the PUC looked at lifeline rates under 9804, the generic rate case that I had mentioned before that the PUC had, they looked at lifeline rates and came up with one form of rate and then later changed it closer to ours. When the federal government came out with PURPA [Public Utility Regulatory Policies Act of 1978], included in PURPA was a requirement that the utility rate setting body, which in our case is the Board of Water and Power Commissioners, investigate lifeline rates. It didn't say they had to adopt them, it said they had to investigate them. And it provided that energy for essential needs of residential customers could be provided at less than cost, which is essentially what a lifeline rate is. It's a below cost rate. So PURPA did not require lifeline rates, but it allowed lifeline rates, and it required that you consider them. So the Blue Ribbon Committee, the state PUC, and the federal government all looked at lifeline rates somewhat alike. They all realized that especially with the very rapidly increasing costs of energy, people on fixed income or low incomes should be protected. And like everything else, there's not a perfect correlation but there's a strong correlation between income and energy use. The correlation would probably be a lot stronger if it weren't for wealthy people having more than one home. If you have several homes, then you don't use as much energy at any one of them.

TC: That's right. Well, the critics of lifeline rates came up with . . . There were various studies that were made at the time and various arguments that were raised against lifeline rates, and part of it, as I said before, was that there was a preferential treatment part of it that some people opposed. But others found that those who were to be helped by this weren't necessarily helped by it. But it sounds from what you are saying that in fact people were helped by it. It was not anything that was . . . It wasn't . . . cosmetic.

DW: No, that's right. And in some of the arguments that were used in this regard, some people said, "Well, the low-income families have to spend more time at home, so consequently they use more energy." Well, that isn't very obvious from our data. They probably do spend more time at home, but they don't buy the types of appliances that use lots of energy. They aren't doing it just to save energy, they don't have enough money to buy the appliances. So that appeared to us not to be a very good argument.

Another item that was discussed is that in the welfare system apparently one of the things they look at is the cost of utility bills when they're setting up how much money the welfare family should get. It was argued that if we lower our bill the welfare system will lower their payments. Well, they didn't lower their payments. Now, maybe they didn't increase them as much as they might have otherwise, but they didn't lower their payments. That was another one of the arguments that was brought up then. It appeared to us that a big concern of the larger commercial-industrial customers was that the political process was going to keep reducing the amount of costs that are attributed to residential customers, which increases the costs associated with commercial-industrial, and I think that was their big concern all along. And that's probably happened, to some extent. The lifeline rate has probably done that to some extent, but not a great deal. The magnitude of that inequity compared to lots of other things wasn't very great.

Let me just say one other thing. The cost of the senior citizen lifeline--we have about 10 percent of our residential customers on that--is about $18 million, and that's about 1 percent extra that everybody else has to pay in order to provide that subsidy. And that subsidy for the senior citizen lifeline customers is a 50 percent reduction on the first 240 kilowatt hours each month, which is a substantial amount of their bill. And maybe because we all feel we're all going to be old someday, it seemed like it wasn't an inappropriate thing to do.

TC: The opposition to the recommendations . . . Well, in 1977, when the committee's recommendations were presented, they couldn't be put into effect right away. There was an injunction.

DW: There was an injunction, that's correct.

TC: We mentioned this last week, but maybe we could get to it in a little closer detail here.

DW: There were actually two different lawsuits filed as a result of the rates. One was filed on behalf of Gold Medallion customers. The Gold Medallion Program is a program that was in place during the late sixties and early seventies. It had been phased out by 1972, so it was late sixties primarily--barely into the seventies, where customers that heated both the space heating, water heating, and electric kitchen, there were certain incentives paid by the Department for people to do that. Their allegation in the lawsuit was that we had had a verbal contract with these people to always provide them with low-cost energy. When we eliminated the declining blocks, they no longer had low-cost energy. The attorneys for the plaintiffs actually went through all of the ads that we'd ever published, at least during about a ten-year period, and looked at the copy on the ads, and they could never come up with an ad where we said anything about lower rates for Gold Medallion Homes. It was just the up-front incentives that we paid, so that in essence never really went to trial. There was a hearing on it but no one testified or anything. There might have been briefs written but it was dismissed.

The more important case was brought by the California Manufacturers Association, and they were able to get an injunction. That case then went to trial . . . golly, I think 1983, it was a long time.

TC: Was it that long?

DW: It was 1984 or 1983.

TC: Because I know that in 1977 the injunction was put in place. Then, in 1978, the recommendations were brought forward again for enactment, and then they filed suit again, so there was a whole year where nothing could be done. And there was some motion, and then again they came and blocked it.

DW: There was a lot of legal maneuvering during this period. We had originally anticipated that there might be a lawsuit, and so in the 1977 rates we actually had two rates. The first one increased the revenue sufficient to cover the Department's costs, and then the second rate was adopted by the Board and approved by the City Council. The second rate would have taken place two days later, and all that would have done is restructured the rates, there would have been no increase in revenue. So, when they went in for their injunction, the court ruled that since the Department of Water and Power was not harmed by not having the restructured rates go into effect, the court granted the injunction until the trial. What we did then in 1978 is we went in with a single-rate ordinance that raised rates, raised revenues, and the judge's ruling then was that in order to get an injunction the California Manufacturers Association had to indemnify the Department against any lost revenue if they didn't prevail in the course of this. And that was big. We're talking $25 million a year or something like that.

TC: Yes, I can see why they would balk.

DW: It was a lot of money, so they didn't press for the injunction but they continued their lawsuit.

TC: So that took another three years to sort out, is that right?

DW: Well, closer to four years, yes.

TC: And then, in the meantime, were you still operating on the old rate structure?

DW: No, we were operating on the new rates. The 1978 rates were the restructured rates.

TC: Okay,

DW: And then we had another rate case--I think it was in 1980--that was also based on the restructured rates, and they didn't even attempt to get an injunction on that rate. The case was still proceeding on the modality . . .

TC: This is another case by California Manufacturers?

DW: No, they didn't file on the 1980 rates, they only filed on the 1978 rates, because the same issues were involved in either case, and if they prevailed on the issues, then the other rates would have had to . . .

TC: Sure, okay. So what you're saying, though, is that in 1980 another rate increase took place.

DW: That's correct.

TC: Okay, I wasn't aware of that.

DW: Yes, based on the restructured rates.

TC: Okay.

DW: Well, let me talk about the lawsuit a little bit.

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DW: By the time the lawsuit went to trial, the federal government had enacted PURPA, and everything that the Blue Ribbon Committee had done in 1977 was very consistent with PURPA. So, prior to the court hearing, the Board held what we call semi-judicial hearings, because this is required under PURPA. We hired a retired administrative law judge. There were fourteen different issues that we had to hold hearings on, including lifeline rates, cost of service, just a whole variety of things, automatic adjustments, which are like our energy cost adjustments, whether or not that was a prudent type of thing. And like I say, PURPA didn't per se say that any one thing was required, but they said that you had to hold hearings on it. Because L. A. is the largest municipal utility in the United States, in our PURPA hearings, both the Department of Energy and the California Manufacturers Association entered as parties and presented witnesses and cross-examined everyone else's witnesses, and so they were parties to those hearings. So the record buildup during those hearings was all then taken to the court and pretty well overwhelmed their objections, because the things that they were saying were illegal were also the same sorts of things that the federal Department of Energy were arguing were appropriate.

TC: Right, and I can see where somebody would say, "Well, this is anti-business and this is bad for . . ." You know, "This will drive business out of Los Angeles," and that sort of thing. And it does sound on the face of it that it was shifting the burden onto business.

DW: Well, it did shift the burden slightly. Some of the data we obtained in preparation for the lawsuit indicated that electricity represented about 2 percent of the value added for most California manufacturers. In other words, electricity is just not a very big piece of the total cost. Those types of industries that use lots of energy, like the aluminum industry, there aren't any aluminum foundries in Los Angeles. I mean, that doesn't happen here. The cost of the electricity was never low enough to justify that type of business being located in Los Angeles.

TC: Well, Anhaueser-Busch was one of the groups that was complaining, along with the California Manufacturers, the Chamber of Commerce.

DW: Yes.

TC: But Anheuser-Busch did have someone on the committee, on the Blue Ribbon Committee, that came up with this.

DW: Yes, that's correct, and he got fired.

TC: Oh, did he?

DW: As a result of his participation, because the Blue Ribbon Committee came out with a consensus report. They didn't have a majority report and a minority report. They changed things, and he felt that he got the best deal possible based on the make-up of the committee, but they were very unhappy with him. Because nationally ELCON, which Anheuser-Busch is a member of--General Motors, Chrysler, Ford, you know, there's probably twenty large industrial type firms that belong to that . . .

TC: What does that stand for?

DW: Electrical Consumers Association or something like that. Anyway, ELCON was taking a very strong stance nationally that marginal cost based rates were inappropriate. They wanted to stay with accounting type costs. And I think they were wrong. Anyway, they were very unhappy that their plant manager had been part of a committee that adopted marginal cost based rates, so he was actually fired. And this is a trivial piece of information, but as a result of that, Mayor Bradley appointed him to the Public Works Commission, which is the only paid commission we have in Los Angeles.

TC: So he didn't lose out entirely.

DW: No.

TC: You mentioned the other suit that had to do with the Medallion Homes constituency. Now, is that where Zev Yaroslavsky comes into the picture as being . . . He became in that period increasingly outspoken about people being hit too hard.

DW: Murphy's Law is alive and well. The restructured electric rates went into effect in late 1978. The winter of 1978-79 was the coldest winter that L. A. had had for over fifty years, and so people got very large electric bills. Even people who didn't use electricity as their primary heat, a lot of them had small electric heaters that they scattered throughout the house. Some people left their oven doors open. It was a cold winter. So, when the City Council started getting large numbers of complaints from their constituents about how much higher their electric bills were, they reconstituted the Blue Ribbon Committee again--this was some year and a half after the Blue Ribbon Committee had finished their first report--to see why their recommendations were resulting in these high bills. They met for about three months, gathered a lot of data, and the primary result was that the people's consumption had gone up very considerably. If your consumption goes up, under the flat type rate the bill goes up, probably proportionately more than it would have under the old declining block rate. But the reason for the very high bills was the cold weather, not the rate structure. Luckily, the next winter was not a cold winter and bills came back to normal and the issue went away. But you're right, they reconstituted the Blue Ribbon Committee for that specific purpose. Zev was on the Blue Ribbon Committee as the City Council member of that committee that adopted the rates in 1977, and it's my belief that he was pleased that it was the high consumption that was causing the high bills, not the rate structure. Because I think he really felt that was an appropriate rate structure, and I think he still does.

TC: I happened to see a news clipping where he was . . . it might have been an Op[inion]/Ed[itorial] piece in the *Times* where he was saying that the council should have more of a PUC sort of relationship to the Department of Water and Power. It shouldn't just say, "Okay, whatever you say goes." The council should be the one that says, "This is what you guys do and this is what you guys do." So he seemed to be taking this grandstanding approach during this period, just from my looking at it.

DW: I would say clear back in the early seventies, from time to time it's suggested that the PUC oversee the Department's rate setting process because they're, "better qualified," and the staff is trained and everything like that.

TC: Maybe we should clarify, and I don't think we did last week, the PUC regulates or oversees the private . . .

DW: Investor-owned utilities.

TC: Investor-owned utilities, right. Okay, so DWP and municipals are exempt from their oversight?

DW: Yes, in California. There are some states where the PUC does look at municipal rates, but in California they don't. We discussed with the PUC what they felt they could do and how they could review LADWP rates. First, they said that they weren't at all interested in doing it and they would only do it if the governor told them they had to do it. And second, they said that they would insist on a transfer of funds from the city to the state to cover whatever costs they incurred reviewing our rates. I think it's that second part about the transfer of funds, that every time it's brought up it kind of goes away again. No one, I think, wants to do that. Like I say, the PUC staff, especially during the seventies, was so busy with the investor-owned utilities coming in almost every year for a rate increase, they just didn't want any more work. They would have had to hire additional people had they had that additional workload.

The PUC sets rates for the investor-owned utilities. The Board of Water and Power Commissioners sets rates for the Department of Water and Power. The City Council approves those or disapproves them. The City Council doesn't have the ability to change the rates, they can either approve them or not approve them. Now, if they disapprove them and say, "Oh, by the way, if you do this we'll consider them again," that would have some kind of weight, but their only authority is to either approve or disapprove the rates. Those are the only choices they have. You know, they can't say, "Well, instead of giving you 6 percent, we'll give you 5 percent." They have to turn down the 6 percent and say, "Gee, if you come back with another rate that's 5 percent, we'll consider that again."

Let's talk about the Blue Ribbon Committee just a little bit more. This is getting a little disjointed.

TC: Okay, sure.

DW: After the Blue Ribbon Committee spent the better part of eighteen months looking at electric rates--like I said, they started out with looking at the system--they then went on to look at water rates. By then--this is my view of the subject--they were kind of burned-out. And remembering back in 1976 and 1977, that's when I took over water rates, also. So they did look at the Water System some and they essentially said, "Well, let's just do the same thing for water that we did for electricity." And it just didn't work very well, but that's what they stuck with.

They spent a maximum of six months looking at water rates after having looked at the electric rates for about eighteen months. So I think they were just kind of burned-out, I think they were just kind of tired eventually, and so one of the things that came up during what I'll refer to the fall 1991 water rate increase was that the City Council was still very concerned about the rate structure used for the Water System, and they wanted a Blue Ribbon Committee to look at that again. So a new Blue Ribbon Committee--totally new members--was appointed for the sole purpose of looking at water rate structure, not electric rate structure.

I think those City Council people who are familiar with the rate structure feel the electric rate structure is still very good. Zev Yaroslavsky, for one, is still satisfied that the electric rate structure is doing the things that the Blue Ribbon Committee wanted to. But he wanted to have a new committee go back and look at water rates one more time to see what changes they would recommend there and gave a strong indication that they felt that the inverted type rate for water would probably be appropriate. The City Council is represented on the committee, but they don't have a controlling interest in the committee, but they made that strong recommendation.

TC: Well, how do water rates . . . That was another area that I wanted to get into. How do they work? How is arriving at appropriate water rates different from arriving at appropriate power rates?

DW: Well, the revenue requirement part is done exactly the same way, there's no difference there, but after you get the revenue requirement, water is just a very much different type of commodity. First of all, you can't store electricity. You have to generate it when the people are using it. Water you can store easily. With electricity, the cost of the fuel is an ongoing, forever cost. In the Water System, water is essentially free, and so all you're doing is moving it from where it is to where you want to use it. So the cost of moving it isn't very great at all--I mean, the variable cost of moving it--so it's almost all fixed costs. The costs are virtually all fixed. When you put the pipes in the ground, you have to pay off those bonds over the life of the . . . You don't have any choice for that. So we used to say that the biggest variable cost the Water System really had was the chlorine used for treating the water. It's not a very big cost, just not a very big cost. So the concept of short-run marginal costs just didn't make any sense in the Water System, and that was another big difference between the Water System and the Power System. In the Power System, about 28 percent of the energy is used by residential customers. In the Water System, something like 52 percent of the water is used by residential customers. And it might be up even higher than that if you count multi-family units. Just single-family units used to be about 52 percent. So some of the things that they were trying to accomplish in the electric side with lifeline rates and things required the commercial-industrial customers to pay that subsidy substantially. On the water side, the residential water customers are going to be paying the subsidy. So there were just a lot of different issues involved. In my opinion, the original committee was just tired enough they didn't really get into all those issues, they just tried to make one size fits all and make the water and electric the same.

On the Water System, the long-run marginal cost is the cost of a new water supply. And whether that's desalination or what you're going to argue about the next water supply, we kind of took the position in 1977 that the long-run marginal cost was MWD [Metropolitan Water District], and then MWD had to go out and figure out how to supply the water, because that was their responsibility. That was probably shortsighted to do it that way, but that's essentially the way the rates were developed, using MWD as the long-run marginal cost of supply. Which, like I say, presumes that MWD can go find more water someplace.

TC: Now, this is a side issue, I suppose, but I happened to see a paper that you delivered to the American Water Works Association on time-of-use pricing.

DW: Electric rates.

TC: Electric rates for water systems. And it struck me then that, of course, the Power System sells power to the Water System. Now, was there any argument from the Water System on time-of-use pricing when that was imposed?

DW: I didn't mention that much when I was talking about the Blue Ribbon Committee. That was another one of the features that they recommended, that we go to a time differentiated rate, especially for the larger customers when the metering is justified. Again, this is something that the state and federal government both came out with as desirable features for a rate when they went through this process.

Of course, because of our close relationship, we worked very closely with the Water System, and their rates didn't go up as much as average because the Water System tends to design pumps to operate twenty-four hours a day. The number of hours on-peak in the rates that we designed was about 24 percent, so that means that 76 percent of the hours were off-peak. A load that operates twenty-four hours a day, actually benefits from time-of-use rates, they actually came out ahead, and that's the premise of the article I wrote for AWWA.

TC: Oh, yes, right.

DW: However, if the Water System goes in and puts a little bit bigger pump in, then they can run it only during the off-peak period and not even run it during the on-peak period, except a few times during the year when there's a drought or something like that. In other words, it would be very seldom necessary to run it during peak periods.

As pumps had to be replaced, they replaced them with bigger pumps that wouldn't have to be operated twenty-four hours a day, so they could cycle them and take advantage of the off-peak rate. And I know they started to do that and I assume they continue to do that. But they didn't go en masse and go out and replace all the pumps they had. But as they needed to be redone, they put in larger ones so they wouldn't have to operate twenty-four hours a day.

TC: I'm wondering here whether we should bring the rates question up-to-date. In the eighties, for instance, what were the high points or low points in rate structuring? Pretty much what I'm gathering from you is that what was established by that 1977 and 1978 period has pretty much run its course until this last fall.

DW: Yes, well, like I said before, the rates adopted in 1978 were based on short-run marginal costs. When the cost of oil and natural gas dropped very sharply in January 1986, the short-run marginal costs dropped also. Now, it was the nature of the rate design that we continued to collect the right amount of total revenue, but the energy charge was larger than it should have been. If you want to force people to conserve, that's not all bad. But in the long run, people tend to do things that aren't necessarily economical to society just because the rate structure tells them it's economical for them. We had an electric rate increase in the fall of 1985, and so that rate had only been in about three months at the time OPEC [Organization of Petroleum Exporting Countries] fell apart. And because we weren't sure what OPEC was going to do, we thought it was best just to kind of sit and wait and see what happened. Well, we went three years, clear to 1988 before we had another rate increase.

So, in 1988, we shifted from the short-run marginal cost based rates to a longer term marginal cost based rate. Still kept marginal cost based rates, but just looked . . . We brought in more costs, because like I said before, in 1977 short-run marginal cost of fuel alone collected virtually all the revenue we needed. We started bringing in some of the costs of new generation and also the costs of the distribution system in 1988. We didn't go all the way. We made a step towards that, thinking that in a couple years we'd make another step. Well, again we went from 1988 to 1991 without having another . . . Well, actually, it ended up the rates were adopted in January 1992, but we went over three years again without having a rate change. So, when it was obvious that we were going to be a long time in between rate increases, in January 1991--well, we actually went in a little earlier than that and it became effective January 2, 1991--we went in with a restructuring of rates with no change in revenue. Now, the restructuring took place totally within the commercial-industrial class. The residential customers weren't effected whatsoever, there was no change to their rates. It recognized the fact that energy costs had just come down. The cost of energy itself had come down and so the rates reduced the costs of energy, increased the costs of what we call the fixed costs to more closely track our long-term marginal costs. That was put in in January 1991.

Like everything else that people do, we didn't do it quite right. We intended to have a rate that collected exactly the same revenue before and after. It now appears that on an annual basis the rates that were put in in January probably collected about $50 million less than they should have. In other words, we went a little bit too far. Now, sometimes it's hard to tell whether we changed the rates too much or, as a result of the rates, the customers changed what they were doing. You know, it's always hard to follow that. So, in this rate increase that we had--well, it actually goes into effect on the fifteenth of February this year--we had to adjust for that $50 million loss in addition to having a general rate increase. There were no structural changes in the rates, what I'll call the February 1992 rates. There's no structural changes there, just a very slight modification just to increase the demand charges.

TC: That was like a 7 percent . . .

DW: A 7 percent average. Yes, that's correct.

TC: Now, this is not exactly history, this is still . . .

DW: It's brand-new!

TC: This was just a few weeks ago, and it was . . .

DW: Well, in fact, it's this coming Saturday that it will actually take effect.

TC: Yes, that it'll actually take effect, so we're talking future history here. Just in those last few weeks, around this building there was quite a bit of tension and discussion on the elevators, in the hallways, on what's happening with the rates. The water rate was agreed finally at 3 percent, which . . .

DW: They had started out asking for 11 [percent], yes.

TC: Eleven, right. How did that work? I'd say anybody on the street or on the bus would say, "Well, hell, they tell us to conserve and then they charge us more. How can they do that?" Was that the argument that was given?

DW: Yes, it was almost a totally emotional argument. First of all, I want to go back and say that we have separate ordinances for the water rates and electric rates. The water rates are going to have to be increased virtually every year for the foreseeable future. The power rates we expect to go every two or three years. We planned to go every two years, but if things are working well we might go three years like we did between 1985 and 1988 and again between 1988 and 1991.

At the public hearings held by our board and the editorial comments in the newspapers and everything, no one really complained much about the electric rate increase. It was a 7 percent increase after three years; it's pretty obvious the inflation rate was greater than that. The Power System has an advantage in that we have Southern California Edison to compare ourselves to. And there are reasons that we should be lower than Edison, and we are lower. We're about 15 percent lower than Edison. But Edison is a well-run utility and so you can say, "Well, Water and Power is lower than Edison. That seems reasonable." The fact that we've been three years without an increase, the fact that the increase was less than inflation, all these things seem to have a picture that the people were willing to accept the electric rate increase, even though dollar-wise it was four times larger than the water rate increase.

On the water, I think the big issue was the mandatory conservation. I think everybody feels that they are not wasteful--I just believe everyone feels that way--and so when someone is told they have to use less, that changes their lifestyle, especially on water. On electric, you can use less by buying a more efficient widget, and so your end use comes out exactly the same, it just uses less input because it's more efficient. On water, it doesn't really work that way. You can go to low-flow toilets, that helps a little bit, you can go to low-flow showerheads, and that helps some, but if you want the clothes to come out of the clothes washer clean, you pretty well have to use a full load of water. So the biggest area the customers have the ability to save water in is their outside irrigation. That's the thing you can do that disrupts your life the least. However, the same drought that was causing problems up in the Sierra Nevadas is causing problems here in L. A., and so everybody's lawn was getting brown and some of their fruit trees were dying and there was just a lot of resentment for the mandatory curtailment on the water. I don't think there's a person in Southern California that hasn't driven along the freeway and seen the sprinklers going at very inappropriate times. And so here you see here's my state government out there wasting water and they want me to curtail and they're going to raise my rates. In fact, I got sprinkled on last night going home in the middle of this huge storm we're having by a freeway sprinkler. You know, it was on last night at about five o'clock on my way home. So there was a lot of resentment from the mandatory conservation.

Then the second thing was there was a lot of resentment, as you said before, "I'm conserving. Now they're going to charge me more." Well, it's the sort of thing if you plot it out arithmetically, if you were saving the required 15 percent, and people were saving closer to 30 percent, if you're saving 15 percent and get an 11 percent increase, your bill is still lower than it was the prior year, but we could never get people to understand that.

TAPE NUMBER: 4, Side A

March 4, 1992

TC: I wanted to finish off on the discussion that we were having last time on rates and rate making. This is possibly a side point, but I wanted to cover it anyway, and it has to do with the purchase of power from Bonneville Power in Portland that comes across the Intertie. You said that was called wholesale rates?

DW: Wholesale.

TC: How does that all work, if that's even a fair question to ask in brief.

DW: In wholesale rates, I'll describe the two different kinds. One is what we call spot market or economy purchases, and these are purchases that are made on almost an hourly basis. They might be made for a week or two at a time. In essence, if the selling utility can produce electricity less expensively than the purchasing utility, then a transaction is made, and typically it's what we call split the difference in cost. In other words, if one utility has a cost of 25 mills and the other utility has a cost of 20 mills, the sale price will be at 22 1/2 mills. Both parties come out ahead of what they would otherwise be. From the standpoint of the Department, if we are making either a purchase or a sale, the profits from that would go through the energy cost adjustment and it would be automatically passed back to our customers.

There's another kind of wholesale transaction, what I'd call long-term in nature, and again there's two different kinds of those. One is where you're actually buying the permanent output of a plant for a long time. The IPP [Intermountain Power Project] contracts would come under that type of a category. We purchased 105 megawatts from Montana Power for a twenty-year period. That would be that kind of a thing. It's a negotiated price. In almost all cases, it's based on the price of energy from a specific generating plant. The other type is the purchases that we make from Bonneville, and Bonneville is probably the only good example we have for long-term capacity or capacity and energy contracts.

The emphasis for building the original DC line was a capacity, energy exchange which we entered into with Bonneville. Bonneville's rates were unchanged from roughly 1934, when the agency started, up until the 1978-79 time period. Well, from about 1974 on, Bonneville was losing money every year, and the federal government finally said, "Look, we're going to quit lending you money if you don't start making money." So Bonneville started into a whole series of wholesale rate making processes. They had one in 1979, they had one in 1980, one in 1982, one in 1984, one in 1985, one in 1987. So they went from having no increases for almost forty years to having one on a very regular basis.

A lot of the issues in Bonneville's rate setting process is regional customers, which would be people in Oregon, Washington, Idaho, and Montana, versus non-regional customers, which are primarily California parties, of which L. A. is one of the major ones. The way Bonneville's political base is run, it's based on what the eight senators from Oregon, Washington, Idaho, and Montana want. And so L. A., along with other California parties, participated in all of Bonneville's rate setting processes. We then appealed those rates at FERC [Federal Energy Regulatory Commission] and actually appealed them in the federal court. When I say the California parties, that included L. A., [Southern California] Edison, PG&E [Pacific Gas & Electric], plus the California Public Utilities Commission and the California Energy Commission. So all five of us were working towards the same end, and that was to get what we considered fairer prices from Bonneville. Because under the Power Act, Bonneville could only sell energy outside of the Pacific Northwest that was surplus to the Pacific Northwest's needs, and we could see why that was in the act.

TC: Which Power Act is that now? Is that the Regional Act or . . . ?

DW: There was an amendment to the original act in the late sixties, and they call it the Regional Act, and it, among other things, established the Northwest Power Planning Council, which has two representatives from each of the states and did several other things, among which was authorizing building the Pacific Intertie, both the AC and DC Interties. At that point, what they call extra-regional sales became important--you know, sales outside of the Pacific Northwest. Up until then, there were no significant sales because there was no path for those sales. So, since we could only buy surplus energy, our argument throughout that process is that capacity costs were inappropriate for California because we weren't buying capacity, we were only buying energy. Because if it wasn't surplus, we couldn't have it. Very frankly, we lost at all levels with our arguments. So Bonneville's standard rates charge more for surplus energy in California than it does for firm energy in the Pacific Northwest.

But going back to what I was talking about originally on wholesale rates, when that price gets too high we just don't buy it because we don't need to buy it. We have other facilities that we can get the energy from and so we buy most of the time under one of these spot market purchases, they are all short-term deals, and so it makes it very difficult for us to enter into a long-term contract with Bonneville. We are currently negotiating a swap with Bonneville, where they'd give us energy in the spring and summer when they have to run their dams at high levels in order to get the small fish flushed down, so that they aren't eaten or just die on their way to the ocean, and exchange that for energy during the wintertime when our units are less loaded and when Bonneville has their peaks. So we're working on that kind of a thing. And since it's an exchange, the total kilowatt hours would be exactly the same in both directions, it's just the timing.

We'll get it during the spring and summer when our loads are high and they'll get it during the fall and winter when their loads are high.

TC: So it wouldn't come under the rulings that govern . . .

DW: It would not be a rate. It's not being governed under the rate because no money would exchange hands. All that would exchange hands would be the kilowatt hours would come down and then go back up again.

Like I say, it was a unique experience with Bonneville in that all the California parties were united, we all had the same thing in mind, and quite often the PUC and the investor-owned utilities, it's really hard for them to agree on anything. But in this case, we were all agreeing on what should be done, and it was just trying to get it through FERC and Bonneville. In both the court cases and at FERC, I think our biggest obstacle was the fact that the way the process works, the rates that were currently in effect were not the ones that were being litigated. The ones that were being litigated were in effect five years earlier. So, in some cases, no sales were made under any of those rates. It was just the idea the rate was there, and if it was too high we didn't buy anything, and so the court couldn't get real excited about it because from their standpoint there really hadn't been any damage.

TC: Yes, no one was hurt.

DW: But from our standpoint, if we had a more appropriate rate we could use it in our planning process and probably would have reduced our costs further.

TC: Okay, you left the Rates Group then in 1984? Is that correct?

DW: Yes, that's correct.

TC: What were the circumstances of that? Was it just time for a move?

DW: A couple things happened. First of all, at that point in time, I had been in the Rates Group for about twelve years--that seemed like a long time. There weren't at that time any clear and present rate concerns, rates looked like they were going along pretty smoothly. I had an opportunity to promote within the Power System. This was a promotion. I came back from Finance and Accounting where I was in charge of rates back into what was then the System Development Division, and it was a promotion for me, so that's why I came. I mentioned earlier, I believe, that when I left they reevaluated the rates and again split the rates back up into the Power and the Water separately.

When I came into Conservation . . . I'm sorry, back then it was System Development, there had been a separate Conservation Division established that reported directly to the General Manager's office. It was decided that by 1984 we were through with the aftermaths of the oil embargoes and that sort of thing, and so it was thought that it would be more effective to have Conservation included along with other resources in the resource planning process, and so the Conservation Division was merged with the old System Development Division to form a single new division. Because of my involvement with demand side and conservation programs over the years, they felt that was a good place for me to be. So, when I first came into the group, I was responsible for all of the . . . what I'll call conservation demand side programs, plus resource planning and rates and those types of functions. Transmission design was also included.

TC: So let me get this straight . . . The old Conservation Division was made an office within System Development.

DW: A section within System Development.

TC: A section within System Development, okay. And, of course, since then the conservation concept has become the main . . .

DW: It has grown some.

TC: Okay, so we will hold off on that particular thing.

DW: Yes.

TC: Okay, I just wanted to get the steps here.

DW: When the first oil embargo happened back in 1973, the Department was approximately 80 to 85 percent dependent on oil and natural gas, and the price of natural gas always tracks fairly closely with the price of oil. So the Department had a very difficult time obtaining any supplies of those fuels, plus the costs were going up astronomically, and so by the mid-seventies--1975--when things had calmed down enough that we could again start planning, the Department made a conscious decision to reduce its dependence on oil and natural gas to no more than 25 percent by 1990.

In order to accomplish this, we built resources ahead of need. We built the IPP project, and our participation in Palo Verde [Nuclear Generating Station] were both done ahead of the need. In other words, we didn't need those generation plants to meet load, we wanted to build them for fuel diversification so that we would not be so dependent on oil and natural gas. It was actually a very successful program, because by 1990 we were down to 20 percent of our energy coming from oil and natural gas and fuel plants instead of the 25 percent. We were very fortunate.

The result of that decision back in the mid-seventies is that we don't need additional generation facilities probably until the year 2000. And depending on how our demand side management programs mature, we may not need new generation until 2006 or maybe even 2010. So the advantage of this is it gives us a lot of opportunities to kind of sit back and look. We aren't in a panic mode, we don't have to do something.

And very frankly, there are a lot of engineers at the Department who are kind of skeptical about the results of the demand side programs. We think that part of that problem is the fact that during the seventies conservation was kind of looked at as sitting home in the dark, cold. And that really isn't conservation, that's deprivation.

TC: Right, like the Department will give new sweaters to all their customers. (chuckling)

DW: Right, and so the conservation demand side programs . . . And the reason we call them demand side programs is because everything we do on the customer side of the meter is called demand side and everything we do on our side of the meter is supply side. So the Department has historically been involved with supply side decisions and the customers individually make their demand side decisions.

Because of the higher capital cost of more efficient appliances, for instance, and because of the information not necessarily being available all the time to the consumer, it appears to us that most consumers make their purchase decisions on the first cost of the appliance. You know, that's kind of what drives them. They're going to buy a refrigerator. They can buy it for $700 or there's another one that's more efficient, has the same features, but it's going to cost them $900, they'll go for the $700 every time, even though a refrigerator lasts for twenty years. The California Energy Commission, and then ultimately the federal government, has helped some in this respect, in that they've put in appliance efficiency standards that are much higher than they had been historically. In some cases, there was no efficiency standard at all, and so that's greatly improving the efficiency of the appliance stock. But we believe that through incentive programs we can get the customers to go even beyond what the current laws require and get more efficient appliances in homes and businesses that will remain in effect for twenty or thirty years.

If you put the extra money into making the appliance more efficient, the customer gets exactly the same output that they always received. You know, they get the same amount of light or heat or cold, whatever it is they wanted out of the device. They're getting the same amount, so they're not being deprived in any way. However, by having a more efficient appliance, it requires less energy from the Department to provide them with the service they want. I've told some groups that probably the only person who really wants electricity is Dr. Frankenstein. Everybody else wants heat or light or cold or whatever, you know, some kind of a process that they want to implement, and so if we can do those processes more efficiently, the customer receives exactly what they were after and the Department can do that at lower costs ultimately.

The cost of a new generating facility--and it depends on the type of process that's used--will be somewhere between $750 and $2,000 a kilowatt. Two thousand dollars a kilowatt would be a new coal or nuclear plant, probably. A hydro plant would probably be in that same general range. Geothermal could probably build for something like $1,200, and if you get clear down to combined cycle natural gas, we can probably do that for around $700 a kilowatt. There are a lot of things that we can do on the demand side that cost $200 or $300 a kilowatt, so they'll reduce the load, and that's a lot better use of society's resources.

This is one of the things that a lot of engineers struggle with: Should the Department just provide kilowatt hours, which is what we meter, or should we try to save society's resources? And if there's a less expensive way to supply the kilowatt hour . . . In other words, if one person uses fewer kilowatt hours, the kilowatt hours that are freed up can be used just like kilowatt hours that are generated at a generating plant.

So the basis of the Department's current demand side programs is that we put in permanent fixes. These aren't things like during the seventies, everybody always said, "Well, set your thermostat higher during air conditioning and lower during heating cycles." Well, those are things that people can change their mind on doing easily. But what we're doing is putting in a more efficient air conditioner. And if there are more efficient air conditioners in, it doesn't make any difference where the thermometer is set. We'd still like to have them set the thermostat at 78 degrees during the cooling season, but even if they don't, wherever they set it the appliance will use less energy to supply the customer with the cooling that they require. These are permanent hardware changes on the customer side of the meter that will reduce future demand.

TC: And the customers are educated through this process, presumably. How do I know that this refrigerator is better than this refrigerator over here? Does the customer come to the Power System and say, "Help me out on this"?

DW: Well, we don't even have to do a lot of education. We do education, and we try to do most of that at the grammar school level, because hopefully as those people mature they'll have a better understanding of things, but we don't really have to educate the parents. If there's a $700 refrigerator that has the features that they want on it and there's a $900 refrigerator that has the same features, and the Department will pay them $200 if they buy the $900 one, then they come out ambivalent. So they're ambivalent on first costs, plus, I don't know if you've purchased a major appliance, but all major appliances in California now have labels that say how much per year it's going to cost to operate. So, if their first cost is the same and they can look at these two refrigerators and see one is going to cost $80 a year to operate and the other one is going to cost $50 a year to operate, then we think even without very extensive programs they're going to do the thing that we think is appropriate. So it doesn't rely on education, which you have to keep reinforcing. Like the thermostat, setting that at 78 instead of setting it at 72 during air conditioning season, that's an educational process. But if you have a more efficient air conditioner, wherever the thermostat is set, it's still going to save energy.

TC: Where did the whole concept, or even the terminology of demand side come from? Was that something that was out there in the industry, or is it something that originated here?

DW: It's probably an economist's term. You know, economists use that term for a variety of purposes, and in the mid-seventies after economists started getting more involved with electric rate setting and utility planning processes, that term was more widely applied to what we do on the customer side of the meter. But the Department had demand side programs back in the sixties.

We have a program that a lot of people point out as a self-serving program. The utilities entered into the Gold Medallion Program, where if someone had an all-electric home, we gave the builder rebates in order to get all-electric homes built. That wasn't a bad program. It takes a lot of knocks, probably, but it wasn't a bad program. Because that program required R-11 ceiling insulation when general construction standards in California required none, it required R-7 wall insulation when the general building standards required none. So, even back then, we were making the home more efficient at the same time we were encouraging people to use electricity. So we didn't call it a demand side program back then because that terminology wasn't really developed, like I said, probably until the seventies. But the Department has been involved in what our customers do and gave them incentives to do what we thought were the right things even back in the sixties.

TC: Now, does this affect the big commercial users the same way, or is that a different sort of setup?

DW: It affects all of our customers similarly. With the big commercial users, the biggest energy use in the city is commercial lighting, and so we're developing programs, and we have some in place now. We're developing others that will encourage our customers to put more efficient lighting in. One thing is to put more efficient lighting in when the building is built. Since a lot of the high-rise buildings in Los Angeles have to do sprinkler retrofits, we feel while they're doing that they might as well be doing a lighting retrofit, too, and so we have a program that will help them do that. Then the other thing is most office buildings have a commercial service that comes in and changes out the fluorescent tubes about every four years, rather than waiting until each tube burns out, and the same people who do that can come in and put more efficient tubes in, change the reflectors and do some other things and substantially reduce the lighting loads. Since this is something that's an ongoing process about every four years, we can get in line with that. So our biggest single program for commercial buildings is the lighting, although they also use air conditioning. So we get involved with their selection of air conditioning systems and, again, offer to subsidize some of these costs in order to get the most efficient equipment installed.

On the industrial side it gets more complicated because the major industrial uses are all involved with the processes, and so we have people who can get in and look at the industrial process and see how they can use less energy. I'll just give an example. Oil refineries, for instance, tend to put in pumps that will give them the maximum flow through the pipes. If they want to have less than maximum flow, they shut a valve down to reduce the size of the valve opening, but the pump is still pumping just as hard, that's inefficient. With modern controls now, we have what we call variable speed motors, where if you want to reduce the flow, instead of shutting a valve to reduce, you slow down the motor. It uses less energy and, if anything, gives you better control over the process. So with the industrial customers it's a much more individualized process. We encourage everybody to buy the most efficient motors they can, and those sorts of things, and for the industrial customers, the motor loads and the heating loads for process heating are the two big things.

With heating, for instance, there's some marvelous things now. They can use infrared, they can use microwave, they can use what we call induction heating, for steel and iron, which are much more efficient than running it through a furnace fired by either electricity or gas.

So we're starting the programs out in the new construction area because we want to capture the most we can when the building is being constructed or the industrial plant is being built or the home is being built. But we also will have a retrofit programs, and hopefully we can get the equivalent of our portion of the output of an IPP plant--that's about 500 megawatts--from these demand side programs much more economically than we could get it by building new plants.

TC: Does it take sort of face-to-face contact with the people, at least on the industrial side? Obviously, you can't have face-to-face contact with all the residential users, but, say on the industrial side or commercial side, there must be a certain amount of outreach there to let them know that this kind of efficiency upgrade is available.

DW: You're right, and it takes, in our opinion, face-to-face contact all the way through for all of our customers. We start out by talking with the people who do lighting and heating, air conditioning, those contractors. We talk with them because they in turn talk with their individual customers. And if we let them know what's available, then they can talk with their customers.

One of the programs we are planning is to offer an audit for every residential customer in the city. We're going through this, it's going to take us maybe ten years to finish this. We have 1,200,000 residential customers in Los Angeles, so it's not something you can do overnight. We're picking some of the older areas first because they're the ones that are most likely to have the most obsolete equipment. Among other things, we will install several compact fluorescent bulbs instead of the incandescent bulbs. A compact fluorescent uses about one-fifth the energy for the same light output. In other words, we're not reducing the light output; in some cases we do that, too. We say, "Gee whiz, you don't need 100 watts here. You can get by with 75, but don't put a 75 in, put in this 15 watt fluorescent," and we give them the 15 watt fluorescent. The fluorescent fixture will cost probably $12, where an incandescent light bulb probably costs 50 cents, but the difference is made up in about one year if you have a lamp that's on a lot, like an outside security light or something like that. In about a year you've made up the difference in the cost of electricity, and so we give them those. And we're going to have a program where we'll give them coupons to replace those as they wear out. And it's like everything else, we're learning about this process. We aren't experts at it yet and so we're getting other people to help us.

TC: Yes, it's not history, or at least the decision to go ahead with it is very recent history.

DW: Yes.

TC: The term "invisible plant" has been used.

DW: Yes.

TC: And I think that's very evocative, if people catch on to what it actually is about.

DW: Yes, not only is it invisible, but there's no smokestack associated with it, all those things, yes.

TAPE NUMBER: 4, Side B

March 4, 1992

TC: Well, I think we've covered demand side resource development. Is that what it would be called, demand side resource development?

DW: Sure.

TC: But I did want to cover a couple of the major power projects still out there that the Power System is involved in or considering. One that I have heard of for a couple of years has been White Pine Power Project. If you could just say what that's about.

DW: Sure.

TC: I know we referred to it earlier as a non-project at this point, but it's still something that a lot of thought was put into.

DW: Yes, when we were trying to site the Intermountain Power Project, the first site that was selected couldn't pass the environmental hurdles that were necessary. So the governor of Utah got a task force together to look around Utah to find another site that would be suitable. In that same general time period, which was roughly mid-seventies, Kennecott Copper Company, which had a big smelter in White Pine County--which is what I'll call kind of central eastern Nevada--was closing down and so they were looking for something that would replace the jobs associated with Kennecott. They came to the

Department and said, "If you need a place to put a plant and you can't locate it in Utah, here's a place to put it." At that time, the Department had a smaller percentage of IPP than we currently have, and that's because some of the Utah entities' loads didn't develop so they dropped out of the plant. So we looked at White Pine County and set up a project to build a power plant there.

In order to build a power plant, you need four things: you need land, and there's lots of land in White Pine County; you need cooling water, you know, water for boiler makeup water, condensing steam, and all those things; you need a way to get the fuel in if the fuel isn't already there. The Department purchased the Nevada Northern Railroad, which was owned by Kennecott Copper, and with Kennecott closing down there was no use for the line, and so we bought that essentially at its salvage value. So that railroad gave us the mechanism to bring coal in or the right-of-way could be used to bring natural gas down. Then the other thing you need is a transmission corridor to get the energy from where it's being generated to where it's needed, and we successfully obtained a transmission corridor from White Pine County into the vicinity of McCullough. So it's a very viable site.

But with a lot of our partners, both in Utah and Nevada, their loads did not develop the way they were anticipated to develop. Frankly, the Department's loads have pretty well continued along the same course that we predicted, it's just the idea that we had not predicted the drop in the cost of oil and natural gas in 1986. So, when the cost of oil and natural gas dropped very precipitously, a lot of our older oil- and gas-fired plants again became economical. So it was more economics on the Department's part; on our partners' part it was mainly lack of load growth, so that project just isn't needed.

We're doing the work necessary to maintain the water rights, because we think that's a very valuable asset. The water rights are held in the name of White Pine County, not in the name of Los Angeles. We've gotten a lot of editorial comments in Nevada saying L. A. is going to do the same thing to Nevada that we did to Owens Valley. But we own none of those water rights, we can't take the water out at all, even if we wanted to, and we don't.

We're also doing the monitoring on the air quality permits. New air quality permits would be necessary in order to site a facility there because the laws on air quality have changed since the late seventies when the last permits were obtained. So this project, it's a viable project, it can be used for a coal-fired plant, which is what it was originally sited for. Although if we were going to build something today, we'd probably build a combined cycle natural gas there. It's more economical. The economics is what's going to drive that decision. If it's five or six or seven more years before the decision is made, it's conceivable it could be central station solar.

The Department, along with Edison and the Department of Energy, is converting the existing Solar One project to Solar Two, which will be a molten salt system, and it looks very promising. Sandia National Labs has done a lot of research on metallurgy for the components of the system and we're going to test that out. If that works, it's conceivable a solar plant would be built at the White Pines site.

All these things are viable. The thing is, we don't need anything right now, and depending on how our demand side programs work, we may not need anything for another ten years. But at some point in time we will need additional generation. The other thing is, there's a lot of technological changes that are occurring all the time. So, as those changes occur, having a site available that can be used for a variety of plant types is very valuable.

TC: Sure, there's a lot of potential there.

DW: It gives us a lot of flexibility, yes.

TC: And the alternative generation is also interesting. *The Intake* had an interview--it was 1991, I think--with Vern Pruett on this whole matter of demand side development. He pointed out in that interview that geothermal, solar, and fuel cells are really being considered now as coming into their own, or almost coming to the point where they will be economical.

DW: Yes, that's correct. For instance, geothermal is very competitive with coal right now. One of the problems with geothermal is it's very site-specific. You can only build a geothermal resource where you have the natural hot water available, or the steam, which is more desirable.

TC: I understand, too--and I got this from talking to Pete [Peter G.] Lowery--that geothermal can be very corrosive to the machinery that uses it.

DW: Well, it depends on the geothermal resource. At Coso for instance, based on our tests--and we did lots of tests on the fluids at Coso--those don't look very corrosive and we don't think there's going to be a problem at all. We were developing some geothermal resources along with Edison and Unocal down in the Salton Sea area. Those were very corrosive, and we could never solve the corrosion problem, so that project was never developed. And it's not just corrosion. Quite often there's suspended particles like sand, and when the steam is coming up and carrying that sand, it's like sandblasting inside the pipes. So even if it's not corroding, it's being eaten away from the inside because of the sandblast characteristics. So it's again kind of site-specific. Some sites have big corrosion problems, others have very small corrosion problems. Just because the hot water is there doesn't mean you can build geothermal.

TC: I see. The other project that we mentioned before we started to record was the Utah Nevada Transmission Project [UNTP], which I don't know too much about. I just know the name of it. If you could just describe what that's about.

DW: Yes, well, the Utah Nevada Transmission Project would have one line that would go from Delta, Utah, which is the site of IPP, down to the area of McCullough, which is in El Dorado Valley, just south of Las Vegas. A second line would go from Delta, Utah, across over into Steptoe Valley, which is in White Pine County, and then south to the same destination. The reason we're building two lines is because if you have a single AC line, and that line is lost, you have no transfer capability. So we design transmission lines for what we call an N minus 1 contingency, so the loss of one line is one of the things. So, by having two lines that are separated quite substantially, a single thing wouldn't take both lines out.

The advantage of the UNTP would be that it would provide a . . . I guess I ought to say that the STS, the Southern Transmission System, associated with IPP is fully loaded. There's no additional room left on that line. The advantage of UNTP is that it would allow us to make economy purchases from Utah--there's still surplus generation in Utah for much of the year--and it would also provide a transmission path for several new projects.

The new projects would include a purchase by the Department from Deseret G & T [Deseret Generating and Transmission Co-op] out of their Bonanza unit. It could include a second Bonanza unit. Bonanza was designed as a two-unit, 800 megawatt facility, two 400 megawatt units, with what we call a captive coal mine. The coal mine only ships coal to the plant. All the infrastructure was put in for two units but they only built one unit. So, if we could build a second unit there, we'd be able to utilize a lot of equipment that was put in for the first unit. UNTP could be used for a third or a fourth unit at IPP, if we decided to do that. Or, it could be used for the units at White Pine County. It could be used for all three of those types of things.

TC: It's very versatile.

DW: In addition to that, there is surplus hydroelectric up in the Idaho-Montana area, and Idaho is developing what they call the Southern Transmission Line, which will interconnect UNTP or perhaps it will go all the way down to the McCullough area on its own. Because there is surplus hydroelectric much of the year--maybe not all year long, but much of the year--coming down from that area. Plus, there are some cogeneration facilities up in that area that currently have no market in the Pacific Northwest. But if there was a line available, then they would have a market and we could negotiate. Cogeneration is a very efficient source. And in addition to that, there are geothermal facilities in central Nevada that currently are essentially landlocked--they have no transmission path to get energy out--and those could be tied in very easily with the UNTP, and so that would give us access to what they call the Steamboat area in Nevada. It's a large geothermal area that may be viable. So that line would provide all those options. It would provide short-term economy transactions, it would provide a long-term path for a variety of new resources that could be developed up there.

TC: There's no line from Idaho-Montana south as it stands?

DW: The only lines currently go west over to Bonneville and then south. And the Pacific Intertie, both AC and DC, are fully loaded most of the time, or at least enough of the time that that isn't an economical path for a firm resource.

TC: Tell me, is the Western Systems Coordinating Council in this at all?

DW: The Western Systems Coordinating Council is involved with any new transmission line that's built external to the Department's system. In other words, if we built a new line within the city, they don't care about that, but any line external to our system, they're involved in it, and there are a whole variety of tests that we have to show can be passed by that new line. In essence, you put the line in, you load it up, and then you remove it and see what happens to the rest of the system. So we've gone through all that and we're confident that the line will benefit the western system.

To digress just a little bit, one of the problems with the western system is that there are very weak ties along the western edge of the Rockies. You know, the system is sometimes referred to as a doughnut. There are really strong ties along the West Coast with the DC line and the two AC

Interties, very strong ties down that side. There are good ties across the bottom over into Arizona because of Palo Verde and other things, there are very strong ties that way. There are very strong ties across the north between Idaho and Montana into the Bonneville system, but the ties between the Northwest and the Southwest along the Rocky Mountains tend to be lower voltage lines that just don't have much extra capacity and it's always been considered kind of the weak link. So 500 kv lines linking that area would really solidify the whole western system. Let me talk about UNTP just a little bit more.

TC: Yes, sure.

DW: One of the problems that we had with that was just east of Las Vegas is an area called Sunrise Mountain Natural Area. It was declared that because of a lot of very interesting geological formations that are there--and the University of Nevada, Las Vegas, actually uses it as an outdoor classroom. Almost fifteen years ago now, I guess, congress established a variety of wilderness study areas to set aside land that isn't yet developed to maintain in a wilderness state. In setting up that legislation, all natural areas were included. So that meant this Sunrise Mountain area became a wilderness study area. And as long as it's a wilderness study area, no new transmission lines, nothing that disturbs the ground can be built there. You can't put in anything.

Now, very frankly, this Sunrise Mountain area is not a wilderness area, it's really not. There are two transmission lines there now, there's a state highway, there are mining claims, some more active than others, but they're actively pursued. It's not a wilderness. No one would describe it as a wilderness. But until congress acts on the wilderness areas, nothing new can be built there. As a result, UNTP could not be built. We had some legislation that we thought would clear it up but the Nevada senators were reluctant to go along with that, so that stopped that line. We think that because of work that the folks in Utah have done with Nevada that that's very likely to be cleared up. And if that's cleared up, then I would expect to see a new transmission line, that UNTP, the first leg of that, would be built and in operation in the 1997-98 time frame. So it looks like we might get the go-ahead to go on that line.

TC: Well, let's move now to finish this, I think, with a discussion of the transition from System Development to Conservation and Planning. I went away for a few months, I guess it was in 1990-91. When I left, System Development was here. When I came back, I referred to System Development and got corrected at every turn. (chuckling) Somebody was talking about CPD [Conservation and Planning Division] and I'm saying, "Wait a minute, what's CPD? What's happened?" How did that come about?

DW: Okay, if you remember, in the mid-eighties, 1983-84 time frame, Conservation Division, which had been a separate division during the latter part of the seventies and early part of . . . Well, in fact, Conservation Division was created out of what we refer to as our General Sales Division.

TC: General Sales, okay.

DW: That occurred in the late seventies, and then in the early eighties it continued as a separate division reporting directly to the General Manager. When the oil embargoes were over, and then especially when the cost of fuel started dropping, in the late seventies people thought fuel would go at about twice the average inflation rate forever. Well, it hasn't. The perceived need for a lot of conservation kind of dropped away. The other thing that lent support to that was the fact that the Department had over-built, had deliberately built for fuel switching. So we weren't building new capacity anyhow, and so there was no big driving economic incentive for the Department to become more involved in conservation. Now, we knew conservation was important. It's not that we thought it was unimportant, it's just that it didn't have the same kind of needs in the mid-eighties that it did in the mid-seventies. So, about 1983, Conservation Division and the System Development Division were merged into a single new division called System Development Division. And part of the reason for this is because demand side programs, including conservation, are part of our resource mix. In other words, the kilowatt hours that we save are equivalent to kilowatt hours that are generated, especially if there are hardware fixes that are made to make that happen. So the two divisions were merged, and that continued until about 1990.

At that general time frame, Mayor Bradley appointed new commissioners, three of which are very environmentally active and concerned. It was their belief--and I think it was an accurate belief--that conservation really should be elevated, made more important. So there were a lot of discussions as to how best to do this, and it was thought: Let's go back and have a division reporting directly to the General Manager that is responsible for conservation. The old System Development Division argued that that wasn't a very good idea, that had been tried in the seventies and it didn't really work. Because you had one set of people who were off planning good things to do on the conservation demand side programs, we had a whole different set of people who were designing the system. And to the extent that they weren't both doing the same thing, the optimum result wouldn't occur. So it was decided it was probably best to leave the supply side and demand side planning in the same group. The same person has both the authority over the groups and the responsibilities, but in order to highlight the increasing significance of conservation and demand side programs, it was decided to rename the division, and so the division was renamed.

The staff dedicated to demand side programs is going to increase fairly substantially. It's already increased some, but it's going to increase additionally. Because we're starting to recognize in the eighties we knew it was twenty years perhaps before we needed any more supply side resources, now maybe it's only ten years, and so maybe it's time to get more involved with DSM. Plus, there's a lot of equipment that's available now that just wasn't available seven or eight years ago. Like these compact fluorescent bulbs, they were what I'd call essentially experimental that long ago, but now they're very good bulbs. They'll last four to five years, do great things.

TC: So it's more than a cosmetic name change in order to soothe the hostility of perhaps some people in City Hall?

DW: Well, I think it is. In other words, before the name change, the staff directly associated with demand side programs was probably around eighty, seventy-five to eighty, in that range. The staffing on that function has now increased to about one hundred and thirty-five, and it's expected to increase to perhaps over two hundred over the next couple years. So we're putting a lot more emphasis on that side, I believe.

TC: So these are real division changes here because of that.

DW: Yes.

TC: Well, I don't know, we've covered a number of things here these last . . . We've had, what, four sessions, I guess.

DW: I think it's the fourth, yes.

TC: I've covered what I wanted to cover. I've talked to a number of men who have all been retired for twenty years or so. I just recently finished up with Burton [A.] Currie, and he's been retired for nineteen years, and you're still here. (chuckling) Those guys were old-timers, and you're not an old-timer.

DW: I'm an old-timer. (chuckling)

TC: But maybe I'll come back to you in a couple of years and ask a few more questions. But for now, I'm done if you are.

DW: Yes.

TC: Okay, well, I wanted to thank you for this. This has been very instructive and it will be a good addition to our series here. Thank you.

DW: Okay.

END OF INTERVIEW