

William R. Dickson Oral History Project  
Interviewer: Paul Gray  
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Conversion of Industrial Buildings to Academic Use at MIT

WD: So today is Monday, April 11th. And we're going to have a discussion with Paul Gray [president emeritus]. And the first topic that we're going to speak about is the oil or the Arab oil embargo or energy crisis, which I believe was in 1973. First we ought to set the tone of it. It not only was a matter of the cost of fuel and electricity, which actually was a lot cheaper than it is today, but the fact or the thought that we weren't going to be able to get any oil enough to operate the power plant as it was called, the steam plant at that time.

And so we were quite concerned that we reduced consumption to the maximum degree possible within practical means. And we had anticipated some problem, mainly with electricity and the cost of electricity prior to this time. So we actually had been doing some experiments that before the crisis came that helped quite a bit when it did come, because we could try certain things that we knew what the results were going to be rather than just guessing what they might be. And I'll name one of those in particular. You remember at the time or some of you will that the prediction was that there might not be enough fuel oil for the demands of the United States. And that natural gas would probably run out in, from a supply point of view, with the U.S. before the year 2000. And of course that eventually proved to be incorrect, because as the price rose, more people decided to go heavy into the exploration, and much more was found. And I think the thought is now that there's many years of natural gas supply at this time, which of course is five years past the year 2000.

But there always was enough coal, but most people that burnt coal, at least in the city, had gone away from it because of the environmental effects and had switched primarily to oil, at least in this area. In other areas of the country they might have switched more to gas.

PG: Did we have the capacity to burn coal, Bill, like that? I thought we did not.

WD: Well, the original plant was a coal plant. And before World War II, just before World War II they converted the boilers to be able to burn oil, number two fuel. And as soon as the war came along, they were forced to convert back to coal because, again, oil was a critical product during the war because of all of the demands of the armed forces. And it was even -- the demand was so much that it was even rationed, gasoline, to the general public. So that we didn't convert back to oil again until after World War II. And then we converted back immediately. And there never has been any coal since that time. And the current situation is that with the current boilers, without major, major overhaul, we wouldn't be able to burn coal anyway. So that we turned to a situation where we can burn oil as the primary fuel and interruptible gas as a secondary fuel. Interruptible gas is when the demands of the public or the users of gas, primary gas, are low enough so that the gas company ends up with an excess of gas. And then on very short notice, they will allow us to burn gas. And if I remember right, they could cut us off in two hours. And we'd have to shift back to oil. So that the boilers at the time were capable of burning either gas or oil, and primarily oil. And of course the oil was stored in tanks under the ground in the yard next to it so that we had a limited supply, particularly in the colder weather. And I can remember a time when there was an oil truck from White's Fuel sitting outside the plant on a continuous basis. In other words, we would use the oil from one and then shift to the oil from another, or be filling the tank, using the oil from the tank and filling the tank at the same time. And it went on continuously.

So that we did not have a lot of storage. And that meant that if the fuel supply was cut, that we could be in quick trouble because we weren't going to get any interruptible gas either at the time. So that the best thing for us to do was to see how much we could cut demand. And we were quite successful. I can recall that we had less bureaucracy than we might have at the current time. And I basically called the shots on what was going to be done.

And I'm sure that at some time we would fill Phil Stoddard, my supervisor, in on what we were doing but not very often. And we immediately started meeting every morning at 7:30 or 8:00 o'clock and devising what we would try that day to further reduce consumption. Some of the things were rather simple, and some of

them weren't so simple. What kind of things did we do? Well, first of all, in the electric area, which indirectly affects fuel, because that's how they generate the electricity, we had been experimenting with cycling fans. In other words, if we had -- and the experiments actually were held in the Ford Building.

PG: Were we generating electricity at that time?

WD: No. I think we weren't generating electricity. And we had an emergency generator but that's all --

PG: Um-hmm.

WD: -- of about 1,000 KW. I'll get back to our generator electricity when we talk about another subject. But we needed oil to run and we needed to purchase electricity from Cambridge. So that by cycling fans, we would take a -- well, I remember the Ford Building had three major fans. And we would turn one of them off for 20 minutes every hour. And so we had two running at one time instead of three. And we would coast basically for the other 20 minutes that the fan was off. And it had some minor repercussions, particularly in the hot weather, because when you stop the fan you actually reduce the air conditioning available. But nothing severe and it worked fairly well.

PG: These were fans that served different parts of the building?

WD: Yes. They would serve -- like one of them might serve the 7th and -- 6th and 7th floors.

PG: So people who were in that area would notice when it was off?

WD: They got to -- because they could hear fans -- they got to know it when they could hear fan noise sort of coming through to the diffusers. And after a while -- we didn't advertise that we were going to do this. We just did it. After a while people could figure out that their fan was off. And it didn't cause much of a problem. We had some people saying, well, why don't you operate this way all the time and save 33 percent of your electric quote? And sometimes that was a hard question to answer. It worked well enough, and we were concerned enough that we tried it some other buildings that we had not experimented with. And for the most part, at least to the relatively short term -- well, what short term? Two or three months until the situation sort of stabilized, we were able to do that.

Well, this group that met every morning would decide what to do different the next day in order to conserve fuel. One of the obvious things was that we would reduce the temperatures in the buildings in warm weather and increase -- let's see. Have I got that right? When we needed to heat, we would heat less so that it would be cooler in the building. I think our target was around 70, and we often heated much more than 70. And during the evening hours, where we could, we set back the temperatures to the mid 60s. And we installed some apparatus that was sort of seat-of-the-pants kind of stuff that allowed us to do this because most of our buildings were not equipped with the setbacks that would readily allow you to do this on a timed basis. Likewise when the weather was warm, we decided to let the temperatures rise higher than we normally would. And I think we adopted 78 as the reasonable temperature. Rather than trying to drive people down to 72 or something. And I would guess we had more trouble in the air conditioning season with the higher temperature than we did in the heating season with the lower temperatures. As the word got around as to what our goals were, and those were well published. We didn't try and keep that a secret. People knew enough to bring sweaters and other things if they tended to be people that would run on the cold side.

We also did work in the dormitories where we reduced temperatures at night to 65. This was allowed by the housing code. And it said that you had to maintain a temperature of at least 70 degrees during the daytime and 65 at night after 11:00 o'clock, I believe. And that leads to sort of a humorous story. We had at Westgate an individual from a foreign country, graduate student who was used to warm climates. And he often stayed up late as most graduates do studying and got really uncomfortable when we would set back the temperatures to 65 at night. And he called everybody he could think of. And finally he was directed to me. So he called me one night at about 1:00 o'clock in the morning. I was sound asleep of course. And he told me his problem. I asked him what the temperature was and he told me. And I said, "Well, that's pretty much what it's supposed to be and that's what we're going to do." So, we parted ways.

And a couple of more times he called me around 1:00 or later complaining that he just was not able to study because of the temperatures. And I told him, well,

put some clothes on because we weren't going to raise the temperatures. I told him what the problem was. And I knew I hadn't got anywhere. So I finally had had enough of being woken up at 1:00 and 2:00 in the morning. And I set the alarm clock for 4:30 and I called him and asked him how the temperature was and woke him up from a sound sleep of course. He finally did go to bed. And that was the last time I ever heard from him. But there are different ways you can accomplish things if you have to.

This group that met every morning consisted of a strange variety of people. I was the leader. Dick McKay was the mechanical engineer in charge of the power plant. His operation was [fair?]. Tom Shepherd who was in charge of electric operations was there. Andy MacDougall who was head of heat and vent, sort of a chief foreman was there. And August L. Hesselschwerdt, a former professor of mechanical engineering and now a consultant and part-time employee in the plant, was there, and someone else. I can't remember in time whether it was Haige Kachegian or whether it was George West. But one or the other was there. And if we needed anyone else for some reason, we'd just call them in.

Hesselschwerdt was a theorist. He had taught mechanical engineering, heat and ventilation and air conditioning until he decided that it was no longer necessary to teach that. And eventually he left the department unhappily and was quite happy, however, working with the people at the plant. And he was very good at figuring ways to conserve steam. Perhaps the most terrible devices we had on the campus were steam meters that measured theoretically the flow of steam. And they were always broken or just didn't work right. So we spent a lot of time and effort in calibrating steam meters and making changes where necessary. And by knowing the characteristics of a building, we could greatly reduce the amount of steam we fed to the building. This was particularly --

I remember one of our main buildings that we did a lot of work with was the student center. And we cut all sorts of steam consumption from the student center and still kept the building comfortable. It even had a steam absorption machine for air conditioning. And so it was a big user of both steam for heat and steam for air

conditioning. Where if you had electric driven [compressors?], they didn't require steam for the air conditioning.

PG: Well, how do you reduce the -- how do you control the volume of the steam?

WD: Well, it passes through reducing temperatures.

PG: OK.

WD: And you basically control the orifices in the reducing valves. And they're tied in with the steam meter. And so this was the first time that we ever started accurately getting measurements of how much steam we were actually putting into some of these buildings. A lot of it was just being wasted.

PG: Does this mean that the pressure is lower in the building than after you reduce the volume?

WD: Not necessarily the pressure. We did have -- we usually had three stages of pressure reducing valves. We had the stage that we distributed throughout the campus in the mains. And then we had a secondary stage, which was sort of halfway between it and a lower stage. And the lower stage was basically steam pressures that you would use for a heating system. Like you know in your house, the steam pressure is very, very low.

PG: Yes.

WD: And so we had three stages -- we used almost exclusively Spence reducing valves. And we generally had a common setup in each one of the buildings and three sets of valves. I don't pretend to know everything there is about this, but I could give you an example of how successful we were in this whole operation. Back in the early '70s or late '60s we had a cold windy day, and we peaked at production of steam in the power plant that day. I can't remember how much it was, but we had a peak. We used to measure the amount of steam generated. And it was the highest we had ever generated. Well, for ten or fifteen years later with the same conditions, and probably eight or ten more buildings --

PG: Sure.

WD: We never hit that peak again. So that we were able to save considerably on the amount of steam used throughout the campus. And of course steam is generated in boilers --

PG: Right.

WD: -- which were fueled primarily by oil. So this was a big contribution to the future of the Institute as far as the use of fuel. We also did something that obviously wasn't done overnight, but we had a relatively new building, the Hermann Building.

PG: Um-hmm.

WD: And it had a high class heating and ventilation system, a dual duct system, which meant that you put hot air and cold air through two separate ducts to each space. And then you had a mixing box. And yet you used the mix of the two to get the room temperature. Very nice for the occupants. They could sort of dial -- one guy in one office could like it hot. And the guy next store could like it cold. And each one of them could get their own temperature. So this was an expensive system, but it was a very good system. However, we decided that we would venture into something new. And that we would use basically a single duct system with variable volume control.

The variable volume mixing boxes were relatively new in the market. Not many people had used them. And what it allowed us to do, of course, was to cut consumption of fuel in the building considerably, but it all came from the central -- well, I shouldn't say that. The steam came central either -- the air conditioning came from another steam absorption unit in that building. So that both the hot and cold came from steam.

By using the variable volume system, which monitored the -- which changed the amount of air you were delivering to a space to let it get warmer or colder, we were able to cut the main fan in the building. It was not a big enough building to have several fans. It had one 200 horsepower fan. And we were able to cut the horsepower to 40. And to my knowledge, that building has operated ever since with the 40 horsepower motor and variable volume control system. We just did away with the dual duct system. So that those are the kind of things we were willing to experiment with.

And I would say that Louie Hesselschwerdt will swear he was the real father of the steam control working with McKay and others, Andy MacDougall. And without a doubt, the electric side and things like this change at the Hermann Building were overseen by Shepherd who was such a good engineer that he could be

comfortable before we made the changes of how they would work. It wasn't like you would say, well, let's try this and see how it worked. He could figure out, at least in his own mind, how it was going to work and then make the changes. And they did work that way.

PG: Um-hmm.

WD: So that I think that he was the primary person in the electric field. All I did was get my baton out and wave it. Now, as far as the practical little things -- and I don't even remember what some of these were -- Andy MacDougall who ran all the buildings was the best at this, because he would know what he could do without getting really in trouble and what he couldn't do. So, between the bunch of the people there in that room, we came up with lots of ideas, put a lot of them in place, greatly reduced the fuel consumption because of the reduction in steam consumption and the variance in temperatures and sort of got through all this before the energy crunch, which really to the inner severest never took place until we were able to operate again with some ease.

PG: Yeah, we had another crunch, what, about five years later, I guess, '79 or -- '78 or '79 but got through that one with --

WD: That was mainly from, if I remember, the price.

PG: Yeah, the price went way up --

WD: Rather than from not --

PG: That's right.

WD: -- being able to get it. When you have a feeling that you can't get it and you're not going to be able to produce enough steam for the institution, I think it's easier to make changes than it is just for dollars.

PG: Um-hmm.

WD: And there are many people interested in the dollars, and there are lots of others who don't give a hoot. They're interested in their own comfort. So that, you know, from a dollar standpoint, they're worse off right now than they ever were.

PG: Yes.

WD: Because of the high price of fuel oil, which we don't use much anymore.

PG: Now, the gas is going to be up --

WD: We burn gas, and gas -- they just mirror the gas priced oil.

PG: Um-hmm.

WD: So, even though they don't have to economically, they increase the price of gas as the price of oil increases. One other thing that we did that took some time, but it made us realize we didn't have enough oil storage. And of course building underground oil tanks was not the best technology of the world because of concerns that people had about leakage.

PG: Um-hmm.

WD: The fact that you now had to put in double hull tanks, etc. So we did have a big reservoir under the building next to the power plant for water. I think it was in case we had trouble getting water for the boilers. This was water that had been taken from the river. And it stored about 150,000 gallons in the basement of this building. That's all the basement was, water storage.

We decided at this day and age, we really didn't need the water storage; that we had enough alternative supplies to the power plant and that we could do away with it. And so we lined this tank, emptied it and lined it and filled it with oil, so that it's our biggest outdoor tank with 50,000 gallons, which I think it was. I think we had three of them of different sizes. We immediately equaled that or surpassed it in one location by having the ability to store 150,000 gallons of oil. And that would give us a few days supply if not able to get oil from the company.

PG: Um-hmm.

WD: The company at the time I think was White Fuel. Later Metropolitan Oil. So that many changes were made and for the better. And I think some of those have probably slipped away in the years intervening. Something like the Hermann Building was permanent, but we eventually gave up the recycling of fans in the Ford Building. As things got a little easier, people did notice more when the noise from the diffusers stopped. And some people started complaining vigorously that we were making them work in unsafe conditions, because they didn't have enough ventilation.

Another thing we did that comes to mind is we shut off either all or most of the DC fans in the main group. The DC fans were these giant fans that used to supply ventilation air to buildings and classrooms and stuff. And we decided that the

windows leaked so much anyway that we weren't going to have a problem if we cut off this ventilation air. And we never did. We cut it off and really never did experience a problem. There was even enough leakage to the windows so that in rooms like the chemistry labs that had a lot of old fashioned hoods, you could still run the hoods and not have a problem in the room. Because they just suck air coming in from the outside.

PG: So, if we ever replace all the windows in the main building and get tighter windows, we may have to put the fans back in?

WD: Well, as we've made changes, Paul, and we have made a lot since that time in the main group. We have generally put in AC vent systems.

PG: Uh-huh.

WD: But the big DC fan systems will never be put back in order. And I think -- I'm not sure but I think they may have even been removed by now. So that you're quite right, though. We'll increase operating costs by making repairs to the windows. They won't leak any longer. And they'll probably be dual glass and...

PG: Um-hmm.

WD: That's why we never paid attention to trying to do too much reduction of consumption and stuff in the main group, because there was so much leakage that we didn't supply much air anyway. And of course you know the air in a building is what costs you the money, because you have to both heat it and cool it depending -

PG: Right.

WD: -- upon the season. And so you use a lot of fuel to heat and cool the air. We used to use a figure that if we could recover probably the operating cost savings by investing capital in, well, three years but usually less, then we would go ahead and we'd get permission from people like Paul Cusick, spend the money. And we did work at some buildings where we might have spent a million dollars and got it back in a year.

PG: Um-hmm.

WD: And so the people that ran the institution had a lot of foresight. They also had a lot of confidence that we could develop what we said we would be able to develop. And I had that confidence because of people like Tom Shepherd. Not in my own abilities. And we always did deliver usually in a faster payback. Well, I think when we made

calculations of doing something different in the main group, we were always around the 20-year mark. And the question was why should we invest money for a 20-year return when we could be investing that money somewhere in getting a year or two return? And that's the way we operated.

PG: Bill, I remember the conversion of the water tank to oil but darned if I can remember where it was. What building was it under?

WD: Well, I think it's in the building right next to it, 41 maybe.

PG: Is that where the cyclotron is?

WD: No.

PG: No.

WD: No, that's on the other side. That's 44.

PG: Oh, I see, toward Mass. Avenue.

WD: Towards Mass. Avenue.

PG: Yes.

WD: I think it's now occupied by the plant.

PG: Um-hmm.

WD: I think.

PG: Um-hmm.

WD: But at the time I think mechanical engineering had some stuff at the first floor. And the tank was in the basement.

PG: Had you at that time -- yes, but you mentioned earlier that now if you're going to put an oil tank under water, it's got to -- on the ground it's got to be a double hull tank. Were there any difficulties in making that conversion; I mean difficulties with the state or the town?

WD: I don't remember any. I think we were at the front edge of what might have followed.

PG: Um-hmm.

WD: Because I remember putting or working with Dick McKay and putting in a new underground tank in the '60's. And we didn't have to have a double hull tank at the time. So, this all came along later. And of course it made things much more difficult

to carry out from the environmental issues. We tried some cycling of fans. I recall them, the electrical engineering building, which must have been relatively new.

PG: Buildings 36 and 38?

WD: Yes.

PG: Yes.

WD: And we got along reasonably well for a period of time, but we had one individual who must have spent his time when he wasn't doing brilliant work tracking when the sounds went down. And he really complained that it was affecting his health. That was Hermann Haus. And I think we have ultimately, after running many tests, abandoned it and went back to running the building on a full-time basis.

PG: Well, Hermann was a great teacher and a great scholar. And once he got a hold of something, he never let loose of it.

WD: Right, right. I knew Hermann fairly well. And he was a good adversary.

PG: I think, Bill, this is a side story, but I think I was the last person to talk to Hermann before he died. We'd been in a faculty meeting in May of that year, in 10-250. We happened to sit right next to each other and we chatted before the meeting started. And after the meeting he got up and said, "Well, I've got to get home for dinner." And as you probably know, he was biking home at that point.

WD: Yes.

PG: And he got to his driveway and collapsed on the bike and was dead by the time his wife got to him.

WD: Where did he live, in Belmont?

PG: Concord.

WD: Oh, Concord.

PG: Yes. It was a long --

WD: Long bike ride.

PG: Yes. He was sorely missed in the department.

WD: Yes, he was on my Board of Governors at Endicott House.

PG: Oh, wow.

WD: He was quite a good contributor.

PG: Bill, when you -- you talked about the cycling of fans. Was that all done by people going around every 20 minutes and --

WD: No. We put --

PG: You put timers on it?

WD: We put timers on it.

PG: Right.

WD: As I said, we had been experimenting. We had actually hired a guy to do this experiment. And so for several months before this we had been experimenting, and we hadn't shut them down for long periods of time or anything. We were equipped to be able to do it.

PG: Um-hmm.

WD: And so that we could jump into this right away.

PG: Right.

WD: We didn't have to wait to buy equipment and have it installed.

PG: Assume that energy prices stay where they are now. Oil is what, somewhere in the high 50s?

WD: High 50s.

PG: Natural gas is somewhere around six, seven bucks, isn't it, I think?

WD: Yes, it must be.

PG: And if the Institute were to conclude that it's got to reduce energy usage again because of the cost this time, is there much more that could be done?

WD: Well, I think that most of our motors are oversized, and that our fan systems are too large.

PG: Um-hmm.

WD: And of course that's always a debate when you talk about laboratory buildings, especially those with a lot of fume hoods. But I have a feeling that both -- I may get in trouble for saying this but... That both the Stata Center and the new Brain and Cognitive Science Center have systems installed that are grossly oversized.

PG: Um-hmm.

WD: And so I'm sure that if we set out as an institution to try and reduce fuel consumption, or expenses rather, that fuel consumption in those buildings would be mainly driven by the amount of air. And not the amount of heat that you need.

PG: Um-hmm.

WD: And so that there is, I think, the big potential, a very large potential to reduce costs. And nobody's interested. A matter of fact, the person who worked with us on Building E53, he was the inventor of this variable volume system. And he's also the one that recommended how much we could cut the fan size.

PG: Um-hmm.

WD: He has been trying to talk to the people at the Institute. And he's eccentric. I say that in a real word, he is eccentric. He's also probably the most brilliant inventor of things in the HVAC that I've ever met. And it's clear they're not going to do anything because he recommends it. And he's going to be done soon anyway. I think he's 76. I'm not sure he's getting more -- not getting more eccentric. So you need to have someone who has the will and someone who has the knowledge. And the systems that have been installed lately are just oversized systems I think based on the fact that they don't want to make -- the engineers don't want to get caught on the bad side, bad side of it.

PG: Yes.

WD: And I know I even talked with Gene Barne, the engineer on the Brain and Cognitive and really couldn't get anywhere. I thought he might listen because he used to work for Hankards and Anderson. Well, as I said, when they split off, I forgave the firm. It was BR&A [Baird, Rao and Athanas] or something. Their first job. And so I felt I had some "in" with them anyway. But he just said that one of your friends is a crazy man. And they weren't overly conservative. And I can tell by the size of the ductwork and stuff that they were. And so I'll give you short answer. There are probably many more opportunities now than there were at that time to reduce the quantity of air that's circulating, and therefore not have to heat to cool it.

PG: Mostly in the newer buildings.

WD: Primarily in the new buildings. Correct. Going back to the biology building.

PG: Um-hmm.

WD: There's something that could be done in the biology building also. So that somebody's just got to have the will to do it. And the will isn't in the plan at the present time. People like Shepherd and McKay are all gone. McKay died. Shepherd is in very poor health. And the bandleader is gone. And Vicky never wanted to play around with it. Vicky has a lot of faith, much of it well placed, in the competency of engineers and architects that can't understand all that goes on unless you are one.

PG: Um-huh.

WD: And I know what's going on. I just don't want to err on the other side. The other thing they ought to be considering, and I don't think they are, is to build a second cogeneration plant or a second machine. When we built that --

WD: Oh, that's great. When we built that it was -- peak load was 25 megawatts.

PG: Yes, I remember.

WD: And we did produce during normal times 20 megawatts and other times less than that. Now, the peak load when Brain and Cognitive Science was online and with Stata and some other things is going to be 35 megawatts. So the time is here to build another plant. And you know it's a big expenditure. And no one's interested in spending capital, but they got to recognize they're spending operating dollars.

Our plan would -- another machine and the space to house it would probably cost similar to the first one since we had a lot of stuff thrown in with the first one, electrical changes and stuff that we wouldn't have to make...

PG: Yes.

WD: But, you know, it's probably \$40 million. On the other hand, with the price of fuel the way it is, they must be spending lots and lots of dollars on buying our fuel.

PG: Are we generating steam other than through the cogen plant now?

WD: Yes.

PG: Yes.

WD: And so much that we may need another boiler. And of course the thing to do is not put in another boiler. We avoided that before by building the cogeneration plant.

PG: Right.

WD: But it could be, in my opinion, I don't know the figures, it could perhaps be avoided again. As a matter of fact, Paul, I think Peter Cooper was out here, and I think he said

they have two temporary boilers over across the railroad track, outdoors, that they're using or that they have in case of emergency. So that there's absolutely need to build another boiler. In any case, there's got to be a lot, a fair amount of money spent in the power plant.

PG: Are we generating with -- the existing cogeneration facility, are we generating now electricity at lower cost, much lower cost than we buy it?

WD: Well, the combination of steam and electricity.

PG: Yes.

WD: Yes. We follow the -- and I say "we." I don't. Peter said they follow closely the cost of electricity that they can purchase. And only one time has it dropped low enough so that they considered shutting the cogeneration machine down. And that was only for a month or so. So they follow that on a daily basis. Now I think you also had a question about the genesis of the cogeneration plant?

PG: Yes.

WD: And not to make a long story out of this, but during the late '70s after we had gone through all this problem, we looked at the question of cogeneration using coal, since we knew that coal would be a long lasting supply. Now we had several problems. One is getting the coal into the heart of the city, but on the other hand we were blessed with a railroad right there.

And the second one is, how do you store it? You don't put it in a big pile like we used to have. You have to build silos and store it in silos. And we went quite far. We actually had a preliminary plan for doing this, but then it became evident with the changes of regulations in the environment and the problems with potential transportation problem system. Railroads should cease to exist. And the cost of the silos and stuff, that we abandoned the coal idea. And later on came to pick up the idea of a gas-fired cogeneration boiler. And we spent even years at that getting that permitted because of emissions that would come from the gas turbines. And we were helped immensely in that by Janós Beer, professor of chemical engineering, who had been doing some work on some of this and was well known in the state. And he actually worked with the people of the plant. And they finally came up with this low NOx solution that was approved by the state. And so we put in the plant. It went

through many revisions. We were talking about selling electricity to Cambridge and buying some of it back.

PG: Um-hmm.

WD: That didn't work out too well. So that I think the driving force probably was the fact that Cambridge's infrastructure, which was pretty good at the first few years of me being at the Institute, had very few outages, started to fail all the time. And we could see that they weren't going to put any money in it, and we were going to be in trouble with outages quite often throughout the plant, various places of it. So that we went ahead and built the plant. We had to come up with the space, which is in the building, which you see now. And we decided on using ABB instead of General Electric after researching the sort of reliability of each one of them. And we made major changes at the time to the electrical system also.

PG: Oh, I remember.

WD: And so that it turned into a big job. It was a lot bigger than just putting in a machine. And we changed all the incoming services and new systems within the power plant itself. You might ask why I was called a [foul player?]. It was built of course when MIT moved to Cambridge. And we used to generate our own power. So, we had a cogeneration plant back in 1916. And it stayed in existence until -- ooh, it must have been after 1975. We never used it. I think we used it for emergency power. But we were able -- during the 1975 northeast blackout, we were able to hand-light one of our boilers and generate enough steam to push it into the -- I think it was a thousand KW generator and back-feed into Cambridge, which allowed them --

PG: Allowed them to start up.

WD: To start up.

PG: Yes, I remember that story.

WD: So that's how they actually started up again from a back-feed from our plant, which was totally down. As I said, they had to hand-light a boiler, which I guess there weren't a lot of people around that knew how to do... So that when we went ahead with the cogeneration plant, I gave my one and only presentation to the Executive Committee. And they agreed even though the dollars were a lot. And it probably made sense. So we went ahead and did it.

We had about six months of turbulent times after it went online, different kinds of things. We actually had a turbine blade that broke also. It took a while to figure out what was wrong. But since that time it was repaired and we've never had another significant failure. And then the plan was that we would burn gas or the contract says we have to burn oil for -- if asked for at least 20 -- I think 20 or 30 days a year so that the [gratuities?] of one so they get new maintenance on the system. And two -- I'm not sure what the real -- why that ended up being the case, but we could burn -- we affirmed gas down.

PG: Right.

WD: We had to put in a new gas line from the Gas Works over on First Street or Sixth Street or wherever it was. And it works quite well.

PG: So, we still store oil under Building 41.

WD: Oh, absolutely, because it's -- I'm not sure whether the underground tanks are even there anymore or whether we have to take them out. So that that is our primary oil storage.

PG: If we were to build a second cogen plant, is there space there along that narrow strip between Vassar and the railroad tracks to do it?

WD: I'm not sure. I'm sure they have a plan, but I -- I can't answer that.

PG: Of course --

WD: You'd have to make space somehow.

PG: And you'd have to probably take down the Cyclotron Building.

WD: Well, that wouldn't be a good place to put it. It really should go on the Mass. Ave. side of the power plant.

PG: I see. Where that parking lot is now?

WD: Yes, well, not that far. There used to be a garage, if you remember?

PG: Yes.

WD: The physical land garage. And I think there's a temporary building there now --

PG: Yes.

WD: -- that we used when we were renovating the chemistry building.

PG: Yes.

WD: So that's a potential place. But I think Peter Cooper knows much more about this than I do. I think I don't have anything more to say.

PG: All right. Let me ask you one -- a totally different question. When I was a student -- when you first came, I'm sure, and certainly when I was there, before I went in the army, MIT had a system of automatic clocks and bells.

WD: Yes.

PG: Five minutes to the hour and five minutes past the hour.

WD: Yes, two separate systems.

PG: Yup. And there were clocks that moved every minute, and obviously they were synchronized in some way --

WD: Right.

PG: -- around the Institute.

WD: Yes.

PG: My recollection is that by the time I came back to graduate school that was gone. What happened to it?

WD: They were still there when I first came to work in 1960, but not long thereafter. Well, they expanded so much.

PG: Yeah.

WD: The question was, is this worthwhile doing? And I guess they decided that it was. I was not part of that decision, but it was abandoned. You remember we used to have a call bell system, too?

PG: Yes. Oh, I do.

WD: And that was abandoned at some point in time.

PG: Well, from my perspective as a teacher around there, it's too bad because of the -- without a bell the folks are inclined to take too long and carry on into the interval. They have no signal it's time to stop.

WD: Yes.

PG: I mean the bells used to ring. Students would get up and begin to shuffle around. But that doesn't happen anymore. Here I'll shut the machine off.

[End of interview]