George Hinman

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CH: [laughs] Of course the other area that you've had a lot of expertise on has been regarding the nuclear waste and radiation issues. Is that...

GH: Right. For GAO [General Accounting Office]. I worked on that for about ten years. Hanford and other places.

CH: In what capacity?

GH: As a consultant for GAO.

CH: Yes, yes. And what issues were you consulting for them on?

GH: There have been a number at Hanford. I reviewed their cleanup plans basically, the technical bases they expect to do the cleanup. I have also reviewed some of their proposals for reviving their nuclear activities. One was to convert one of the WPPSS plants to the production of tritium which is a weapons material. Another is the continuation of the operation of the FFTF which again is now considered to be a possible tritium producer. I think that prospect has gone away recently, however, because the government has decided to make its tritium at TVA, on one of the TVA reactors. So it's primarily reviewing their cleanup plans that I've been working with GAO people.

CH: And where does it stand right now?

GH: Right now they are still trying to move forward. It's a very difficult problem. I think the technology in all cases is not demonstrated for some of the cleanup that they may be expected to do. The most difficult problems I see are removing or dealing with,

but I believe removing and treating, the radioactive waste that is in the hundred and seventy-seven underground tanks down there and deciding what to do about contamination of the ground water that has taken place over the course of time and which presumably will continue to take place as more radioactive constituents move down into the aquifer below the site.

CH: And therefore drawing the water out which would draw the polluted water into the aquifer?

GH: The leaking radioisotopes will just seep down and join the aquifer and flow as the aquifer does over into the river.

CH: Do they know the true extent of that right now?

GH: They have a pretty good idea of it for some isotopes and have recently discovered that others are now entering that phase of contaminating the aquifer more than they had thought before. And it's hard to do much about it actually and try to keep it away from the river. I think they're trying to keep it away from the river. They're trying to, in the case of some contaminants, they are trying to draw the water up out of the ground to treat it and then put it back down. That's a long, long-term project in my view.

CH: Is it realistic that it can be done?

GH: I don't personally feel that it can be done. I don't think that the ultimate solution is to keep pumping there forever. And I don't see that pumping for a finite period of time is going to be adequate.

CH: And what is the status of the one hundred and seventy-seven tanks, the ground tanks?

GH: There are several phases there. The first phase was to find out what is in the

tanks. It's difficult because of all the mixing that has occurred over the course of time and chemical reactions that have taken place. And that's still in a very imperfect stage.

Then the next phase is to decide how to remove the waste from those tanks. The current plan is to emphasis injecting water and dissolving or making a slurry out of the tank contents that are not already liquid and pumping it out. And I think that's definitely what they're going to try with some of the first tanks which are mostly liquid anyway. But they are trying one of the so-called single shelled tanks where they will get better experience on how well this will work.

One of the problem with this is that many of these tanks are leaking, and so they have actually been drawing the water out of these tanks to prevent the leaking. But now the idea is of shooting water back into the tanks in order to get the waste out is kind of contrary to the idea of keeping the water out in order to reduce the amount of leakage. And don't believe that hasn't been solved. And I'm not sure if they very recently started to withdraw from one or more of those tanks. I guess they may - I'm not sure they've actually done it for any tank yet. And I'm not sure how firmly they've decided they know exactly what is in all those single shelled tanks. But they still have a lot of ambiguity about it.

CH: How is it possible that there wasn't documentation on what went into the tanks?

GH: They know overall what went into the tanks, because they know what they bought and put into the tanks. But they don't know because of the way the tanks were connected and liquid can flow from one to another. When one overflowed, the overflow would go into another, and so on. And furthermore, they're not sure of all the chemical reactions that may have taken place over the course of forty, fifty years. So that's the reason that you could take any particular tank and say, "What is in this tank?" They've had to try to determine that by taking core samples, but these tanks are typically, I mean they are seventy-five feet in diameter. And they may have anywhere tens of feet of waste in them which is not homogeneous, and they have limited numbers of places where they can open the tanks up and take a - send down a core, to take a core.

So taking a couple of cores under those circumstances doesn't give one a lot of

confidence that you know what is in the tank as a whole. And even to take those few cores has been a difficult problem. So they have tried to track where all of the waste has gone, from the place where it started, where did it go - but it hasn't worked out very well. They don't think they know it very well on that basis.

CH: I've heard that some of the tanks had even been boiling at some point.

GH: Yes. There have been boiling tanks, and there have also been what they call burping tanks.

[End of tape 2, side 1]

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Tape 2, Side 2

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GH: ...serious matter because of possibility of an explosion. That's what they are worried about. And the explosion could come about because of the fact that those burps contain all of the compounds necessary for an explosion in itself. That is, the oxidant that is required, a nitrogen oxide and hydrogen are present in the burps, so that if there is an initiating spark of some kind it could explode. For awhile they had that taken care of. They were mixing the stuff around and keeping it from burping and pumping off the gases that came off.

Now I understand that there has been some problem very recently. This is really one tank we're talking about primarily now that's caused this. They have other concerns about other organic compounds that might be inflammable or reactive, and for awhile they were worried about ferro cyanides which could have produced very large explosions, but I think they finally decided that those had all been decomposed over the course of time. So those are all factors that have really mitigated against an easy solution to the tank problem.

CH: So that the result of the - if they did have an explosion, what kind of an explosion would it be then?

GH: It depends on which kind one was talking about. I think the hydrogen nitrogen oxide explosions, I think were not so severe as to really blow the top of the tank out. But if the ferro cyanides had actually reacted and were present to the extent that it was thought they might possibly be, it could be quite a big explosion. It would blow the top of the tank out and release a lot of radioactive materials. I don't know what the organic concerns would be, but I think in any case there would be a fairly substantial release of some radioactive materials.

CH: Even on the other ones, wouldn't they - I mean if it had enough power to blow the top off it, wouldn't it also be releasing the gases or whatnot that were causing the top to blow off, to be released into the atmosphere? Wouldn't that be...

GH: Those gases would certainly be released, yes. They are not necessarily - yes, there would be a lot of radioactive release if the top of the tank blew off. There certainly would. But those most serious cases I think have been pretty well ruled out.

CH: The so-called green - was it called green runs or green...

GH: The green runs, yes.

CH: That was a release, too, wasn't it?

GH: Those were releases in the processing. They released a lot of iodine in particular, and there has been a concern for a long time that there would have been a particular thyroid disease as a result of the absorption of some of the iodine by children and by anybody, but especially the children.

CH: The tanks when they were originally built, how long were they meant to hold these materials?

GH: They weren't meant to hold them very long. I think there were two factors there. This is what I understand myself. We haven't done a GAO study on this particular aspect, but there were two factors involved. One, in the first place it was wartime, and there was - we were trying to beat the Germans to the atomic bomb. But it was felt that the ground under the tanks, in case they did leak, would have enough absorptive capacity to act as kind of ion exchange material to hold up the leaking radioactive materials. I think they were not able to get the - were not able to get, or decided on the basis of expediency not to use stainless steel for those tanks and used the carbon steel. And they were supposed to eventually disintegrate, and I think they had some plans to do

something about them after the war was over. But then we went into the Cold War, and things carried on, and so they never got things taken care of in an early stage.

CH: There's been a lot of talk over the years about whether Hanford might be used as a permanent storage facility. And now they're talking about, was it Yucca Mountain?

GH: Oh, the repository.

CH: For the repository, the national repository.

GH: I think the state fended that off. I remember that period when people I knew were saying they can't have this in the state of Washington, and were raising objections to it and successfully so. So that - I'm not sure how well characterized the basalts were - I mean there was some word that they were cracked, and it wouldn't be a good idea to use this kind of geological site. But I - anyway, there was enough pressure to abandon that possibility.

CH: Now the removal of the waste that you have been talking about thus far, what would happen to that waste, then?

GH: It would go to Yucca Mountain.

CH: Yes, so that would then leave the Hanford area. It's not that they would be taking it out of one kind of kind of tank and putting it into another?

GH: No, that's not the plan now. Probably there are a lot of people who would like to do that, but no, it's supposed to go into that underground repository down there in Nevada.

CH: How were they constructing that that would be different from the way they're

doing it now? What kind of tanks are they putting it into there?

GH: What they would be doing down at Hanford is they would be eventually embedding all the radioactive material in glass. Actually it's not embedding in the sense that there would be something inside the glass. It would be made into the glass, so there would be those glass logs that would be sent down to be put into that repository.

CH: At Yucca Mountain.

GH: At Yucca Mountain.

CH: And what is the life expectancy of that method of storage? Do they have any idea?

GH: They have a lot of different barriers there which last different amounts of time. I think the longest lasting is the matrix material, the ash. You know it's a kind of a tuff, t-u-f-f is the material. Eventually it is expected the glass will crack, the containers will corrode, and so it will come down to some number of hundreds or thousands of years to how well the basic geological character of the repository will hold it.

CH: And what is the half life of these materials?

CH: Most of them decay in a period where ten half lifes would, say, be three hundred years. Most of the activity at least for the Hanford wastes is in two isotopes, strontium 90 and cesium137, each of which has a half life of about thirty years. And so in three hundred years there would be a decline of two to the tenth power which is very big. Now there are some isotopes which last for a long time and that comes up in conversation. Idodine129 I believe is around seventeen million years. Technetium 99 is, as I recall, two hundred thousand years or something like that. And so there are some very long-lived - I don't remember technetium - I believe that's right, but anyway I'll check it if you send the written thing. There are some very long-lived ones, but the level of activity from

those is very low. So saying they're going to last for a million years is not really a good indication of the time that the waste is going to be really hazardous.

CH: So if you were doing policy recommendations for the power companies or the power councils and things like that, what would you recommend for them in terms of dealing with power issues, power needs in this greater Columbia River Basin?

GH: For future power growth?

CH Yes, for future power growth.

GH: I'm not opposed to nuclear power. I think it has advantages. I'm not terribly concerned myself about radioactive waste disposal. I realize that there is a big cost question, and no utility is going to build a nuclear power plant at the kind of costs that existed back in the early nineteen eighties. But I guess I don't think that will happen any more in this country, so I wouldn't be adverse to additional nuclear power plants. I think that to the extent that one can use resources like, in particular, wind. I think of wind as being the most reasonable really renewable one, other than hydro power...

CH: Or solar?

GH: Solar if you're willing to pay enough for your electricity. Solar, yes, I guess solar.

CH: [laughs] But is solar any less reliable than wind or...

GH: The sun goes down every day.