----------x

PRESIDENT'S COMMISSION ON THE

ACCIDENT AT THREE MILE ISLAND

----------x

DEPOSITION OF GPU SERVICE CORPORATION by ROBERT C. ARNOLD, held at the Three Mile Island Nuclear Power Plant, Harrisburg, Pennsylvania, on the 10th day of August 1979, commencing at 4:05 p.m., before Stephen McCrystal, Notary Public of the State of New York.

BENJAMIN REPORTING SERVICE
CERTIFIED SHORTHAND REPORTERS
FIVE BEEKMAN STREET
NEW YORK, NEW YORK 10038
[212] 374-1138

A P P E A R A N C E S :

METROPOLITAN EDISON COMPANY:

SHAW, PITTMAN, POTTS & TROWBRIDGE, ESQS.
Attorneys for Metropolitan Edison Company
1800 M Street NW
Washington, D.C.

BY: ALAN R. YUSPEH, ESQ.
of Counsel

PRESIDENT'S COMMISSION ON THREE MILE ISLAND:

WINTHROP ROCKWELL, ESQ.
Associate Chief Counsel

o0o

R O B E R T C. A R N O L D, having been first duly sworn by Mr. Rockwell, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. ROCKWELL:

Q Would you state your full name, please.

A Robert C. Arnold.

Q And your current employer?

A GPU Service Corporation.

Q Your current position with GPU Service Corporation?

A Vice president, responsible for the Generation Area. I am also a senior vice president of Metropolitan Edison Company. In the combined positions,

I am head of the Three Mile Island Generation Group which was formed about a week ago.

Q What is your current business address, Mr. Arnold?

A 260 Cherry Hill Road, Parsippany, New Jersey, zip code 07054.

Q Mr. Arnold, did vou participate in the company reorganization that was announced a week or ten days ago, and by "participate," I mean were you involved in the thinking that led to the restructuring?

A Yes, I was.

Q Can you tell me what process occurred that led to that restructuring, and as you tell me about it, perhaps you could tell me who the participants were in thinking it through?

A Well, let me give you a kind of a generalization on it initially.

The major discussions I was involved with as to the conceptual approach to be taken for the reorganization were with Herman Dieckamp. I did, in the course of developing my own thinking on it, have conversations at various times with most of the people within that organization who

report to me.

Q When you say "within that organization," would you be referring to GPUSC?

A And also Jack Herbein of Met Ed. So that I had conversations with Herbein, Wilson, Thorpe, Bachofer, Hirst. They were generally along the lines to share with them what my thinking was and get some reactions from them, but it was more in the nature of alerting them to what direction we were likely to be heading and involve them in the process that intimately -- I would say probably Herbein and Wilson had the opportunity to make most in the input.

Q Obviously there were reasons that led you and Mr. Dieckamp to begin to consider this restructuring and that led you in a certain direction as you restructured.

Could you enlighten me as to what it was that brought you to the point of beginning to think about it and what influenced your thinking in terms of the final structure that you reached?

A Well, Herman and I had been discussing for probably four to six months prior to the accident the need to consider how best to bring the technical

resources that we have within the service company and have had in the service company to bear on the support of the nuclear plant.

Q Of the nuclear plant as distinct from other plants?

A As distinct from fossil plants.

We particularly recognized with the construction at Forked River that the cumulative resources necessary for the four units would justify a greater in-house capability and greater in-house focus on the nuclear plants, so consequently a fair amount of thought had gone into it prior to the accident.

Q Let me ask you if your thoughts in that pre-accident thinking turned to the possibility of GPU developing the capability to serve as its own AE in future nuclear power plant construction?

A I think that the answer to that is no, but perhaps, again, in the way of background, I will move back to the middle of 1977 when I came into the position which I currently hold in the service company.

At the time that I came over to the service company from Metropolitan Edison Company,

part of the charge I was given in the new position was to build an in-house capability that would be able to take engineering effort from the conceptual problem resolution point to the definition of the engineering criteria of a fix, so to speak.

Q I lost a word. Of a fix?

A Fix. That is probably not a general enough term, the definition of the engineering criteria for the project would grow out of whatever issue is being considered.

We did not anticipate that we would be building another nuclear plant after Forked River within the time frame that we were forecasting plant additions, or at least until toward the end of that 20-year period.

Q You work on a 20-year future projection model?

A Yes.

Q And your projection was that the capacity of your various fossil and nuclear plants, including the capacity to be gained from Forked River, would take you close to the end of that 20-year period?

A No, there would be additional capacity

requirements.

Q But not nuclear?

A But within the first 15 years of that at least it was not anticipated that it would be nuclear additions.

We were working to incorporate a policy of balance between our coal and nuclear capacity. I really should say our balance between our coal and nuclear energy as opposed to capacity.

Q Let me stop you there for a moment. Why were you looking for a balance?

A It was our perception that as a mid-Atlantic utility we certainly should continue to utilize coal extensively. We did not feel that the economics of coal and nuclear were overwhelming in either direction, that they were close enough that for our particular territory, the most prudent approach to capacity planning was a balance between the two, and sort of minimize the risks to cost growth in either of them and to fuel supply considerations in either of them.

Q Now, you were tracing this kind of --

A In conjunction with that, while we were building -- in the course of building a much larger

in-house capability to support both new plants and operating plants, we did not envision that within the near term, we would be our own plant designers -- that is to say we did not anticipate that we would be doing the detail design work, 400 draftsmen and a direction at that kind of effort. The program we had underway at that time envisioned a series of replica coal units beyond Forked River.

So the incentive for having a large in-house design capability has contrasted with a large in-house engineering capability with minimum, the kind of minimum distribution of capability that would let our organization establish an engineering criteria and design criteria that a future plant would then have detailed design done outside, did involve some draftsmen and design capabilities, but not to the extent that would be necessary to appropriately consider ourselves having an in-house AE capability.

Q It would involve subsuming work traditionally performed by an AE at least to the extent of defining design criteria?

A Yes.

Q For instance GPUSC or its predecessor

function -- I can't remember the name that it was called -- did not set out design criteria for TMI 2, is that correct, that was laid out by Burns & Roe?

A Within our terminology, that is correct. The basic plant objectives, as it were, the size of the plant, what was expected in the type of plant, would be defined by GPU, and for the Three Mile Island Station it was really set forth by the operating companies, Met Ed and Jersey Central, and then the individual AEs developed what I call the base line engineering documents.

These involved system descriptions, flow diagrams, the establishment of the design criteria that would apply to the various systems and equipment.

What we had under way was to give ourselves the capability to develop those base line engineering documents which then could be utilized by a group of drafting and design people to design, to do the detail drawings, and an objective also included the ability to gather information from current operating plants and factor that in through the design of new stations.

Also it involved the service company's generation people and engineering fixes of problems in current plants.

We had under way, from December of 1977 up through the present, the building of this type of in-house capability.

Q Was part of the reason for this in-house capability the fact that you anticipated a series of replica coal plants, and you felt that having the capacity to get out the design criteria would be helpful in that regard simply because you were returning to a series of plants that were substantially similar?

A Well, I don't know that I would correlate them quite that way. I think the incentives for developing the in-house engineering capability which gave us, in effect, more in-house resources to bear on our own destiny reflects some of the problems that have existed within the industry in the fossil plants and in the nuclear plants with regard to availability, cost schedule of projects, similar types of elements of major construction projects, and the concept of replication and staying with a replicated design for a

series of plants grows out of that same set of incentives or that same set of pressures, so they were complimentary, but one wasn't the cause of the other or the root of the other.

Q The answer you just gave got into the question of addressing some of the problems with respect to design and some other areas, and I am not sure I really followed what your point was.

You said that the development of your own in-house capability enabled you to deal with some problems or you said were like that in the industry or some issues in the industry, and can you elaborate on that?

A In looking at both the nuclear plants and fossil plants, characteristics one sees are cost escalation through the project schedule extension, which is closely tied to cost escalation in the fossil plants.

If you will look at the nuclear industry in general, the nuclear plants have considerably less performance experience or lower performance experience than desired.

Q On whose part?

A The product, the availibity capacity factors,

the operating experience of the plants were less than what we had desired and expected.

I think the development of more and more stringent regulatory requirements, environmental ones that applied to all power plants, nuclear and fossil, and regulatory requirements that were part of the Nuclear Regulatory Commission's predecessor, AEC, all tend to require substantial technical resources to try to address those kinds of problems.

Within the GPU system, the fraction of our investment for total plant investment that was tied up in power plants grew dramatically in the late 1960's and 1970's, and the appropriateness of allocating more of our personnel, particularly our technical and managerial resources, to that area was quite evident, I think, in upper management.

Q So with reference to these areas which you just mentioned, cost escalation, the related item of schedule delays or extensions, the question of plant availability once the plant is built and on-line and compliance with various regulatory requirements, it was your judgement

that building your own engineering organization would enable you to get a better handle, better management control over these kinds of areas?

A Yes.

Q And I take it what you are looking at as you built or planned to build the GPUSC Engineering Organization was primarily a capacity to operate the nuclear plants since you only were projecting one construction of that nuclear plant in the forthcoming 15 years, namely Forked River, and the capacity to build a series of coal fired plants, and to operate them as well.

Is that a fair --

A Yes, it was directed at both the fossil effort and the nuclear effort, and while we only had one more coming on-line of nuclear capacity, that was a very large dollar investment. It was still a six or seven-year effort to be completed, and I think itis probably fair to say that our manning organization planning looked into the three to five-year time frame principally recognizing that after that it is somewhat speculative as to what we might be doing.

The effort was to attempt to build

up expeditiously but deliberately the kind of in-house capability that the company could continue to build on as circumstances subsequently were justified.

Q What prompted your decision at the time you became or at the time you moved over to GPUSC to move in this direction? You have given me some relatively specific issues, and to your knowledge, was it simply an awareness of problems in those areas that got perhaps Mr. Dieckamp or pthers in the organization thinking along these lines and ultimately headed in the direction of creating a stronger or deeper engineering organization?

A I think that is my perception of the circumstances under which my charter grew.

In the years prior to 1977, as we gained experience on TMI Unit 1, Unit 2 was finishing up construction, and we were looking at the restart of Forked River, Mr. Dieckamp and Mr. Kuhns thought the time was appropriate to move in this direction.

At the time I went into the job, these were objectives and directions which Mr. Dieckamp was looking for us to proceed with, were pretty well

laid out for me.

Q Was your assumption of that job coincident with the basic decision to move in that direction so in a sense you were brought in to implement, in part, a decision to move in that direction?

A I think it might be a little bit chancey to read that into it. The person left the position that I went into and went to the president of Pennsylvania Electric Company as a result of the normal retirement of the president prior to that time of the company. So I think it was more a coincidence -- I think it is more likely that it was a coincidence than any deliberate moves that were made on the part of senior management of the company to put me in a place specifically because they wanted to start that effort.

Q Do I recall correctly that you moved into that job in June of 1977?

A Yes.

Q Was it Mr. Dieckamp that briefed vou or gave you your charge?

A Yes.

Q Anyone else?

A Well, within the first few months of being in the position there were various opportunities that I had talked to both Mr. Dieckamp and Mr. Kuhns about what I was doing, how I was going about trying to accomplish it.

We also had under way within that same time period and with which spanned the time when I moved from Met Ed to the service company, a management audit by Booz, Allen & Hamilton.

The Booz, Allen audit report recommended the type of structure, the type of staffing efforts that we had under way, so I think if one were to look at the documentation, it would certainly be clear that those same thoughts were set forth rather strongly in the Booz, Allen, Hamilton audit report.

My recollection is that my first conversations with Dieckamp were early in March of 1977 concerning going into the position. That was probably about the time that Booz, Allen, Hamilton commenced their audit, perhaps, and they actually started the audit, so there was a coincidence of their audit and our development of our specific thoughts on it.

Q Were the conclusions in the Booz, Allen, Hamilton audit grounded in part on engineering thinking in the sense that there should be specifically an expansion of the Engineering Organization to address the issues which you already told me about, cost escalation, schedule extension, plant availability?

A Their recommendations were directed at those objectives. I don't recall that in the audit report they identified staffing levels or resource quantities that would be necessary to fulfill those objectives.

Q But they did apparently --

A They were specific as to the direction they thought we should be moving in terms of the type of organization we should be building, the kind of capability we should have internally.

Q Was there a recommendation to GPU that benefits could accrue to the company by expanding the capacity in this area and using internal management to deal with the kind of problems that you told me about?

A Yes.

Q Did Booz, Allen, Hamilton have engineers

involved in that audit or were they primarily management experts?

A My understanding of the background of two or three of the fellows that were involved in the audit of my area, the Generation Area in general throughout the four companies, was that they had technical backgrounds.

Q At the time you took over the job at GPUSC, did anyone suggest to you that you should look at other utility organizations in particular as models for what had been set out for you to accomplish?

A Herman and I discussed the organization that existed at Duke Power, Baltimore Gas & Electric, and I think Commonwealth Edison.

Q Is that Boston Commonwealth Edison?

A No, Chicago.

I had, within the previous six months, spent a day at Baltimore Gas & Electric along with John Miller, a former vice president of the service company and of Metropolitan Edison.

Q Is that the same as J.G. Miller?

A That is the same as J.G. Miller -- in which we talked with the management people at Baltimore

Gas & Electric as to how they were organized.

I was generally familiar with the organization of Duke Power, Commonwealth, Philadelphia Electric, Public Service & Gas, so there was some discussion as to the specifics of organizations of other companies.

During the course of the audit with Booz & Hamilton, the discussions that were associated with review of their recommendations and review of their findings, we, I think, were very interested and spent a fair amount of time in reviewing with them their perception of how other companies organize similar types of activities, the pros and cons of different ways of structuring it.

Q Had Booz & Allen done any management audits of other utilities?

A My understanding was they had done similar type audits as well as the fellows that were involved with our area. The fellows that were involved in the generation audit had participated in various generation directed activities at other companies, not necessarily as part of an overall company-wide audit, but specifically

the maintenance activities, project costs, and schedules on major projects, similar types of more directed audit activities.

Q Did you find any particular aspects of Duke or Baltimore or Commonwealth Edison to be instructive in what you were setting out to accomplish beginning in June of 1977, instructive, obviously, in a useful, helpful sense?

A I think the way we were structuring our organization was basically common to theirs. I guess it would be hard for me to separate out the extent to which my thinking was influenced in earlier stages of consideration of these issues with my knowledge of how they did things from kind of a more after the fact modeling after them, as it were.

I think that I looked more where they might have significant differences in their organizational approach from what we were doing and whether or not those differences could be rationalized in terms of differences in the corporate structure, differences in our traditions, differences as to whether we had unionized employees or non-unionized employees.

I think the fact that we were a four-company system led to some specific, in a sense, accommodations -- and perhaps that is not a good word -- but led to certain peculiarities to our organization that would not be necessary in a company like Duke.

Q What do you mean by that?

A In regard to the Metropolitan Edison Company, as an example, Metropolitan Edison was responsible for the operation of Three Mile Island. The service company was not.

So that the way in which we were looked to interfacing with Metropolitan Edison Company in support of Three Mile Island's activities, would obviously be different than within Duke Power.

Q How would Duke be different?

A Within Duke Power, at some place within that company below the chief executive level, responsibility for engineering and design would be common with responsibility for operations whereas in the GPU system that doesn't be ome common the way we were structured before the accident until it got to Herman Dieckamp.

Q Did that question of common responsi-

bility for design, construction, perhaps start up on the one hand and operation on the other hand, and did that topic come up as a topic of discussion between you and Mr. Dieckamp when you were talking about taking over the job as vice president of GPUSC in the spring of 1977?

A To the best of my recollection, our conversations at that time were couched in terms that that separation would exist.

Q Was it a given?

A At that point in time it was certainly a given. We had to first build up the in-house engineering resources, I think, before we would want to consider even discussing whether any change in the organizational structure between the companies would have been appropriate.

Q You mentioned in your answer a moment ago that the fact that GPU is essentially a four-company system led to certain results, in essence, as that organizational structure.

In reviewing your statement to the NRC, I note that the chief executive officer of GPU is the chief executive officer of all five companies; is that correct?

A Yes.

Q So that there is at least at that level highly centralized management control flowing essentially from the chairman of the board of GPU?

A That would certainly be my interpretation of it, yes.

Q One of the questions I have had in my mind as I have gone through and listened to a variety of people in the last couple of months is why the engineering and construction function was separate from the operation function within GPU and GPU Service and the operating utilities.

Was there a specific reason for that, to your understanding?

A Well, I think that you know, in understanding the structure on a snapshot fashion, as it were, which I think is what you are looking at, where we were at a given point in time, it is necessary to put that in context of historical development.

Prior to 1967, approximately, the individual operating companies were solely responsible for design and construction of new generating facilities. The planning for new

facilities was coordinated on a GPU basis, but once the plant was planned for a particular company, then that company was responsible for that project, and obviously it was responsible for its operation.

It predates my experience with GPU, so what I am telling you is hearsay, but I guess it is still worth sharing, recognizing the falibility of it.

(continued on the next page.)

SM 2-1 1c

In the 1967-1968 time frame, the Nuclear Power Activities Group was formed. It was headed up by Lou Roddis, who, prior to that assignment, was president of Pennsylvania Electric Company. The Nuclear Power Activities Group was formed, to my understanding, to centralize the technical resources necessary to provide management and oversight on the design and construction of nuclear facilities. That was the initial incentive for forming that group, or perhaps I should say that was the initial charter for that group.

I would expect that it was anticipated from its initial stages that it would continue to evolve, grow and develop into a larger charter than that, but initially it was relatively restricted in scope.

The GPU Service Corporation was incorporated, as I recall, in May of 1971, and so I see the charge I was given when I went over in June of 1977 as just sort of a continuation of that same process that started in the 1967-1968 time frame, to continue to build in-house capabilities within GPU as the investment or fortunes of the company changed with time.

I didn't see that as something that kind of developed out of a sudden change in the perception

of what was needed. We had, I think, for a few years prior to June of 1977, been in the stage of consolidation and solidification of what we had within the Service Corporation and were at the point where it was appropriate to take the next step.

I kind of lost track of just exactly what your initial question was.

Q Let me pick it out.

I think you were addressing the general question as to whether there were particular reasons for a separation between operation on the one hand and design and construction on the other.

A Well, if we look at that time period from 1967 to 1977, we had a number of major construction projects under way, and I think the new company, as it were -- I won't exactly call it a "fledgling" organization, but clearly an organization that was still building its capability, getting itself settled in place, had about all it could handle to properly manage the several major construction projects that were under way.

So I see the division at that time between responsibility for operation and design and construction as being a matter of what was the appropriate

way to focus those resources that we had available to us in light of the challenges we had and that any merging of them required at least demanding a set of circumstances on the design and construction side and also required a larger in-house engineering capability before that merger would really add anything to the process of managing both design, construction, and operation.

Perhaps saying it a little bit differently, if we are going to go to that type of reorganization, there obviously has to be some net benefit in terms of the resources necessary to bring to bear on the operating plants. I really think until Three Mile Island Unit 2 was in service and we had that behind us, Homer City 3 was in service and behind us, and we had gained some of the additional staff that we were bringing into place, that the service company wasn't in a position to provide more support for the operating plant than it had been upon call from the operating companies.

Let me perhaps even elaborate a little more in terms of the question. It is one that frequently gets raised in various contexts.

Part of my charter in the Service Corporation

did relate to the operating plants. I effectively had what would typically be called corporate staff responsibility for operating plants; that is, I was responsible for policy development, coordination of common efforts, review of the way in which the operation and maintenance of existing plants was being executed not with a line responsibility but with a staff responsibility, not with a line function but with a staff function.

So even though I did not have, within the service company, responsiblity for direction of those plants, I clearly had responsibility for the way in which they were operating and for ensuring that Herman Dieckamp had the benefit of the observations and opinions that I would form as to how the operating companies were carrying out their line responsibilities.

Q Do I accurately understand that, for instance, in the spring of 1977, to take that simply as a reference point, you would have had to take engineering -- as an example, you would have an engineering staff associated with a particular unit such as Unit 2 -- or let's take Unit 1 because it is an operating unit -- would that be correct?

A Well, in the spring of 1977, I was vice-president,

Met Ed, and at that time we had an engineering staff both at the site on Unit 1, and we had, in Reading, a corporate engineering staff.

Q I am trying to take them one at a time. You would have an engineering staff associated with a particular operating group, associated with, say, Unit 1?

A Yes.

Q And then you would have another level of engineering staff in Reading at Metropolitan Edison?

A Yes.

Q And then a third level of engineering expertise at GPU?

A Yes.

Q In the GPU Service Corporation?

A Yes.

Q And I take it that in various kinds of situations, engineering talent at various of those levels would be called upon to do certain kinds of job, for instance, GPU Service engineering might be called in to address certain kinds of problems with respect to Unit 1?

A Yes.

Q To the extent that the problem is

appropriate for the task that had been set out for GPU Service?

A Yes. I think the tasking of GPU Service Company engineers in that time frame sort of worked in the other direction from what I understood you to be saying.

Q In what sense?

A Let me perhaps back away from the question a little bit and talk about the approach that I tried to take in Met Ed with the staffing of Three Mile Island and the corporate office.

I felt that the plant staff ought to have sufficient engineering capability to provide the day-to-day engineering resources needed on plant problems; they ought to have also locally at the site the engineering resources necessary to evaluate the plant and activities related to the plant for identification of those items which need additional assistance, need off-site support.

Q In other words, they should be diagnosticians to understand when they need more help?

A Yes. That was, to my mind, clearly one of the objectives that had to be fulfilled by the site level staffing. That was their sole purpose, clearly.

Within the Reading group, we had to have

sufficient engineering capability to provide the independent review and audit functions that are required to manage technical efforts for which outside resources would be needed and to provide company capability for engineering effort that was broader in scope or larger in -- larger from a time standpoint-- than what I would associate with day-to-day support of the plant site.

So, for example, we ought to have within the corporate staff some capability to do the engineering associated with, say, an in-service inspection program that is principally related to the outage periods.

When one looks at the mix of capabilities, that is, the spectrum of technologies you have to have within the company to fulfill those objectives, it results in kind of a core group, as it were, that usually has a capability that goes beyond that minimum objective list.

But that was generally the way I felt that scope or the extent of in-house technical capabilities should be built within the operating company. It is difficult to be precise where the interfaces between site level fellows and corporate ones were, but conceptually in my mind, it should be related to whether

the support requirements, whether they be day-to-day activities at the site and interfacing back with the Service Corporation. I would request assistance from the Service Corporation any time we were faced with problems which I either thought the service company should be aware of those kinds of problems because of considerations of future designs, design of future plants, or if they had additional specialized expertise that we would not have within Met Ed, then I would request assistance on it.

In general, their work load resource match was such that I didn't request engineering help from them to take care of just a peak engineering work load requirement. I would generally go to an AE for that type of assistance or to a consulting firm for that type of assistance. I didn't generally use the service company people to manage a particular engineering effort for Met Ed in a sense. If it was going to be an outside organization, we had the Met Ed people manage that directly, though of course there were exceptions to that. But that was the first approximation. That is the way we approached it.

Q Since you had all of these organizations in place, you essentially had an operational organization

within the operating company, such as Met Ed, and since you had organizations in place in the Service Corporation, why not simply merge them into a single entity which designs, builds, starts and operates plants? You already had compartmentalized structures to do all of those things. Why not move them into one organization so the people are not having to work across organizational lines?

A I think there are two considerations. Maybe I will preface it with saying that because we were not there at this point in time doesn't mean that we didn't think it made any sense to do under any conditions.

Q Just as a foundation here, am I correct that you had been looking at the possibility of doing that down the road?

A Yes, we had, within six months prior to the accident.

Q But why not have done it sooner?

A I think there are probably two and perhaps three considerations that did not make it feasible to do it as of the end of 1978, say, or early 1979.

First was the geographical dispersion. The resources generally need to be located close to the

2.10

plants. Geography makes a difference, so what we would be talking about principally in the type of structure you are asking about would really be what are the reporting relationships within the four companies and not where are the resources located.

Q Precisely.

A That did not seem at this point in time, to me at least, to offer any substantive benefit over what we currently had. In other words, the resources that were available within the service company to be applied to the operation of the existing plants were still available. We had mechanisms set up whereby those resources would be automatically -- or in a sense, the use of those resources or consideration for use of those resources was sort of institutionalized in it, and the interrelationships were developing.

We were developing, since the middle of 1977, additional common procedures, common policies that were taking us in the direction of greater coordination of those activities across the four companies, and I clearly had responsibility for developing the momentum of that direction. Whether the three operating companies and service company Generation Divisions reported to a common person below Bill Kuhns

2.11

or Herman Dieckamp, I don't think is nearly as much the issue as whether their resources are available, are being applied in optimum ways, and I think the ability existed to develop that kind of interplay as a result of the best interests of line management being served by moving in that direction.

In other words, for example, to mandate that Met Ed Three Mile Island didn't do certain things without coming through me that I had responsiblity for, that only was of assistance to the extent that I could add something to the management of that facility, and that meant, in my mind at least, that I would have been able to bring more, apply more resources than were already being applied to Three Mile Island.

I think the resources available within the service company for support of Three Mile Island were being applied through the relationship that Jack Herbein and I had and the people who reported to Jack and the people who reported to me and the understanding that both had for some commonness of responsibility as well as some community of interest led to the use of the resources within the service company in the support of Three Mile Island as we

2.12

desire.

Q Let's take an example. You are talking about obviously a level of communication at the vice-presidential level, you as vice-president of GPUSC, working with Jack Herbein as vice-president of Met Ed, to some extent.

A Yes, that has cearly got to be an element; it is not a sufficient element.

Q I just want to try to focus on a particular issue as a way to try to eliminate what we are talking about.

In GPU, you would have an engineering organization which would have, in a sense, a chief engineer, whatever his title is; would that be correct?

A I guess, depending how you want to characterize that. Dick Wilson, who was my director of Technical Functions, was my chief engineer.

Q But you basically had someone heading up the enginering function?

A Yes.

Q And you had also someone heading up the engineering function within Met Ed.

A Yes.

Q My question goes, by way of this example,

2.13

to whether you are not likely to have more information flow, more integration of experience, knowledge, if you had with all of the areas, engineering organizations you had available, site engineering, Reading engineering under Metropolitan Edison, and GPU engineering, one persion who is essentially head of engineering who is going to look down through those various organizations and is going to integrate the knowledge, the work and the effort going on within those organizations, and by way of analogy, what other lines of organizational structure may exist parallel to engineering, such as maintenance, administration, licensing, various other kinds of standard functions that you see represented?

A Well, while that description on the surface is persuasive or appealing, I don't think it is all that obvious that structuring an organization in that manner automatically achieves the results that are implied by describing it that way. I think the results still rest predominantly on the communications and interrelationships that are established by the kind of administrative processes that are put into place to provide the communications, the attitudes of the people in the organization as to what it is

2.14

the total organization is attempting to achieve, and I think that all of those things can be put into place and to a great degree were in place without there being hard lines on an organization chart from Jack Herbein's chief engineer, as it were, to my chief engineer.

See, I don't think the dynamics of the organization are that peculiar to how it is shown on the organization chart.

Q I don't mean to suggest by my question that relationships can't be established and maintained on an ad hoc basis, which is essentially, I think, what you are describing: people who work together when they want to.

A No, I am not. In fact, that is the point I am trying to make; the interrelationship between the service company and Met Ed was established by policy to be that the things happening at Three Mile Island, for example, the problems that existed there were to be communicated and known to the service company, and they were to participate in appropriate ways in the resolution of those problems, so that it is not dependent upon a constructive attitude on the part of the Met Ed people to have that interplay take place.

2.15 Jack Herbein didn't have to report to me in order for him to have responsibility for ensuring his engineering people's activities were known to my people in the areas that were important to my scope of responsibility and the objectives of the corporation.

If my chief engineer did not have additional resources to bring to bear on Three Mile Island's problems, having a line responsibility from Jack's chief engineer to mine doesn't automatically gain us anything. In fact, it is difficult for me to see where it will lead to any net gain.

The participation of our service company engineering staff in Three Mile Island problems was substantial. It was substantial, I think, through the policy and through the administrative controls that were put in place within the two companies.

One of my groups, a collection of two departments in this case, which was headed up by John Bachofer, was responsible for generation operations, and he was specifically tasked with helping to develop and monitor that exchange of information and that interaction between the operating company experience and the service company, and his exposure to what was going on in the operating companies was

2.16

not limited just to what the Engineering Department was doing but involved what the Operations and Maintenance elements of those organizations were doing.

I think that we, to the extent we had the resources available, they were brought to bear very effectively in Three Mile Island problems.

Q Let's take another example. Suppose an engineer at GPUSC's engineering group sees something happening in terms of site engineering that he feels is inappropriate, that corrective action is to be taken. What route does that engineer take in terms of raising that kind of question as an issue?

A There are a number of possibilities, and it would depend to some extent on what the nature of the problem is. Let's take something that is a safety issue.

Q Why don't we take a specific issue because I think it would help to focus in on a specific item of issue. This issue now I am referring to was marked as Ross Deposition Exhibit 119, an issue which arose in 1977, and I will give you a chance to look at it in a minute.

Let me just for the record identify what we are talking about.

2.17

It is a memorandum dated November 14, 1977, relating to an incident that occurred on October 19, 1977, in the condensate polishing system which resulted in a closure of the discharge valves on the condensate polishers, leading to a loss of condensate and subsequent loss of feed, that led to a GPU startup problem at PORC which was bucked up to Mr. Toole.

If you haven't seen that before, why don't you take a moment to review it because it might be a useful starting point for discussion.

A Let me start off by saying this is an example of -- let me be more direct. This is not a good example of the type of situation or the type of problem within the organizational structure that we have been talking about.

Q Tell me why not.

A This is a problem that was identified as a construction project problem that was directed toward the interaction between the operating staff and the project staff, and that is a completely different circuit, as it were, than what we were talking about before, which I, at least, understood to be problems on an operating plant and how we ensure that that gets the proper review or interplay with the resources

2.18

within the engineering capability of the Service Corporation.

So this is a different context than your previous conversation, but I would be glad to go ahead and talk about this one if that is interesting to you.

Q Let me explore your point. We are dealing, though, with people from different organizations. Maybe I am mistaken, but Mr. Toole was with GPU, or at least the GPU Startup Group.

A Yes. Mr. Toole was the Startup and Test superintendent at the site, and he was at this time within my division.

Q Is it your feeling that because he was here at the site, it presents a different structural or organizational setting?

A No.

Q I am not quite clear then, I guess, as to the distinction you are making.

A Let's suppose this problem came up after Unit 2 was in operation.

Q All right.

A In that case, this problem would have gone, depending upon the evaluation at the site level -- and here I am assuming the problem is identified by

2.19

a Met Ed staff engineer -- they would have either taken the action that they felt was appropriate for the condition, or they would have passed it on to the Reading group for assistance.

Let us take a little time and talk about the various alternatives of the process.

Q Sure. That is what I want to do.

A If the plant level engineer identified this as requiring a design change to the plant, it would have to be done in accordance with the design control procedures that exist within Metropolitan Edison Company. That would have, as a minimum, required Herbein's chief engineer to review whatever design changes were accomplished. It would involve that as a minimum only if the total design change can be accomplished with the resources at the plant site.

If the change was of sufficient magnitude as to require resource expenditures in excess of $100,000, it would have had to have been reviewed and approved by myself.

If it went off-site, if the site people felt they needed assistance from off-site in deciding on a solution to the problem, it would have gone to Herbein's chief engineer for resolution. Depending

on the nature of the problem and how they saw it, they may or may not bring that to the attention of my Engineering Department.

If it was a basic design shortcoming, as is suggested in the memorandum might be the case, then our procedures require them to report the problem and what they intend to do about it to my engineering people.

So that the system is in place that would have required us to be aware of that, even if it didn't involve a substantial expenditure, such that I would be involved in approving the resource expenditure.

This event actually occurred on Unit 2 while it was still under construction. That meant that the design of the plant was the responsibility of the project organization. When the operating company had a question or problem with the way that the plant design turns out to be in place, whether from experience or review of drawings or for whatever, reason, there are several mechanisms set up for them to raise that issue with the project. A problem report is one of those mechanisms.

Ron Toole is, in effect, an extension of my engineering capabilities, the engineering resources

within the service company. He can, with one of these problem reports, either send it on to other engineering people for review and recommendation for disposition, or he can respond to it as his judgment and experience would indicate is appropriate.

When he sends it on, he might either send it to my Engineering Department, to an actual engineer, or he might send it to the architect-engineer, Burns & Roe. He has available to him either of those two rotes, and has guidance as to when he should take it to one group or the other. His alternatives include either asking for their advice and consent or advice and assistance in resolution, and it also includes proposing an engineering change to solve the problem, a change which, as he sees it, is an appropriate one to make.

That, then, is subject to further review by the architect-engineer or the project management people for approval to expend the resources, let's say, to accomplish the change.

So there is a spectrum of responses that are available to him, and he is tasked with pursuing the appropriate responses.

If he does, as in this case, in effect turn

down a problem report as not being a problem from a design-of-plant standpoint, then the operating company's staff have the ability to, in effect, appeal that decision at a variety of levels across the parallel organizations, in effect, the project organization and the operating company organization.

There are instances where this would come up to between Jack and I where the staff was not satisfied, where his staff was not satisfied with the project response, and if Jack and I couldn't resolve it, it could go on up to the president, and if necessary, Herman Dieckamp would solve it. I don't recall any instances where that was necessary, but I think I can probably recall instances where I was in Jack's position that resolution of those types of problems escalated to where I talked with my predecessor, i.e., the operating company VP, did in fact appeal it to the service company VP and reach resolution, and since I have been over in the service company, I know there have been instances, and I can probably recall the specifics if I need to, where it was escalated to where Jack and I settled it between us. So this response on a particular problem report was not a unilateral one on the part of the project group that

was not subject to external appeal, as it were.

So I don't know if you want to talk about this specific one as far as why it got handled the way it did, but in terms of an example of how design problems could be both surfaced and resolved, that is kind of a brief discussion of it.

It seems to me that one of the strengths of the organization we have at this point is that a problem like this can be brought to a fairly high level of management attention, the officer level, before it runs into a single person. If all engineering, for example, were under my chief engineer, it could make it much more difficult for this type of review and appeal process, as it were, and when I was in Met Ed and in the service company, I have encouraged my organizations to utilize the ability for the cross-communications to assist the organization in surfacing those problems that perhaps in a single organization structure may not get up the line as high.

There are, I think, fairly definitive advantages associated with the way we are currently organized. There are clearly some disadvantages. And the management and technical capabilities have developed and grown as discussed earlier. We have looked at whether

we should move toward more centralization of management of the generating facilities.

Q In part, I take it what you are saying is that inter-organizational conflict -- that may be too strong a term --

A No, I think that is probably quite legitimate. It existed in single companies as well as between the design and construction people and operating people.

Q You are saying that kind of organization helps to surface problems because they would be pursued up one organization or across organizational lines?

A Yes.

(Continued on Page 48.)

Q In a sense, that logic could be extended to have a multiplicity of recourse through multiple organizations?

A If that was one of the objectives, but obviously it has a number of objectives.

Q Let me pursue this for a moment. You have on the one hand the design experience, the experience of having reviewed the initial design and having at least participated initially to some extent developing design criteria developed within the architect-engineer, particularly GPUSC vis-a-vis design and construction of the plant; is that basically accurate, that expertise lies primarily within GPUSC?

A Yes.

Q And on the other hand, you have an engineering organization in Met Ed not primarily involved in that, and yet obviously being responsible for operation of the plant on a day-to-day basis; is that correct?

A Probably not as your statement of it would imply, to me at least. I think there are two aspects of it that are part of the prospective on the issue of operating company awareness, of design awareness

and input in design.

One is that the people that are utilized in the operating company and in the service company are interchanged to varying degrees, but fairly substantially, myself being one example. I came from the operating company to the service company.

Q How about in the other direction?

A We have a number of people on the Three Mile Island staff that came over from the service company. Dick Klingaman, the chief engineer for Jack Herbein, was a senior engineer on the project staff for Three Mile Island in the 1969 to 1971 time frame. He was on the Met Ed payroll at that time because there was not a service company in being yet, but he was part of the Nuclear Power Activities Group organizational structure. He was here as superintendent on Unit 2 -- no, I guess he was assistant superintendent for station, and he was station superintendent before he came to the Reading Engineering Department.

So that in a sense is the type of movement we are talking about.

There is not large movement from the service company to the operating company because the service company is the one that has been growing, in a sense,

but Gary Miller, for example, prior to being station manager at Three Mile Island and Unit 2 superintendent, prior to that he was Startup and Test superintendent for Unit 1. He was Ron Toole's predecessor, so he was service company over to the operating company.

The other thing that I guess bears on that is that the operating company was responsible for writing all of the operating procedures, the emergency procedures, maintenance procedures, and of course training the st So they developed, as the plant was being designed, detailed knowledge of the plant design and had an opportunity at that point in the project development to provide input into the project organization to modify the design.

These problem reports are one of the mechanisms they had for doing that. So there was a substantial opportunity for operator input in the plant design.

Having said that though, let me go on to say that it was our feeling within GPU that the input was neither structured sufficiently nor was it as timely as we wanted it.

Q It starts quite late in the game in the sense that the fundamental design has already been

put in place by the time the process of writing instructions begins. Would that be a fair statement, the instruction drafting, as I understand it, doesn't really start until 1975. By that time an awful lot of the design has been reduced to either put-in-place through construction or been finalized. Obviously there is a possibility of changing it but you are dealing with a question of changing rather than input into the original design.

A I think that is correct. Let me perhaps talk about the Forked River Project and the way we are moving there because I think it is indicative of what we saw as the areas in which we could improve on the design of plants.

It was, first of all, our feeling that all the architect-engineers did not go far enough in developing the details of the design criteria at the front of the plant design effort.

Q You are talking about Forked River now?

A Well, I think this is a general observation we had about the design process which led us to certain things at Forked River.

Q All right.

A And obviously Three Mile Island was part of our

experience prior to Forked River.

While we were not able to, as early as I would have liked to with regard to Forked River, because Forked River also started a number of years ago -- the design effort on Forked River probably started about the 1972-1973 time frame when we shut the project down in 1974, and we were restarting in 1977, early 1977. But during the first year to a year and a half that I was in the service company position, we developed, in effect, the specifications that the design criteria for what I will call the base line engineering documents were to fulfill, and it involved, in our opinion at least, a more detailed description of what the plant systems and plant equipment were to fulfill in the way of engineering and design criteria ahead of starting detailed design, and in doing that for all the plant systems or at least all the major plant systems ahead of starting into the detail design of any one of them.

The concept also involved operating company interaction on that by their review of the design documents or the design criteria, I should say, and sign-off on those prior to starting into detail

design effort.

So we felt there was more to be gained through greater operator input from the operators in the design process and we were structuring future plant designs to provide for that.

We also provided on the project staff for Forked River an experienced person from Jersey Central who participated in the ongoing design effort and who provided much of the interface between the Jersey Central staff and the project staff to expedite the input of operating company comments and track the resolution of operating company comments within project organization.

So I think the process of designing and constructing a major power plant has to be viewed as a changing situation. One goes back to the mid-1960s, early 1960s the complexity of the plant was not nearly as great as it is today even for the fossil plants. The effort was a three, three and a half year kind of effort from the time one decided they were going to build a power plant until they had it operating, perhaps four years at most. The problems we are faced with in constructing a nuclear power plant or a modern coal-fired plant

are a completely different set of problems, the complexity of design is much greater, the margins available within the design are much less, and consequently the technical reasons have to be brought to bear on that, and I think as one looks at the way in which GPU was evolving in that last 10 to 15-year period, one can see an ongoing and measured response to those changing set of circumstances to put into place resources necessary to cope with those problems.

We clearly were not the size of the system of a a Duke power so that in look'ng at where we were were in that process compared with some of the larger companies, we didn't have the same in-house base from which to start for good reasons.

Q Let's come back to Exhibit 119 which I have referred you to before, how does the expertise which is developed in the course of creating the base line engineering documents as you have described them, or the design criteria and the expertise which accrues from the ongoing review process during construction of various design elements get factored into review of this kind of problem as reflected in Exhibit 119 which may or may

not -- obviously I am not an engineer -- which may or may not be a fundamental design problem with respect to the operation of a particular system? You have that fundamental design expertise residing in one organization, you have the problem identified in another organization, and I guess the question I have is how does that design expertise come to bear on the evaluation of a report such as this which may have been a fairly significant report in light of the events of Three Mile Island 2 on the 28th of March?

A First of all, let me say that I think that the problem wasn't identified to the designer or to the organization that had the most significant design expertise, it was identified back into the service company. It was flagged by operating people but it was flagged to the service company which is where the larger resources resided.

I think you have to recognize the difference between what the problem report addresses and what this memorandum addresses in total.

Q Yes, there is a distinction. There is not a complete review in the summary of the problem on the first page of all of the elements of the

underlying memorandum.

A That is correct.

What the operators flagged to the project was specifically Item 4 in the memorandum and at this point I don't have any basis for questioning Ron Toole's response to Item 4 which was in the problem report.

For the other items that were in the memorandum, the plant operating people took the action that they felt appropriate and in light of the information that was provided here, I don't think I would question what they were doing either.

If the additional operational and maintenance measures they took in response to the other eight of the nine items resulted in continuing or identification of continuing problems with moisture in the instrument air system, then I would presume that the problem would be pursued further.

Q Let's assume -- and we have data which supports this assumption, although it is not complete -- that none of the other items were followed up.

I come back again to the question of how you take the design expertise which you have in the GPU Service Corporation and plug it in at the beginning

of the process for identification or review to determine whether or not the problem that is identified requires a follow-up review with the original designers of the system, i.e., Burns & Roe and Los Angeles Water Supply Company which was, in part, the supplier of that system?

A Let's try it again because I think you have kind of swapped the point that you are pursuing, at least from my perception of it.

Perhaps you could ask your question again or we could read it out of the record.

Q Let me try to restate it.

This obviously serves only as an example, and by "this," I mean again Exhibit 119, but you have a problem that is identified in considerable detail in the three-page memorandum that is part of the exhibit.

Obviously the organizational issue or problem that this organization or any organization has is to get that information into the right hands at the right time to have it properly evaluated.

It did go to Mr. Toole but apparently only part of the underlying problem was flagged to Mr. Toole in the problem description and I guess the

question is if you had someone with the design expertise and background developed in the course of the years of work with designing and following the construction of a plant at the operating utility level where this kind of memorandum was generated in the first place, would there have been a better chance of getting a full review of the problem that had been identified as it is laid out in the memorandum rather than on some summary description of it which may not have reflected all of the point of the underlying memorandum?

A I am a little troubled by the example we are using for the discussion in that it is not clear to me that this memorandum sets out any larger issues with regard to design than were flagged to Mr. Toole.

The other issues that it identifies, are based upon what I have seen in the memorandum in the one reading through it, were adequately addressed by the action of the operators of the facility were going to take as outlined in the memorandum, at least.

Q But the understanding I have, at least to date, is that those actions were never followed

through, the actions itemized as 1 through 8 were, in fact, never taken -- excuse me, 1 through 9.

A Now the question becomes, as I understand it then, if the operators identified an operating problem but failed to follow through on it, how do we insure that the engineering people who may have a better appreciation for the significance of that problem insure the operators follow through.

Q Well, let me try to restate it again. As I understand the process from what I have been told, you had a problem described or identified in the three-page memorandum which is part of Exhibit 119, a certain number of steps that were suggested to be used in following up.

A Yes.

Q Those steps were not taken.

A But all of those steps were the responsibility of the people to whom the memorandum was addressed who are part of the operating organization.

Q But my understanding is, and it is just by way of an organizational example, that is the memorandum went to Mr. Seelinger, Mr. Seelinger then agreed that it ought to be bucked up to the GPU Service for review. It was bucked up with a problem

description on the face of the GPU Startup Problem Report and then the analysis by Mr.Toole was made that it did not require further action but it did not come back down in the sense of saying, "Well, you better follow up on the steps you have already identified."

A I guess if I were in Mr. Toole's position, I would have presumed, on receiving this particular document, that what the operating organization was asking me to address was Item 8, and the memorandum by its internal evidence inferred that the operating organization intended to take care of the other 8 of the 9 items, and the one that they asked me specifically for assistance on, I give them the answer that I thought was appropriate.

It would not have been Mr. Toole's responsibility under the problem report to have gone back to the supervision of the operating organization and say, "Hey, it is a doggone good idea for you people to do what you said you were going to do. Please tell me when you have finished."

Q But isn't that an example of some of the difficulties of having two organizations in the sense that you have a problem identified in one organization,

it is sent over to another organization for evaluation by virtue of the paper flow and the way the forms are structured, the second organization, in this case Mr. Toole's organization, happens to review really only one of the items, or at least a part of the items flagged in che initial underlying memorandum, assuming all the time that the other organizatin is following through when, in fact, the other organization is waiting to follow the response of Mr. Toole, and when they get the response of Mr. Toole that no followup is to be done, they don't follow up on any of the items.

In other words, don't you have kind of an organizational disconnect here?

A I don't want to be defensive about what I think is the major thrust of your questions. I would not characterize the problem represented by this example as indicative of I think the point you are trying to pursue.

Let me say that if the mechanism for flagging and resolving problems isn't adequately utilized, then it is not going to be as effective in getting problems resolved as it would be if it

were adequately utilized.

I think that in this case, based on what I know to date, my criticism would be of the operating company's failure to follow up on the 8 of the 9 items which, as I read it, they had in effect tasked themselves to do.

Let me say in all fairness that I am sure I could find other problem reports where I would be critical of the service company's response and followup on those problems.

Q I am not trying to highlight this as a unique example, but simply as an example.

Let's take what I think is a more fundamental issue, and that is when a problem is found in a plant, how does one get an assurance that it is going to be reviewed and analyzed by the appropriate technical people and any corrective action that is required is implemented?

A I think there are many ways that can be done. I think that with the exception of the operating company and service company technical organizations and reporting up through separate chains that gives us one particular set of problems with regard to insuring that that takes place. I am quite convinced --

I guess if we were organized as if we were one overall company we would then have a different set of problems to making that happen that would have to be addressed.

I don't think that an organization where it is a single entity that takes care of generating stations from project conception through retirement is necessarily any more able to handle that issue than what we have now. I could cite some things that I think facilitate handling this problem effectively with the kind of organization we have.

The one that I mentioned was the dualism that exists and the ability and frequency with which more than one organization becomes aware of the problem and has the opportunity to talk about it. I think that there are also the closeness to the problem that the smaller organizational unit has.

Met Ed not only had responsibility but had the freedom to act to pursue resolving problems which they were directly concerned with that directly impacted on them.

Take a system that is spread out as much as GPU System with all the resources under one engineer and a particular power plant with a problem now has

a much larger organization that they have got to insure, you know, if they are looking at the organization, as it were, they have got to exercise, as it were, to be responsive to their problems.

A fellow near the top of that organization has a broader scope of problems that he is faced with. I think that, you know, those problems can be addressed and there are ways to solving those. They are not necessarily any easier to solve than the problem that we have with the four companies and having a problem flagged in the operating company at a particular plant were both getting fed into the design considerations for future plans and having it addressed specifically at the plant where the problem was initiated or identified.

We have a number of mechanisms by which we try to develop the communications, develop the awareness on the part of management of the kind of problems that are occurring at the plants.

We will pursue those depending upon your interest, but the basic tool that we put into place for the operating plants to flag problems to us and identify it to the engineering people that are involved

with design plants was an incident report which could be utilized by the operating company to identify a problem and identify what action they were taking on it and that it would be distributed to the engineering people.

When we are looking at a project under construction, we're looking at a different situation and at some point within the organization or at many points within the organization no matter how structured, there are going to be people who exercise judgment that require the problem either to receive further review or to resolve the problem which may involve saying it is not a problem.

I think this is an example of where the operating organization clearly have the opportunity at least to appeal the particular answer they got from the people responsible for the design.

Now, if you ask is this a generic problem where the operating people didn't place enough importance on what they, themselves, laid out in the memorandum and how could we get people who will have the proper perception of that looking at it, I think the answer in this case relates to the way the problem report can be utilized,

relates to the plant trips such as was described in the memorandum as having occurred, would be identified up through the project management organization and they have the responsibility for understanding why it happened and being satisfied that from the plant design standpoint is adequate.

We had on-site and as part of the on-site project management a number of Burns & Roe engineers who would be involved with the Startup Testing Program that this was a part of, so there would have been people with the right kind of familiarity of system design right here at the site.

I think what kind of clouds this is, well, this obviously is a problem that is associated with the same equipment that initiated the plant upset that eventually developed into the accident. It is not at all clear to me at this point that this is an alarm bell or that this is a warning flag for the problem that we had.

Q Obviously that is part of the judgmental process that you were referring to a moment ago. Something we are looking at now, the EPRI Report, tracks analysis, tracks this analysis very, very closely which is something we are looking at

simply to see how close a tie there is between the two incidents. I don't think we are sure yet.

A Again, I don't want to appear defensive about this item because I think the issue you are raising was a very real issue to us. It was one that was emphasized by Herman Dieckamp when I went into the job of the need to couple together the operating plant experience with the plant design and to provide the kind of technical review of what was happening at the plant that was necessary to have the reliability of operation and safety of operation that was necessary.

So Iwouldn't want to have my answers indicate that I would feel everything was optimum in those areas, only that we recognized those problems. We had a mechanism in place to address them and we were continuing to work to extend even the type of administrative controls and management tension and technical resources that were addressing those generic issues.

Q Perhaps using your articulation of need that you just gave it would be useful for you to tell me what mechanisms you did have either already in place at the time you took the job

or mechanisms that you then modified or created to provide the connection between operating experience and the design review function. I think you mentioned that a moment ago and I am interested in it.

A We had established a procedure which we had a great deal of difficulty getting executed reliably, so I would not want to take too much credit for what it was, but a policy was set out and it is indicative of what we were putting into place as one of the ways to address this problem.

This procedure required, for certain types of plant upsets, plant events, the station had to initiate a problem report -- and I forget exactly what we termed it at that time. It was chartered towards design problems, those places where we felt the problem was indicative of a design deficiency as opposed to operator error or inadequate maintenance, something like that.

The routing on that problem report included the operations people within the service company, John Bachofer's group, and the engineering organization.

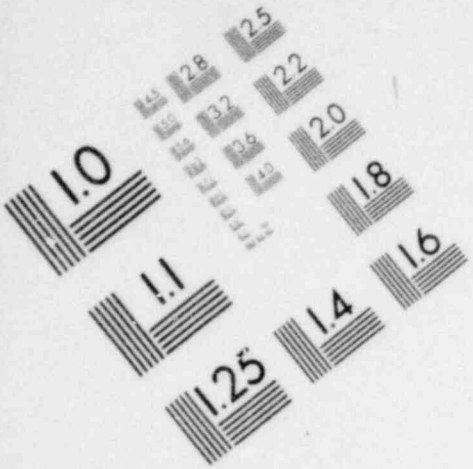
Q Mr. Bachofer's group was which again?

A He was director of Generation Operations.

For Three Mile Island we had a number of review kinds of groups. The GORB included service company personnel, engineering personne. The Operations and Maintenance Committee or O&M Committee for the station included Bachofer. The Management Review Committee looked to the operating experience as part of their review of the plant.

The Plant Licensee Event Reports from the plant included copies to the service company people and then John Bachofer was specifically charged with maintaining awareness of the problems at various operating plants.

We had build a rather extensive outage analysis capability. This involved identifying the causes of forced outages and then he kept track of the corrective action programs that we had to reduce forced outages arising from those various causes; that is kept track of them by specific projects that were a major cause of forced outages, and we provided, through the reports that went to various company management people, presidents, vice presidents, an awareness of what our outage history has been with our outage experiences, the cause of the



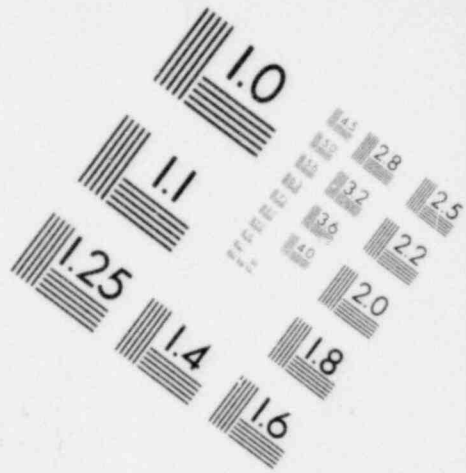
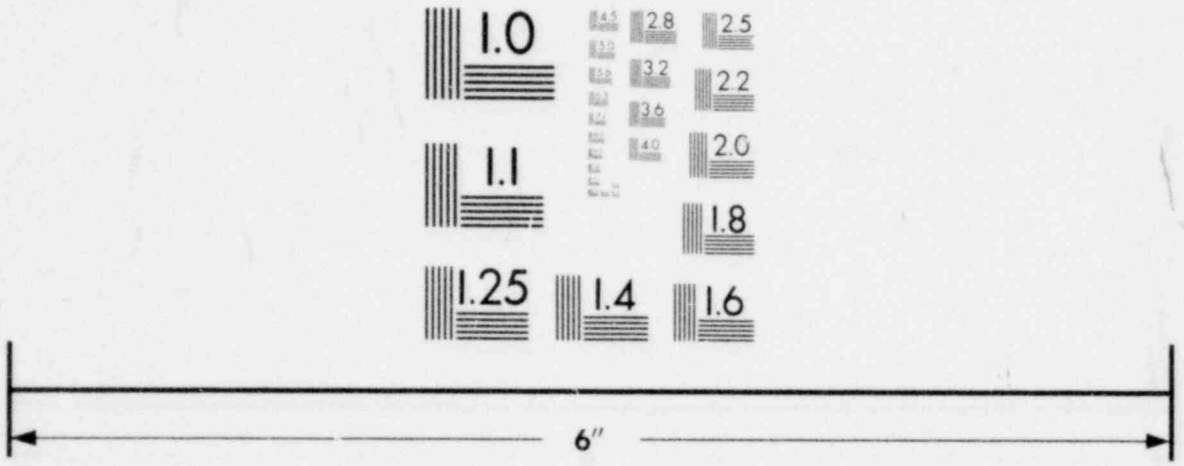
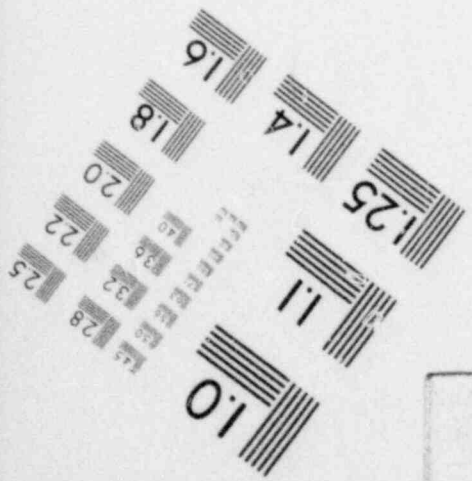
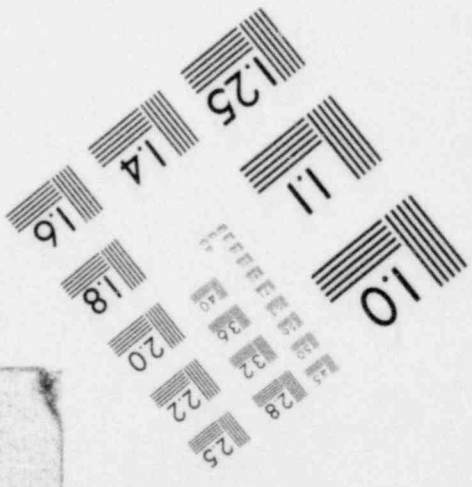


IMAGE EVALUATION
TEST TARGET (MT-3)



MICROCOPY RESOLUTION TEST CHART





outage, the prograns that we have under way to improve forced outage rates.

We also -- well, that doesn't relate to this issue, so I won't go into that.

So I think through a variety of these mechanisms we were providing an awareness to a substantial degree to the technical people within the service company of the kind of problems we were incurring that were occurring at the operating company.

(Continued on next page.)

T-4

SM/mf-1

Arnold

On new projects, before they go into service, there was a pre-commercial review board that was instituted and that review included looking at the kinds of problems experienced during a Startup-Test Program, airing any concerns that the plant operators had to the design of the plant, just hopefully giving us a fairly sound basis based on extensive review of the history of the plant for putting the plant in service before it would go into service.

We relied heavily on the problem reports and the other administrative devices available to not only plant operators but also to the project people who were assigned to the project to flag and correct design problems that were identified during the construction phase.

These things go into the hundreds.

Q You have identified perhaps five or six or seven different mechanisms which you had for providing this review integration function between operating experience and design considerations.

A Yes.

Q I assume that it is not only between

operating experience and design considerations but also between operating experience and maintenance considerations and operating experience and training, and operating experience and other general kinds of management structures, which all contribute and flow toward the operation of the plant.

A Yes. In the most general sense I think either those or other mechanisms also addressed maintenance experience and training experience.

Q To what extent did the people who were participating in or directing these various mechanisms which you have described -- did they devote full time, exclusive attention to the review process which you have described?

A I don't think there is probably anybody who could be characterized as devoting full time to the review process. The possible exception to that might be some of the Quality Assurance Control people, but I don't think that that is the same context as we have been talking about.

Q Did you ever look at the possibility of establishing a group whose sole, kind of exclusive responsibility it was to perform this review function rather than making it an add-on to other

line or operating duties?

A Yes, we have talked about how it should be structured a number of times. It seems to me now when we talk about review there are kind of a couple ways in which to look at it.

I think we have kind of touched on both of them.

One is review of specifically identified problems somebody raises as a flag and says, "I have got a problem, please help me." The other aspect is someone that is looking at the experience at a particular site in a particular organization and saying, "There is a problem that needs adjusting that hasn't been flagged," or someone that is reviewing the process for identification of problems.

I am not sure which of those two contexts you are asking about, have we looked at dedicating people exclusively -- and maybe you would like to talk about both of them.

Q Maybe. I really include both, but let's address them separately.

A We have not looked at a dedicated group to review potential design problems that were flagged by someone, because from my viewpoint, at least,

the people that are involved in the design certainly need to be involved in evaluating and correcting the problems.

Now, if those problems are safety related thought, then our administrative procedures apply at the site and apply within the corporate structure and which require certain reviews to take place, and while the people that are dedicated or the people that perform those reviews are not dedicated exclusively to that, they are predesignated as to who has to take part in the review which, I think, is kind of an iteration of the concept of "do you have someone set aside that is dedicated to that?"

Another way of perhaps achieving the same advantages of that is also insuring a particular group of people who encompass certain capabilities review all tbe problems.

If they are safety related, then they do fall into that latter description.

I don't see any particular advantage to design problems, per se, going through a dedicated group.

We have looked at providing a

dedicated group to look for problems. Herman and I talked about putting into place, were we to determine a Nuclear Safety Audit Group that would be solely involved with that type of activity.

It is a part of the organization structure that we have defined with the change we made last week to establish such a group.

In our discussions about what that group should be doing, what its role is, we reviewed the current requirements within the operating companies for review of incidents, review of deviations from requirements that are part of the independent review and audit requirements of the INC standards that are incorporated into our general specifications.

The Quality Assurance people, to a great extent, constitute a Dedicated Review Group. They are not solely looking at design problems that are raised, they are also more looking at the process and providing review of in-process work.

Where I come out on the Dedicated Review Group, I guess, is that it is one way of approaching the problem. It doens't necessarily involve substantial advantages over other ways of

approaching it, but I guess to my mind, with the sole exception of nuclear safety audits, I think that the operation of nuclear plants involves sufficient exposure to us, as the accident demonstrated, that it is prudent to have the kind of audit function which is set aside and dedicate relative to how our nuclear facilities are being operated, maintained and administered that would, in some ways, parallel the internal audit function that we have in the financial area.

Many of those functions, equivalent functions, are performed by the requirement of the license and all of that, the regulations, and guidance, and standards that are incorporated within our requirements by license, but it does seem to me that someone in a stand-off position may offer some advantages.

The concerns I have about establishing and implementing that kind of group is that I am not sure that it is the type of role that is very attractive to a really talented, experienced, capable individual. The role of an overseer or an auditor is not attractive to everyone, and if we want that to really be meaningful to us, to have

substance to the function, you have always got to have good people.

Q I take it there are various inducements that an organization can offer to make that role one that attracts good people if enough importance is placed on the role?

A Sure.

Q Among them, salary, among them, consideration for advancement within the company; would that be accurate?

A Yes, certainly there are compensations that one can offer and that also includes a limited tour of duty in that role as well.

Q Continuing to focus on the various mechanisms which you have described for the review and connection between operating experience and considerations of design, maintenance, training, and whatever other considerations come in, have you looked at creating a mix in any of these review groups between people wholly dedicated to the review and between people who are involved in the review as part of their responsibilities with additional responsibility in maintenance or training or design so that you have a balance?

A Well, that concept is embroidered in the Plant Operations Review Committee and the General Office Review Board functions.

Q Is there anyone on the Plant Operations Review Committee that devotes his or her attention specifically addressed to questions having to do with the Plant Operations Review Committee?

A Ask that again.

Q Is there anyone who is a member of the Plant Operations Review Committee whose sole responsibility is to the tasks that come before the Plant Operations Review Committee? Is there, in a sense, a full time staff member of that Review Committee?

A There have been periods of time in which this was effectively a full time assignment. During the Startup Test Program, for example, there were periods of time when the making of that Plant Operations Review Committee was almost continuous.

When we created the position of superintendent-Technical Support for each of the units, it was envisioned that the major portion of that individual's time would be spent as chairman

of the Plant Operations Review Committee, and so to that extent we were in that mode.

Q But obviously the superintendent of Technical Support has a whole line structure reporting to him and for which he has direct responsibility over and above his responsibilities as chairman of the PORC?

A Yes, that is correct.

Q Has anyone ever been assigned to PORC or GORB with no other responsibilities except to devote his attentions to those issues which come before either of those groups or one of those groups?

A No, we have not done that. We have talked about it. In general, I don't know that I feel it gains a whole lot.

I think that that approach was taken by TVA. I think that approach was taken by Commonwealth. I don't know if they are still taking that approach.

Our feeling was that for what we wanted, the General Office Review Board, for us, was a group of people with a sufficient management experience, technical background, to sort of

sense how the organization was doing, to be perceptive as to where problems were likely to be developing, based on what they were seeing, hearing, much of it indirect in nature, and thereby be able to look for problems, be able to warn the organization of where problems may well develop.. For that type of role, people who were involved in doing this type of job would be much more effective than taking even a fairly senior guy and sending him off and saying, "You review every problem report that comes through."

Q Well, the functions you have just described, for instance in the context of PORC, would not be defeated by having, in addition to those people who bring the day-to-day experience working in their respective areas to the work of PORC, that would not be defeated by having, in addition, one or two, however many people devoted full time to the work of PORC, would it?

A No, I don't think necessarily it would, but I think what that type of an individual eventually becomes, what that role really evolves to in practice, is one of insuring that problem reports receive adequate technical review by other people.

Clearly that individual is not all things to all disciplines, so as I see it, it is merely a different way of structuring your organization to give yourself assurance that problems that are identified within the organization receive an adequate review. It is one way of doing it.

It is one we have looked at under a variety of circumstances a number of times, I should say. It doesn't particularly appeal to me as the way to administer the organization to accomplish that objective.

Q Let's go back to Exhibit 119. I take it that the startup problem report would be another mechanism for review similar to or in addition to the mechanisms which you have just described to me; in other words, it is a way of flagging something and it is a way of sending it to a particular man to be reviewed; would that be fair?

A Yes.

Q In this case I gather, simply from looking at the form, that the review apparently was performed by one man, Mr. Toole; is that it?

A Yes.

Q Was there a group which reviewed the startup problem reports, or was it one man, Mr. Toole, that, on an ongoing basis, reviewed the startup problem reports?

A I think it would be accurate to say that startup problem reports got reviewed by a variety of individuals. They initially came into the Startup-Test Organization, and Ron Toole or one of his discipline heads, would make some sort of judgment as to what needed to be done to resolve the problems. Again, how much additional people were involved with a review would depend upon the course that the particular problem report took from that point.

I think that whatever mechanism one has has to recognize that not everyone or not everything flagged by members of the organization as problems are, in fact, problems.

So there was the ability on Mr. Toole's part to make a judgment as to whether he could, within his own organization, adequately resolve that. That statement, as I said before, is subject to appeal in a sense.

I may say if we were looking at a

dedicated individual to look at problems and be sure they got proper review, I would expect that Mr. Toole would be a candidate for that type of function. He had that kind of background.

If you go to the next step of putting in place the tracking system to be sure that problems that require review are, in fact, adequately reviewed and corrective action identified and executed, that is another step above and beyond this. That is basically a kind of accounting and clerical-type function, and again, there are many ways to do that within Met Ed.

We have established a computerized system for tracking those problems that were identified and were still in the pipeline, so to speak, toward resolution, and that probably is for many of the less dramatic problems, a larger challenge, that of being sure it gets followed through to some type of action in the field.

Q Mr. Arnold, have you felt that you have had enough resources in terms of people and time to pursue the various review mechanisms tha we have been talking about and that you have described me to a level which reached your satis-

faction as to what needed to be done? And I am looking at this -- let's look at it in the time period that you became vice president of GPUSC up through the beginning of 1979.

A Well, I think the answer to that is clearly no. We had authorizations to increase the size of our staffing, build our staff since the summer of 1977, and that effort had to be under way since that time.

Q And you are referring, in building the size of your staff vis-a-vis these review functions?

Well, including the review functions inasmuch as the review function takes place within the various functional groups, the resources available within those functional groups included our ability to perform reviews as the staff increased from mid-1978 to early 1979.

Our involvement with the problems at the various plants, including Three Mile Island, increased substantially over what they had been, say, in 1977, so the resource limitation was not a cap put on by the company, but was just a result of the length of time it takes to recruit

and staff that kind of an organization that we were striving for.

Q Was it your judgment at the time that you came in that more people were needed both in terms of the general staffing and in terms of what effect the general staffing would have on the review function that needed to be expanded, starting in the spring of 1977?

A The review of operating experience was clearly a limit of what Herman Dieckamp described to me he wanted my division to accomplish.

Q You mean at the higher level?

A Yes, an increased level of review and involvement with the problems of the operating plants, was clearly one of the elements that he wanted me to address in the organizational structure that I was developing.

So in the sense that we saw that type of effort, what I think I would term review, or let me say that review is an integral part of assimilating the operating plant experience into the knowledge of our people that are involved with the design efforts. That was part of what we were trying to do. That is when we were

trying to increase the amount of review of operating experience that was being undertaken by the service company staff.

Q Why did the recognition of the need to increase the review process occur at that point in time, just developing perception, or was it something else?

A I think it was the developing perception coupled with where we were on major projects at that time.

We had gone through what we thought was almost the completion of Three Mile Island 2 Construction Project, the events in early 1978 stressed that considerably from where we thought we were in mid-1977.

Q You mean the April 23rd transient?

A Yes. By the spring experience, yes, and other things that occurred under the umbrella necessary, in the time period necessary to take care of the steam safety valves.

We were at the point where we were finishing up Homer City Unit 3, which was to become the prototype of a family of standard fossil plants. We were at the point of restarting the

Forked River Project. So that the conditions, I think, were such that it was timely to make this move.

I think another aspect of the need for review related to our fossil plant experience. We were, I guess, distressed -- is the best way to put it -- with the performance of our major coal plants, and we felt that a substantial increase in application of technical resources to some of those problems was necessary.

That had been building over a several year period. The application of technical resources to those problems had been building over that several year period, the staffing for it was principally taking place within Pennsylvania Electric Company, who operated the new, large, coal-fired units.

Clearly the utility industry in general was getting lower capacity factors from nuclear plants than they anticipated would be the case. Three Mile Island Unit Number 1 ran quite well despite the problems experienced during Unit 2's Startup and Test Program, and the stretch-out of that Startup Program.

I was really optimistic about how Three Mile Island Unit 2 would run.

Oyster Creek was among the better performers in the boiling water reactors, so our particular experience with our two nuclear plants in general was much better than the average for the industry.

Our experience in coal-fired plants, was really somewhat below average.

Q Was there any underlying requirement for the various review processes which you described, GORB, PORC, Operations and Maintenance Committee, Management Review Committee, LERs, that sort of review process, was there any underlying requirement that the review process include a going back to the person who flagged the problem in the first instance to discuss what that person, on a face-to-face basis, what it was that that person perceived the problem to be as part of the reveiw?

A I don't think there was a formal requirement for that. I think to the extent that the person reviewing a particular problem was not confident he understood what the originator of the flag was attempting to describe, I think that would occur.

I think too, the resolution of problems invariably involved discussions with the people who were involved with the identification of it.

I think in many cases the initial flagger of the problem may not even be that clear. Frequently identified problems are identified as a result of discussions, and some of the normal interplay that takes place within a staff whereby a consciousness of a problem that requires some engineering assistance or engineering review develops, and in fact, I would be inclined to think those are the kind of instances that we are more concerned about being overlooked in the case of something just breaking and you have got to fix it before you can continue to operate the system or equipment, or what have you.

So I think the idea of sort of formally requiring face-to-face conversation with the person that first flagged the problem is a little bit of over simplification of how the problems surface, how their awareness is developed for the problem.

Clearly, many would fall into that category, but there is a lot that don't.

Q Well, again, going back to Exhibit 119,

the initial impression is that probably Mr. Toole did not consult with the people who flagged the problem, i.e. the people who signed off on the three-page memorandum at the time that he resolved it and possibly he didn't have the time to read the underlying memorandum and that his resolution was based on the summary description.

Again, that is subject to additional inquiry, but to the extent that that may be the case, is there a possibility that simply Mr. Toole didn't have at the time because of all the other responsibilities he had to go into the problem in the depth that one might have wished?

A Again, without appearing to be either defensive or uncooperative, I think if I were asked to investigate the background of this particular incident and if proper response to it was not taken, why wasn't it? With my perception of the way our organization worked, I wouldn't really focus on the interface with Mr. Toole.

The problem identified to Mr. Toole is a very specific one. I don't think you can read into the problem description any implication that he was expected to evaluate the overall incident and

the implications of that incident by the submission of the problem report.

Q Why not?

A Well, the problem description addresses itself specifically to the ability of the valve to open with the differential pressure across the valve that existed at the time of that transient, and it asks for a review of the design of the controller and reevaluation of the controller's capability to open the valve with that Delta P.

Mr. Toole, I think, must have read the memorandum in order to identify what Delta P existed at the time, or else he found out by other sources because the problem description does not contain the value that existed at the time of the incident and quite clearly Mr. Toole's position is that the Delta P across the valve was not in excess of the design capability of that component, and what he states very clearly is that, "We don't consider the Delta P to be the problem with the valve operation," and consequently concludes "This problem report doesn't require any further action."

I wouldn't take an issue with that.

So I think the line of inquiry that I would be inclined to pursue is what other mechanisms, if any, was the overall incident looked at, were other evaluations made of it, did anyone else look at it and why weren't the other eight items by the people requested in a memorandum to take action on.

Again, I don't want to appear to be downgrading the performance of the plant staff for in a sense passing the buck to them, but it would not be my expectation that Ron Toole, as a result of this problem report, at least, would pursue the other items.

Q Let me tell you about a braoder concern that seems to arise out of some of the things that one sees as one looks across the spectrum of issues arising out of the accident, and that is that there appear to be -- and I phrase this tentatively in the sense of an inquiry and questioning process rather than expressing any ultimate conclusion, because we are trying to avoid and to be very careful to explore all of the avenues, but necesarily you would have to hypothesize as you go along.

A Yes.

Q You may have become aware of the so-called Dunn memorandum generated within Babcock & Wilcox?

A Yes.

Q Relating to the Davis-Besse incident on September 23, 1977. Are you generally familiar with that?

A Yes.

Q Have you, by any chance, seen the memorandum?

A Yes, I have read it.

Q There again you have an incident where somebody identified a problem, where it moved through an organization without anybody ever quite getting a handle on it, moving from one area of an organization to another -- in that case it was all within one organization; in this case it was interorganizational to some extent, Exhibit 119, but apparently having a system where one person never took ultimate responsibility for looking at the problem as a whole, or saying, "I am going to look at everything that has been raised in this connection, and I am going to go back and I am

going to follow it through, I am going to see what implications it has and I am going to see to it that action is taken. That is what is required."

There are other examples that seem to rise to the surface as one looks at the various issues that arise out of the accident where issues arise which foreshadow, in a sense, some of the aspects of the accident, and where somehow the organization -- and I don't know whether, as I said before, I don't know exactly what connection the issues raised in Exhibit 119 may or may not have to the accident, although there is a certain similarity -- a variety of occasions where the issue is spotted by someone, but somehow not adequately taken hold of and pursued to resolution, information distributed, decisions made.

(Continued on the next page.)

SM 5 1c

The question that I guess I come to is how, in this industry where so much rides on that kind of follow-through and the consequences of accidents are so potentially great, can one assures that these things are caught, that they are followed up and that the issues that are identified by people perhaps of relatively low level of the organization rise through the organization to a point where one person says, "I am going to follow this through." Either there is a procedure which requires comprehensive, systematic follow-through with an analysis by the kind of people who are in a position to really assess and analyze the problem raised --it is a very broad question, I know.

A If you have the time, I would like to talk about it.

Q I would like you to.

A Let me digress for a moment, if I could, so I get this off my mind.

Q Sure.

A When you found this in the files, or by whatever mechanism you came upon this, are you confident that the problem report, when it went to Toole, had the memorandum attached?

5.2

Q I don't know that yet. My understanding is it did, but we have to ask Mr. Toole.

A You recognize the date, I presume.

Q Yes.

A That the memorandum was only written three days before he answered the question.

Q I talked to Mr Ross this morning about this, and Mr. Ross indicated that the underlying memorandum was discussed with Mr. Seelinger, and it was Mr. Seelinger's conclusion that it ought to be forwarded, and that apparently the issue was then forwarded. I don't have a precise answer on whether Mr. Toole had the underlying memorandum at the time he had the problem report, and it is obviously something we have to double-check.

So to the extent that there have been any assumptions in our discussion, they are purely hypothetical until we have had a chance to talk to Mr. Toole.

A All right, because I guess I am impressed that the problem report had a two-week turnaround, and one might -- one would suspect if the memorandum was attached to it, that it had a three-day turnaround, and with the amount of activities going on at that time, that is doing pretty well, maybe to our

5.3

disadvantage in this case, but at any rate --

Q I was going to say that could be an open question as to how you evaluate it.

A Yes. If he had the memorandum, then I would suspect that what might well have happened in this case -- and it may be pertinent to thinking about the generic problem you are interested in -- John Bromer wrote a relatively limited scope problem report because it predates the date on the memorandum by 11 days.

The plant upset received further discussion and consideration by the plant staff subsequent to drafting or -- excuse me -- subsequent to drafting the problem report. The Startup and Test people were not given a copy of the memorandum by the listing on it, and it may well have been a case of where the memorandum was forwarded with the problem report and the problem report no longer was the appropriate scope and was not revised to reflect that.

Q There are a variety of scenarios that you could hypothesize. Number one is that the memorandum was written afterward. Query: Why wasn't another problem report written reflecting the full scope of the memorandum, or why wasn't it sent back up for

5.4

second review in light of the memorandum, or maybe the problem report was held up until the memorandum was ready, but then it wasn't revised. There are a variety of scenarios. We don't know what they are at this point, but in any of the scenarios, the ultimate question is whether it got a full review, whether, for instance, the question ever went back to the original designer of the system to say, "Hey, is this significant?"

A I would not necessarily say that sending it back to the original designer is the way to ensure that it gets appropriate review for significance.

Q I am not suggesting that that is the be-all and end-all, but it is certainly one which one would consider in the review process.

A In most instances, certainly.

Let's go back though, if I can, to the more general question. It isn't, I think, clearly an issue that we have wrestled with extensively. We have generally focused on it in terms of administrative tools for trying to cope with the more or less formalized ways of trying to cope with safety-related issues.

For example, the quality assurance program

5.5

we established for Met Ed, not only an option by procedure but an actual assigned responsibility within the procedure for everyone who is a member of TMI, is to fill out non-conformance reports or deviation reports -- I forget what nomenclature we use -- but to commit to writing and submit in through our review chain problems that they have identified relative to safety.

It was my policy while I was within Met Ed -- and I am sure Jack continued it -- that we encourage people who had concerns about decisions that we were making as to their impact on safety, that they surface those, and I had occasion where I would talk to engineers who were within the engineering organization, who were within the operating organization, who were concerned about how we were addressing or failing to address, in their opinion, resolving problems that they perceive at least existed, and I encouraged those kinds of discussions.

I encouraged the organization, if they felt that even I wasn't responsive or satisfied, that they utilize the parallel organization within the service company, and I identified to them people within the service company that I thought could be utilized as

5.6

kind of a safety valve, as kind of an appeal group, to ensure that items relative to safety didn't get short-circuited or short treatment because of the pressure of circumstances at the time the priorities were perceived to exist.

Nuclear plants are a very complex installation. The mandated administrative controls are extensive, complex. I think there is a large risk that the substance of what we are trying to accomplish is submerged by the form. I think a sensitivity to the liability that grows out of that situation existed on the part of Herman Dieckamp, Jack Herbein and myself, and the majority, if not all of the management people within our organization, so that we were attempting to continue to find mechanisms and processes which would give us more assurance that problems would surface, that people had a chance to identify them and get them appropriately reviewed within the organization.

I think in terms of the environment and the attitude and the policy within the coroporation, it was constructive in this respect: It fostered getting people to try to identify to us problems, but again, we had focused principally on aspects of the plant

5.7

which were safety-related or personnel safety as well as nuclear safety and health physics kind of areas.

The feedwater system, while very important to reliability of plant operation and therefore, from an economic standpoint, of substantial importance to us, was not viewed by us as a safety-related system, using that terminology as words of art.

Q As it is defined by CFR?

A As it is defined by the Code of Federal Regulations, and as the plant design was developed to provide nuclear safety.

Q Although clearly the feedwater system as a whole, if you look at main and auxiliary feed, is ultimately essential, isn't it?

A No. It is certainly desirable, but the core can be cooled without the use of steam generators -- flood the containment building. But nuclear safety did not depend upon the steam generator being serviceable or being available for us.

Q Clearly going to the flodding of the containment building in order to cool the core is an extraordinary event.

A I certainly agree, and I don't want to indicate by that that we ignored the auxiliary feedwater system

5.8

or we ignored the main feed system either.

Q No, but we keep getting off on the side tracks -- but it is important to our discussion, I think. You come back again to the question of who defines safety, and can you view a system that is non-safety-related, which when it fails requires an extra-ordinary kind of event in terms of a nuclear power plant, and one that I hope I never see in this country, namely, flooding the entire containment building in order to keep the core cooled. It just raises issues of definition, which is another interesting issue here.

A I think that gray area is occupied by the auxiliary feedwater system at a point where I would come out on the side of saying it is important to safety to us, and although the auxiliary feedwater system was not a safety grade system as this plant was originally designed, the surveillance requirements, the operability demonstration requirements, effectively treated it as a safety system.

The only sense in which it was different from a safety system, as I would perceive it, had to do with some of the design criteria that were applied to it during the initial design. In this case, it was even designed to criteria more stringent than

5.9

Unit 1, and my understanding is that is why we had 12 valves in that system and we didn't have them in Unit 1. But the main feed system, as such, is not of that nature.

Let me try and put it in a different context. I think you approach nuclear safety, not in terms of trying to identify which system do you want to treat that way, really from the standpoint of "I have got a reactor core, and I have got to ensure that I can provide cooling of the reactor core." How do I provide the reactor coolant system with a system that gives me assurance that I can do that, and rather than make the feedwater system one of those systems, we have provided high-pressure injection, core flood tanks, and low-pressure injection, and thereby made the maintenance of nuclear safety independent of the reliability of the feedwater system.

Q Insofar as those systems, the other systems, function?

A Yes, and we apply the kind of design criteria and surveillance requirements and redundancy on the part of the design criteria that give us assurance that they will function as they did in this case, as far as the functioning of a system goes. Once we have

5.10

accomplished that, then I think we look at the feedwater system and say, "Now what do we need to do to give us maximum reliability for that," not because we have to have it to protect the core, but it obviously can contribute to protecting the core, and it is clearly important to us from an economic standpoint.

Q Reliability also feeds back into the safety equation, doesn't it, in the sense that the more times you have to manipulate your plant up and down through transients, the great possibility there is for error, for mechanical malfunction?

A I think that is true. I am not a statistician by training, but I think that is true.

I think the same thing can be said of a number of other systems, so I would not be that selective, I guess, about the feedwater system playing a role that was that different from others.

When we looked at design problems such as this, we are really looking at an area of plant design that is not governed by the same procedural requirements.

Q Just to clarify the record, when you said "this," you are referring to Exhibit 119?

A Yes. We are not looking at procedural requirements that would apply to those systems that are part

5.11

of the safety systems of the plant. The level of effort applied to these kinds of problems reflects our perception of the economic considerations of its reliability, not a safety consideration.

I think it is probably fair to say that -- in fact, I know it is certainly my perception in my discussion with Herman -- that we were looking at design review of -- including in new plants designs -- operating experience of both safety and non-safety systems. We were looking at improving the performance, the reliability, the technical efforts across the board at our power plant. We had not put into place the administrative controls that have the degree of rigor associated with them that applied to safety-related systems, and I guess I still would say, even in retrospect, or even having been through the experience of the accident, that we probably would not be well-served to rely upon applying those same controls and taking that same degree of rigidity that is in effect and transforming the feedwater system into a safety system.

Q Let me explore that. You say you would not be justified in doing that. In what way, and let me pose some reference points: In view of the

5.12

economics of the operation, in view of the safety of the plant, in view of the limitations put on you by public utility commissions? Can you relate it to any of those factors or other factors?

A I am not relating to any of those if I heard you right.

I think one of the largest difficulties with achieving the degree of reliability that we want with regard to nuclear safety is the complexity that is involved in fulfilling all the requirements placed upon us. I would suggest that nuclear safety would be best served by taking steps to simplify the safety systems, simplify the plant and the administrative controls that relate to ensuring nuclear safety. Let the economic incentives drive the controls that are placed on the non-nuclear portion of the plant.

I think that the more complex, the more people that have to process information that relates to safety, the larger the difficulty with doing that flawlessly. It would be particularly a problem in backfitting existing stations to redefine, in effect, systems that were designed as non-safety systems to now be safety systems, which would lead to a level of inspections, operational testing, and administrative

5.13

controls that would greatly increase the difficulty of adequately managing and administering.

These things may sound very straightforward, taken element by element, but when you get them in the aggregate and start seeing the complexity of the administrative processes that it engenders, it is difficult to envision how you can expect it to be carried through flawlessly.

The industry has assumed that we are not going to have flawless execution of it. That is where the defense in depth is expected to compensate.

I am very disturbed with what took place within the B&W organization. I am disturbed because of its applicable to us in this case. I am also disturbed by the implications of it in terms of the nuclear industry and the point and issues you raised earlier in your discussion.

Q In fairness to B&W, that is not the only example we have seen.

A And certainly I am not suggesting that examples could not be found in our own organzation.

Q Sure.

A Let me, at the risk of cluttering up the record, give an example of the kind of difficulty we get into

5.14

with the complexity of the regulations and the regulatory requirements.

We sent a sample to an off-site laboratory, and I would dare say we spent 15 man-hours trying to decide whether or not we fulfilled the regulatoryrequirements for transmitting that sample to a laboratory in Philadelphia and never did arrive at a consensus.

When one looks at our technical specifications and sees how extensive the various administrative requirements are, the kind of items that have to be routinely reviewed, the systems and the personnel that you put in place to fulfill those requirements, can get to the point where just the complexity of it tends to defeat the objective or tends to defeat the attempt to reach the objective.

I am not trying to say that at this point the regulations are too complex or we have got an impossible job or anything like that. I am saying that that direction has to be looked at as far as what the implications are, and that I think there are moves that we can make to simplify the process, reduce the complexity of the plant as it relates to nuclear safety, which are more apt to have incremental benefits associated with them than moves we make to improve nuclear safety that

5.15

involve more complexity, more extensive requirements being applied to a larger and larger portion of the plant.

Q How do you look at that issue in the context of potentially doing something about it, number one, and number two, providing a meaning level of assurance, whatever that is, to the public at large that in fact nuclear power plants can and will be operated safely?

A I think there are a number of items that bear on that, and without indicating priority by the order in which I mention them, let me just kind of list them.

I think first of all the defense in depth is a fundamental philosophy that needs to be kept in mind, and by "kept in mind," I mean kept in mind on the part of the designers and the operators of the plant, that defense in depth is there not for statistical purposes but is there because there are going to be breakdowns both physically and with people that make that redundancy essential to us. So I think that understanding the implications of the requirement for redundancy, the understanding by the operators and designers, is critical to us.

I think within GPU, the direction we are moving

5.16

is to, in a sense, pull the plant up within the organization, be sure that it has a visible role in the organizational structure to measure with its importance to the organization. We are approaching organizing for support of operations of the lant, to provide people with some management experience close to the plant operations -- using "operations" in the most general sense -- who do not have such a broad scope of responsibility that they can't really direct their management capabilities across that scope adequately.

So we are trying to reduce the span of control, reduce the scope of responsibility of the people who are part of the management structure who are responsible for the plant.

I think we have got to clearly have, internal to the company, the kind of administrative checks and balances that are represented by the regulations and by the other things that we do, and I think it is important that we have the kind of real-time surveillance of what we are doing by agencies such as the Nuclear Regulatory Commission for the flagging of places where conditions may be starting to relax or where, through a variety of reasons, oversights are

5.17

occurring that are not being flagged by the organization itself.

Picking up on some of the items, I guess, that are currently under discussion in the press, at least, I don't have any reservations about an on-site inspector, about the continuous presence of the NRC or regular daily presence of the NRC. I think, however, it is essential that the accountability for the plant be clearly with the licensee.

It would seem to me that the company has got to feel absolutely obligated for being able to respond to whatever situation it may be presented with at the plant and never be in a position to say, "When I get to that point, it is somebody else's job to take over from there, and I am going to be relieved, and I will be able to step back."

I think from a practical standpoint, the NRC or some similar agency is not going to be able to develop the kind of organization that could at any time or at any place assume responsibility for operation of the plant. If private operation of nuclear generating stations is not judged to be safe enough or reliable enough and safe enough, it would seem to me that you would have to move all the

5.18

way to operation of those facilities by the Federal Government and some kind of contractual arrangement for purchasing the power.

I think one or the other has to be accountable. It can't be both, and I think, myself, that we get more safety by having the accountability with the utilities with the Federal agencies available as an oversight review, the role that the NRC currently occupies, than we would have with the Federal agency operating them and presumably another Federal agency doing the oversight.

That is a personal observation, but I think it is important to think through the implications of either of those kinds of steps.

(Whereupon, the deposition was adjourned at 8:00 p.m.)

Robert C. Arnold

Subscribed and sworn to
before me this ___ day
of _____1979.

Notary Public

LC 19

STATE OF NEW YORK)
) ss.:
COUNTY OF NEW YORK)

I, STEPHEN McCRYSTAL, Notary Public of the State of New York, do hereby certify that the foregoing deposition of GPU SERVICE CORPORATION, by ROBERT C. ARNOLD, was taken before me on the 10th day of August 1979.

The said witness was duly sworn before the commencement of his testimony. The said testimony was taken stenographically by myself and then transcribed.

The within transcript is a true record of the said deposition.

I am not related by blood or marriage to any of the said parties nor interested directly or indirectly in the matter in controversy, nor am I in the employ of any of the counsel.

IN WITNESS WHEREOF, I have hereunto set my hand this --- day of August 1979.

STEPHEN McCRYSTAL