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UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

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GENERAL PUBLIC UTILITIES CORPORATION, :
JERSEY CENTRAL POWER & LIGHT COMPANY,
METROPOLITAN EDISON COMPANY and :
PENNSYLVANIA ELECTRIC COMPANY,
:
Plaintiffs, 80 CIV. 1683
: (R.O.)
-against-
:
THE BABCOCK & WILCOX COMPANY and
J. RAY McDERMOTT & CO., INC., :
:
Defendants. :

- -x

Deposition of General Public Utilities Corporation, by WILLIAM FELS, taken by Defendants, pursuant to Letter Agreement and Rule 30(b)(6), at the Marriott Hotel, Harrisburg, Pennsylvania, on Thursday, December 3, 1981, at 11:10 o'clock in the forenoon, before Nancy A. Rudolph, a Shorthand Reporter.

WALTER SHAPIRO, C.S.R.
CHARLES SHAPIRO, C.S.R.

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-and-
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of Counsel

Also Present:

ROBERT LUTZ

* * *

IT IS HEREBY STIPULATED AND AGREED by and between the attorneys for the respective parties hereto that the sealing, filing and certification of the within deposition be, and the same hereby are, waived; and that the transcript may be signed before any Notary Public with the same force and effect as if signed before the Court.

IT IS FURTHER STIPULATED AND AGREED that all objections, except as to the form of the question, shall be reserved to the time of trial.

* * *

W I L L I A M F E L S, residing at R.D. #2 Rhoda Avenue, Mt. Joy, Pennsylvania 17552, having been first duly sworn by the Court Reporter (Nancy A. Rudolph), was examined and testified as follows:

(Resume of William Fels marked B&W Exhibit No. 329 for identification, as of this date.)

MR. KATCOFF: Once again, this deposition is taken pursuant to Rule 30(b)(6) and is governed by stipulation as follows:

"These depositions will not involve questions on the substantive issues, such as training, Davis-Besse, prior transients or operator action during the accident."

EXAMINATION BY MR. WURTZ:

Q Mr. Fels, we have marked as Exhibit 329 a resume that you have just provided to us.

Did you prepare this resume?

A Yes, I did.

Q Does this resume accurately set forth your educational and employment background as of today?

A Yes, it does.

Q Could you describe what responsibilities you have had from 1978 to the present for the TMI

Unit 2 plant computer system?

A Basically, my responsibilities were to follow the installation, field input checking and proper operation of the operator interface for the Unit 2 computer system.

Q Could you describe what you mean by the field input checking?

A The transducer in the field that measures the processes connected to cables in the computer. The computer then digitizes the analog voltage. The voltage is equivalent to mass flow, pounds, temperature, whatever, and presents that as a usable value to the operators.

That checking would entail putting a voltage in at the field and verifying that the proper number comes out at the computer.

Q The third thing you mentioned was the operator interface. Would you explain what you mean by that?

A The operator's interface is essentially the last part of the field input checking whereas you have the correct span, the correct engineering units, if that point belongs in an enunciator group, it is there and the further checking of the operator interface

would entail verifying that the operator can do a group print, a print point, all of the operator functions, that they work properly.

Q Did you have any responsibility in the area of deciding what inputs would be assigned to your groups or summaries for the operator's use?

A What groups are you referring to?

Q Well, if you had involvement in any groups, could you just identify those and describe your involvement?

A As far as deciding on points going in groups, it would only be from the standpoint if points were identified that were not in an original group that were being added from the same process or same area of the plant, then they would be added to the appropriate group.

For example, feedwater group, if the A/E, the plant or the vendor added another point from the feedwater system, then it would be prudent to put it in the feedwater group.

Q What groups exist? Feedwater group is one, I gather.

A There is quite a list of groups. You would have to refer to the operator's guide and the Macro

Corporation software descriptions.

Q And that information is contained in materials that we have here on the table?

A Yes. I don't see the operator's guide but I do see the two Macro books.

Q Perhaps you could show us in the Macro books what sections you are referring to.

A Let me see one of those.

Q Just provide an example or two and a general indication of what you are referring to.

A I need volume 1.

This is an example (indicating).

Q How would you identify this section of the manual? Would it be by those letters in the lower right-hand corner of the page?

A These letters and this number.

Q The number is TMIC-82, Human Communications Extensions, and the page in the book has the letters HCE in the bottom right-hand corner.

Which entry were you indicating on that page? It is page 7.

A Well, these (indicating).

Q Additional print groups?

A Yes. Well, that's what's in the

group.

Q For example, one says group 15 reactor coolant and makeup pump conditions, and then other groups are identified, groups 15 through 19, and so all of the inputs in those groups would be put together somewhere in the computer, is that what you mean, in the wiring?

A Well, no, they would be put together in the software. These groups just consist of individual points.

Q I'm sorry, could you explain that. The groups consist of individual points, you said, just in reference to the one we read into the record, group 15?

A The computer basically has, let's just use that as an example, a thousand inputs. It does the things that I mentioned under field input checking to each input. Now, to make it useful for the operator, if you have 20 of those individual points from the feedwater system in software, you make a group available and put those 20 points in it so that whenever he pushes one button, it automatically prints out or displays those 20 points.

Q Now, in order to know for each of the groups

what 20 points come out when the button is pushed, I look in the Macro book, is that correct? Is that information contained in there?

A I don't know.

Q Do you know some place where it is contained?

A Yes.

Q Where would that be?

A I can think of two places it should be. It should be in the alpha listing and I am pretty sure it is in the operating procedure, the plant operating procedure for the computer system.

Q What is the alpha listing?

A It's another computer listing that contains some of the group information and headings and titles and messages that the computer outputs to the operator.

Q Who prepared the alpha listing?

A That was there when I got there so I have to assume that it was prepared by the computer vendor.

Q You referred to an operator's guide earlier. What is that?

A That's a vendor document specifying the operator interface to the computer system. It tells the operator how to use it, what the groups are.

Q Now, the groups can be changed, though, can't they?

A Yes.

Q How would we know what groups existed as of the day of the accident, for example?

A There essentially would be no changes to the groups other than groups added at the time the system was installed. The groups themselves were not changed on a daily or weekly basis.

Q Where are the groups that were added identified?

A Those are identified primarily in the Macro write-up on the balance of plant addition.

Q Any place else?

A Not that I could think of.

Q Can groups be added to or subtracted from by operators in the control room?

A Only three.

Q Could you identify those?

A Typically called operator group A, B and C. They wind up being groups 11, 12 and 13.

Q What can the operator do in those three groups?

A The operator can put points that he wants

to look at in those three groups.

Q How many points are there in each group?

A I believe there are 36.

Q Per group?

A Yes.

Q If the operator wanted to add different input to group A, what would be involved in that process?

A There is another function available that says add point to group and he merely uses that function, enters the point that he wants to add to the group, and that point goes to the head of the list.

Q So you just push a button that says add point to group and type into the computer group A and identify the point by code number, is that it?

A Yes, the operator's console prompts you when you push a button and if you add point to group, it more or less asks for a group number which would be the 11, 12 or 13. After you enter that, it asks you for point number.

Q The point number's code number on the input/output list?

A That is correct.

Q So it would only take a matter of a minute

or less to add a point to one of these groups?

A That's true.

Q Do groups A, B or C have trending functions?

A Yes.

Q Could you describe those?

A It's one function called group trend.

Q How does that work?

A There is a function number associated with any of the operator functions. There is a number associated with group trend. The operator would enter that number, specify the group and specify the interval that he would like that group trended.

Q Could you give an example of that to make it concrete?

A You request the function associated with a group trend --

Q And that involves pushing a button?

A There is a start clear button that prompts the operator console to enter the function number. You enter the function number.

Q So you don't push a button that says group trend?

A You hit a start clear button and it asks you to enter numbers from a numerical key pattern.

Q Which is right on the computer?

A It's on the console face.

Q You mean it appears on the screen or it is taped onto the --

A It's a hardware panel of buttons. All of the function buttons have inscribed upon them the function number and the actual function. All of the group buttons have the group number and group function inscribed on the keycaps and you have a small numerical keypad on the far right that has a stop clear and start cancel number buttons on it, 0 through 8, and decimal point, plus and minus. Everything is keyed from the start clear button.

When the operator hits the start clear button, a little display window just above that pad asks for function number. You give it a function number.

Q Where does it get the function number now? He pushes the start clear button?

A The group of buttons on the left-hand side are the function.

Q Function buttons?

A Well, it's a black, little square button that has a function number and the function that you

want on it, e.g., the one in the upper left-hand corner for function 1 might be print point and it will have on there a number 1 and print point inscribed on the cap. When the computer asks you for a function number, you put in a 1 and enter. Then the computer knows that it needs to ask you for what group or, in this case, for a print point function. The computer would prompt you by asking you for point number.

So you enter the point number from the IO list and hit the enter again, and it will print the value descriptor for that point number.

All of the functions on the operator console work in the same general manner.

Q So in the case of the trending, you push the start clear button and then you would find the function button for group trend, is that correct?

A That's correct.

Q You push that and the computer would say what group?

A True.

Q Then the groups are also identified on the buttons?

A Yes. The operator groups are identified on the buttons. There are some balance of plant

groups that aren't identified on the buttons.

Q So if you wanted to do some trending of group A, for example, you would walk over to the console, punch the start clear button. It would say what function? You would punch the function button?

A No, you enter the function number.

Q Then you would -- the final step after you put in a group trend function number and you do that on -- it's a keyboard that you enter that with?

A A small vertical keypad on the face of the console.

Q I guess I don't know what a keypad is. Where do you get the number -- well, a keypad, where do you get the number that you want to put on the keypad?

A Off the inscribed caps.

Q Then, finally, you enter the group and that just involves -- that's another keypad or what is that?

A The same keypad. You would enter 11, 12 or 13 depending on which group you wanted to trend.

Q If you wanted to do a single point trending, how would you do that?

A That's a different function.

Q Could you do that step by step?

A It's exactly the same as what I have just said except that when you are prompted, you are prompted for point number instead of group number.

Q How do you assign a point to the analog trend recorder?

A Again, it's another function.

Q So it's start clear and then you put in the function for analog trend recorder and then it will say what point?

A It will say what recorder, what point and ask for span information.

Q I wonder if you would give us a general description of the NOVA functions and what I would like you to do is identify each of the NOVA functions and give a brief description of what it does and then as to some of them, we might come back and try to go in more detail and into function.

A The basic purpose for the NOVA was to provide the same functions for monitoring of points that the Bailey does except that it's an expansion of that capability from a number standpoint. So it does the analog and digital scanning of points for an additional group of points, most of which come from the balance of

plant as opposed to the NSS.

In addition to that, it provided sequence of events, monitoring and processing. In addition to that, it provided a display CRT for the operators. In addition to that, it provided some utility functions for computer people, mag tape, magnetic tape handling capabilities.

Q Anything else?

A Not that I could think of.

Q Take your time. I just didn't know whether you were waiting for me or looking at any of these materials, too.

A Well, I really didn't review the entire balance of plant design before I came here so that's the high points, to the best of my knowledge.

Q Now, the first point you mentioned was that it increases the number of inputs that can be scanned, is that correct?

A Yes.

Q And these are all balance of plant inputs?

A Primarily.

Q Do we have here on the table a complete list of those inputs?

A Yes. BOP input list.

Q I show you a black binder which has got a number on it, 2761-1-1. It is called Unit 2 Computer BOP Input Specs.

Is this what you are referring to?

A Yes.

Q Now, does this BOP input specs listing contain all of the NOVA inputs as of the day of the accident?

A Yes.

Q Is it limited to NOVA inputs?

A That particular listing is.

Q On the first page it indicates there are revisions 0 through 11. 11 was the last revision on February 1, 1979 before the accident?

A If that is what the date is, yes.

Q Then it gives, under the ID column on that same page, there are some initials. What are those?

A That most likely would be the person making the revisions.

Q Is there some way to tell from the printout what revisions were made on the date specified?

A I think -- there is a column for Rev. numbers; in other words, something was done to this at the Rev. 9 update.

Q So you look in the Rev. column and there is a number identifying when a change got made to a particular input?

A Yes.

Q Would that mean, for example, you pointed to one that said point No. 3049 ES Actuation B Building. Did that mean you could put something new in and take something old out or you just changed what is there in some fashion or what kinds of revisions are involved in a list like this?

A Most of the revisions made from the basic list were made dealing with descriptors, points sources and in the case of the point you used, for example, the contact description.

Q By that you mean what you call it, just the words that you use there?

A If it's open, you call it normal or you call it trip. You can change those depending on form of contact you have in the field.

Q And then point sources can also be revised, you said?

A If the point source is changed, yes, you would typically revise that, yes.

Q What does that mean, a point source, what

are you referring to?

A In the case of an analog input, the analog source of the signal RTD, thermocoupler, pressure transmitter, wherever you are getting your process variable.

Q Are those point sources identified in the printout?

A In those cases, they are, yes. Not in all cases.

Q When would they not be? Is there any system to it?

A I really can't answer that. Most of this information was here when I started work here.

Q The second thing you mentioned as another function was the sequence of events monitoring and processing. Is that described by a software program?

A Yes.

Q Do we have that here on the table?

A You do in the Macro books.

Q It is contained in the Macro volumes in the system description?

A Yes.

Q And those volumes accurately describe the software?

A Yes.

Q There were no changes made to it?

A Not that I know of. Any changes would be marked up in the latest listings of the actual programs themselves.

Q There would be some kind of entry showing the change has been made?

A Yes.

Q And we have the latest program for software?

A To the best of my knowledge, that is the latest, yes.

Q Could you identify that?

A The two books on the bottom.

Q These books have tags on them. They are identified as 2761-2-1 and 2761-3-1, both entitled "NOVA BOP TMI Unit 2." Mr. Fels' name is on the cover.

Are these your own personal copies?

A Yes.

Q And to the best of your knowledge, these two volumes contain NOVA software as of the day of the accident?

A Yes.

Q And any changes from a Macro description would be included in this description contained in these

two volumes?

A That's true.

Q To identify the inputs in the sequence of events, would we look in the software or the input list or where?

A The input list identifies the sequence of events inputs.

Q In what manner?

A There is a column in there that says point type. They are labeled SOE.

Q Or if it says ALM, that means alarm?

A Standard digital input, yes.

Q Are there any other possible entries? You say it would be in the point type column?

A Yes.

Q That is where group assignments would be indicated?

A Not group assignments, no (indicating).

Q I see. When point type says ALM, what does that stand for?

A Standard digital input.

Q That is what the letters ALM indicate?

A Under the point type column in this listing, that's true.

Q Standard digital input?

A Yes.

Q Is that an acronym?

A Just alarm it stands for.

Q You talked about a display CRT as a NOVA function. Could you describe that?

A Well, essentially there is, I believe it was a 12-inch monochrome CRT installed in the operator's console.

Q Was there just one CRT associated with the computer in the TMI-2 control room?

A Yes.

Q And it was this 12-inch CRT?

A That's correct.

Q How did the NOVA drive, or whatever expression you use, the CRT?

A The NOVA had the software handler and the hardware serial interface to drive the CRT.

Q What went up on the CRT?

A Group displays, both Bailey and BOP, current alarms.

Q Current alarms?

A Current alarms was the default display.

Q Was the what display?

A Default.

Q What do you mean?

A If you had a group up and canceled that group, current alarms would come up automatically.

Q If you had a group on, the group would keep showing up until you canceled it?

A It stays there until you update values, yes.

Q If you cancel that out, the alarm comes out automatically?

A That's true.

Q And that would not be a display of what is on the alarm typer, it would be a display of what the computer is currently scanning and picking up?

A It could be the same.

Q What do you mean?

A As the alarm printer.

Q Are you saying you are not sure?

A I am saying it could be. It depends on conditions.

Q Oh, I see. What does it depend on?

A That particularly is a stored chronological display for the CRT, no time taking. So if you're a long, long time between alarms and an alarm comes in, the line that gets written to the CRT and the line that

gets printed will be there about the same time.

Q If you are backlogged on the typer, then they would be showing something different?

A That's true.

Q The CRT shows --

A The CRT is faster than the typer.

Q In fact, there wouldn't be any delay time on the CRT, I imagine, is that right?

A There is some but not much.

Q How many lines are there?

A 18.

Q 18 lines?

A Yes.

Q So if it is, let's say, a quarter to 5 and the typer is typing out 4:15, the alarm CRT is typing out or is showing quarter to 5 alarms?

A That is essentially true.

Q And the things that show up on that CRT are all of the points that have been designated as alarm summary points, is that right?

A Any point in the system that goes into alarm.

Q Any point in the system that goes into alarm?

A Yes.

Q Does that include a radiation alarm, let's say?

A In Unit 2 I don't believe there were any radiation alarm inputs. The only qualification on whether the point would go into alarm or not was whether or not it was removed from alarm checking.

Q So if it is an input in the system, it is going to be on the alarm CRT?

A If it goes into alarm, yes.

Q And you said the only exception is what?

A If it had been removed from alarm checking.

Q What does that mean?

A There is a function called remove from monitor and essentially what that means is removed from alarm monitor checking.

Q Why would that be used, what's the purpose of that?

A Say you have an input go open and the field input would be constantly changing erratically.

Q This CRT I gather can also be used to display any individual point as well?

A No.

Q So the CRT is limited to the group displays

and then automatic current alarm function if a group is not being used?

A Yes, that's true.

Q If you wanted to get a -- use the computer to draw a signal point, you would get that on the utility typer, is that it?

A No, there is a NIXIE display window also on the console and if you want to display the value for a signal point, there is a function connected with that. When you exercise that function the point number shows up in one window and the value shows up in the other.

Q What kind of a readout is that on the value?

A I guess you would have to call it projection. They're small, I would say approximately one inch by one inch six segment displays. When you crank up a number, it shines the number on the face of the display.

Q And that gives you an ongoing reading for that value?

A Yes.

Q It will tell you to cancel it?

A That's true.

Q So that is a digital display of the value?

A Yes.

Q Again, the way to put that into effect is

the same way that we talked earlier about making any group or point come out, you use the start clear and the function button and the computer asks a question and you put in a point that you want to have trended?

A That's true.

Q You mentioned also in connection with the NOVA that it does some utility function such as, an example you gave, as mag tape handling. Were there any other such functions?

A Yes, they are described in the utility or maintenance sections of the Macro books.

Q By magnetic tape handling, what are you referring to?

A Well, the Bailey did not come with mag tape. It came with paper tape as a medium for software maintenance dumping PDO's, that type of thing, which was cumbersome and time consuming. A mag tape allows you to do that much faster and clearer.

Q Now, as I understand it, in the NOVA software, there is a multiplexor task?

A Yes.

Q Could you describe that?

A That is the route task for scanning the plant inputs. That task knows to address a piece of

hardware with the two wires on it that goes to the field transmitter and bring back a digitized value that it read from the field input. It is identical in concept and style to the same task in the Bailey.

Q It works with the NOVA inputs?

A Yes.

Q It is limited to the NOVA inputs?

A Yes.

Q There is an analog trend test. Have we already discussed that or is that something different?

A You have asked me about how to put stuff on analog trend.

Q Maybe you could describe that, the software also.

A Very basic. The computer reads the value stored for the point you want on trend. Then re-outputs that value back through another piece of hardware that changes the digital value back to an analog value corresponding to the span, analog span, of the pen recorder. That is in a nutshell what it does.

Q And the CRT output task you already discussed in connection with the CRT display?

A Yes.

Q There is something identified as a CRT

update task. What is that?

A He's the guy that, if a value that you have displayed in any given group changes, he goes out and updates that line.

Q Could you give an example of that?

A You have an operator group display. Let's say the temperature goes up, one of the points you have displayed is a temperature. The cursor on the CRT screen will move and that value will get updated without having to black out the whole screen and redisplay the whole thing.

Q I see. Once an operator group display is put on the CRT, it just sits there and is automatically updated by this task if any particular value changes?

A Yes.

Q How frequent are the updates?

A 30 seconds. And I am not really sure of that.

Q So a kind of trending is occurring there in the sense that it is regularly updated?

A Well, I guess I wouldn't call it trending but it is a real time function so you try to maintain your values current with the process.

Q As I understand, the TMI Unit 2 computer

could do a leak rate calculation, is that correct?

A That is true.

Q Is that software present here?

A No.

Q Where is that contained?

A That would be user software.

Q What do you mean?

A There is a unit function available in the computer to add your own programs in what they call a user area. That is where that software is located.

Q Which computer does that calculation?

A The Bailey.

Q Is there any other software in the user area?

A Yes.

Q Could you identify that other software?

A No, I cannot. It would require a printout.

Q What would you go and get if you wanted to have a printout of all of the programs in the user area, what would you call for and ask somebody to bring you?

A I would just get a list at the user library.

Q You would get a software printout in what was called the user area?

A It would be a one-sheet page with program

names and addresses associated with those names.

Q Then you could select, if you were interested in a particular program, then you could get that?

A That's true.

Q But this one sheet would tell you what is there?

A Yes.

Q Are there any other programs at TMI Unit 2 that we don't have other than those in the user area?

A Well, you don't have the operating system software.

Q Are you able to see what is here?

A Yes, I know what's there.

Q Anything else?

A You don't have the nuclear steam supply system software.

Q Anything else?

A Nothing else other than the user programs that I mentioned earlier.

Q What does the operating system software involve?

A It's basically some core software that allows you to interface with the computer.

Q Could you give an example?

A Some of the functions available are, first of all, accessing the user program area, being able to program in assembly language or FORTRAN and to edit and compile, do all the normal things you do with software. There is -- the other side of it is some utility functions to allow you to dump areas of memory, either bulk or core, put stuff on paper tape.

Q Now, as I understand it, there are three operator summaries and that's group A, group B and group C and that's all, is that correct?

A That's correct.

Q If I see an entry on the printout that says operator group trend, that is the group trend we were talking about earlier?

A Yes.

Q The operator simply decides to trend one of those three summary groups, is that correct?

A That's true.

Q Since the operator can change the inputs in those group summaries, I guess the only information on exactly what was in the groups on the day of the accident would be in the computer printout on the day of the accident, is that right?

A If they requested that group on that day, yes. You would have to look at the time on the group printout and the alarm printer printout for the time after that to find out whether it had been changed.

Q I'm sorry, I didn't understand the second part. The alarm printer printout would tell you something about this?

A Yes, because add point to group is one of the functions that is reported on the alarm typewriter.

Q Is there a list some place or would there be a list, would it be indicated in the input list what inputs were assigned to the operator summaries as of any date, let's say, any given revision of the input list?

A I don't understand your question.

Q If I went to the input list for February 1979 and looked at it, would there be some way of identifying which of the inputs had been put in, as of the point of time the input list had been put in the operator summaries?

A No.

Q Who decided what inputs would go in the operator summaries?

A The operators.

Q Do you know anything about the process by which that occurred?

MR. KATCOFF: Are you asking about March 28, 1979?

MR. WURTZ: No, the initial, as a group assignment.

A Generally speaking, if the operators were running a test of some form, they would have a list of points that they wanted to watch, either for precautionary measures or because to satisfy test requirements. Those are the points that they would put on the operator groups.

Q Was the makeup of those groups changed a lot on a daily basis or weekly basis?

A No. To qualify that, they were typically doing plant operation, one or two of the groups were pretty much left alone and had specific information on them dealing with the primary and secondary side that the operators wanted to look at. Any changing that was done primarily was done during the testing program whenever the requirements for watching certain points were different.

Q During startup testing, you mean?

A Yes.

Q Which were the two groups that were left alone?

A I don't really know.

Q The ones that contained that specific information about the primary and secondary systems?

A I am not sure. An operator would be better qualified to answer that.

(Recess taken.)

BY MR. WURTZ:

Q If I look on a utility typer printout and see an operator group summary, does that mean that group summary automatically went up on the display CRT or are those two things separate?

A They are separate.

Q So you get the operator summary on the CRT only if you specifically request it on the CRT?

A That's true.

Q Otherwise the CRT keeps giving you the current alarms, is that correct?

A Yes.

Q And just so I have this clear, the display CRT would have the last 18 alarms on it?

A Yes.

Q So that when a new input goes into alarm,

the oldest of the 18 would go off the screen and a new one would come on?

A That's true.

Q I have seen a group called the enunciator group review. What is that?

A There is another row of buttons on the operator's console that's called the enunciator group buttons and those have specific groups associated with them as far as process function, such as there is a reactor coolant group, there would be a turbine group. I forget the exact number of those now. There is something around 20, maybe a little less than 20 of them. You have the availability to do a value display, an alarm display by pushing the appropriate buttons and a limit display.

Q Could you convert that then into a step-by-step process? Let's suppose you wanted to do one of the enunciator groups. How would you go about that?

A If you wanted to do values for that enunciator group, you would push the value button and the enunciator group button that you want.

Q And if it were a reactor coolant group, you would press reactor coolant value?

A You would press value and reactor coolant group.

Q And it would then give you the values for that specific point in time?

A Yes.

Q You said there is an alarm display function. What does that tell you?

A There are several. There is an alarm request button associated with the enunciator groups, the same as there was a value button and a limit button, so you can request for the enunciator groups, if you wanted to know what was in alarm in any of the given enunciator groups, you would follow the same procedure except you would push the alarm review button.

Q What does the limit button give you?

A It gives you its alarm limits.

Q It gives you the value at which the particular input goes into alarm you mean?

A Yes.

Q And that would be something hadn't reached alarm and you wanted to see how close it was, you could call that out?

A No, you could call the value of the alarm out -- the value enunciator request. It's not -- the

limit request is only going to give you high and low limits, not a value.

Q High and low limits, could you give me an example?

A If you have a temperature span, let's say 0 to 600 degrees, you might have a low limit, low alarm limit set at 32 and a high alarm limit set at 500, so that you will get alarms unless it's within those bands. If it goes to 500.1, it will be a high alarm; if that goes to 32, it will be a low alarm.

Q When you punch the limit display button, what comes out on the printout?

A Just the limits.

Q What words appear?

A Point number, descriptor and low and high limits.

Q Just to tell you that there is a low and high limit?

A Yes.

Q Without telling you what it is?

A No, it gives you the value. It tells you what it is.

Q You referred earlier to a NIXIE display window. What is NIXIE?

A It's kind of an old description of one of the first methods of displaying digits. There are two display windows. They are not true NIXIE windows but they are like a NIXIE window. One is used more or less for point number functions and the right-hand window is used for values.

Q Where would we get a list of the enunciator groups?

A Probably the easiest way would be to have somebody just look at the console. They are described in the software listings somewhere. I don't recall exactly which listing they are in.

Q Would it be in the Bailey software or the NOVA software?

A The Bailey software.

Q Would it be possible to take photographs of the console in such a way that one could identify what appears on the various --

A Probably several photographs you could. The caps are pretty small and the inscriptions are very small.

Q The ability to trend certain values going into the past, historical trending of values, is a subject I want to touch on briefly.

Does the software we have here describe the computer's ability to do those things as of the day of the accident?

A There is essentially no historical trending of data other than what was described by the analog trend recorders.

Q Well, I am thinking now about at 4:15 you want to get information from 3:45 to 4:15.

A Oh, that time period there are two other functions available.

Q Could you describe those?

A Memory trip review.

Q And that works from --

A And post-trip review.

Q Could you describe each of those?

A The post-trip review is a program that gathers data for a specific set of points all the time. I think it's half an hour's data at a time. I am not really sure of that. There are what they call post-trip initiators which, in general terms, usually means turbine trip or reactor trip. And the program at that time gathers data in a more rapid fashion and stores a certain amount of data after trip, flashes a light on the operator's console that's inscribed post-trip review

to let the operator know that it's ready.

He can then request if if he wants it.

Q Can he always cancel it?

A Yes.

Q He does that by pushing a button?

A Yes.

Q Does the sequence of events work in the same fashion, a light goes on?

A Yes.

Q And he can either request or cancel at that point?

A Yes.

Q The inputs of the post-trip review cannot be changed by the operator, is that correct?

A That's correct.

Q If it is 4:15 and you want information from the past, the post-trip review and the memory trip review are the only two places where that would be collected?

A Yes.

Q Could you describe the memory trip review?

A The memory trip review is essentially the same as the post-trip review except that you specify the data gathering intervals but it works off the same

list of points associated with post-trip review.

Q You specify the time interval you said?

A Yes.

Q And it holds 30 minutes of information?

A I believe that's true.

Q What are your options as far as time interval?

A I don't recall.

Q But the inputs in the memory trip review and the post-trip review are exactly the same?

A Yes.

Q When you are dealing with the post-trip review, what is it entitled on the printout?

A Post-trip review, the date and time on the header.

Q Let me try to understand this. If you ask for the post-trip review, the computer would say post-trip review and give you what information?

A I am not sure exactly what the header says. The format of the output and the point numbers in each of the groups are the same.

Q Now, with the memory trip review, you specifically request that?

A Yes.

Q And the post-trip review, the light goes on and you just say, "Hey, I will take the information"?

A Right.

Q So that if the memory trip function were being used, there would be some entry on the printout saying what, what would appear there?

A Some entry where?

Q How could you identify the memory trip review, would there be some typed entry on the printout?

A There should be on the header, yes, there should be something to distinguish between the two.

Q Just looking at this page 1 of 6, it is called the memory trip review. Can you determine whether that is the memory trip review or the post-trip review there?

A It looks like a post-trip review to me because of the time of trip line in here.

Q You are pointing to those stars?

A Yes.

Q What would you see there if it were the memory trip review function?

A You wouldn't have a trip line defined and I think it's probably just called memory review.

MR. KATCOFF: Can you describe the document

for the record, please.

MR. WURTZ: Yes. This is one page from the day of the accident. It is called page 1 of 6 and it has a number that says E19726.

Q So the trip line with the asterisks identifies that and though it has the word "memory trip review" on it, it is really the post-trip review function?

A That's true.

MR. WURTZ: I would like to mark these documents so that we will have a record of which ones we had here for this proceeding, although we will not take them nor will the reporter because I realize in one case, anyhow, it is the only printout?

THE WITNESS: That's true.

MR. WURTZ: So you can have it copied but we will have the reporter's stamp on it just so we know what it is.

(Binder entitled "Unit II Computer BOP Input Specs 2/79" marked B&W Exhibit No. 330 for identification, as of this date.)

Q Exhibit 330, as I understand it, is a complete list of NOVA inputs as of the day of the

accident, is that correct?

A That's correct.

(Two-volume document entitled "NOVA BOP TMI Unit II, W. Fels" marked B&W Exhibit No. 331 for identification, as of this date.)

MR. WURTZ: As Exhibit 331, we have two volumes; one is 2761-2-1 and 2761-3-1.

Q Mr. Fels, as I understand it, these two volumes constitute the total software description for NOVA as of the day of the accident, is that correct?

A That's correct.

(Two-volume document entitled "Three Mile Island, Unit II, Balance of Plant Software, Volume 1, Revision 1, February 1978" and "Volume 2, Revision 1, 1978" marked B&W Exhibit No. 332 for identification, as of this date.)

MR. WURTZ: Exhibit 332 consists of two volumes prepared by the Macro Corporation, Revision 1 dated February 1978 entitled "Three Mile Island, Unit II, Balance of Plant Software."

Q As I understand it, Mr. Fels, these two volumes are the NOVA system description, is that correct?

A That's true.

Q These volumes actually describe the NOVA as it existed on the day of the accident?

A Yes.

MR. WURTZ: Off the record.

(Discussion off the record.)

(Binder entitled "Unit II Computer PID - Bailey Point Input List - Bailey" marked B&W Exhibit No. 333 for identification, as of this date.)

(Blue binder entitled "Unit II Computer FCC" marked B&W Exhibit No. 334 for identification, as of this date.)

Q Exhibits 333 and 334 are Bailey computer input lists, is that correct, Mr. Fels?

A This one is an input list.

Q Exhibit 333 is an input list?

A That's correct.

Q I see a revision date there of January 3, 1978, is that correct?

A Yes.

Q As I understand it, any revisions after January 3, 1978 are written on the pages in Exhibit 333?

A That is true.

Q So that Exhibit 333 represents a complete

listing of the Bailey inputs as of the day of the accident?

A That is true.

Q Could you identify Exhibit 334?

A 334 is the functional computer C software in the Bailey.

Q What is the revision date on that?

A 1/16/78.

Q If there were any revisions after January of 1978 up to the time of the accident, would those be recorded in Exhibit 334?

A Yes.

Q So that Exhibit 334 in fact is a complete software description for the Bailey as of the day of the accident?

A For that functional computer, yes.

MR. WURTZ: There are certain additional materials we request. Mr. Fels may be able to assist in locating them quickly.

One would be the current alpha listing being used.

MR. KATCOFF: Current, you mean 3/28/79?

MR. WURTZ: The one in effect as of the day of the accident.

The second document needed to identify the user area software programs, and then we would, after reviewing that, request certain programs, perhaps, I don't know, I would have to see what is there.

Third, it would be helpful if we could get some photographs of the console.

I guess we are finished.

Thank you, Mr. Fels.

(Time noted: 12:55 p.m.)

William Fels

Subscribed and sworn to before me
this day of 198 .

C E R T I F I C A T E

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

I, NANCY A. RUDOLPH, a Notary Public within and for the State of New York, do hereby certify that the foregoing deposition of WILLIAM FELS was taken before me on Thursday, December 3, 1981;

That the said witness was duly sworn before the commencement of his testimony and that the within transcript is a true record of said testimony;

That I am not connected by blood or marriage with any of the parties herein 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 4th day of December, 1981.

NANCY A. RUDOLPH

I N D E X

E X H I B I T S

* * *

UNITED STATES DISTRICT COURT

SOUTHERN DISTRICT OF NEW YORK

GENERAL PUBLIC UTILITIES CORPORATION, JERSEY CENTRAL POWER & LIGHT COMPANY, METROPOLITAN EDISON COMPANY and PENNSYLVANIA ELECTRIC COMPANY,	
Plaintiffs,	80 Civ. 1683 (RO)
-against-	AFFIDAVIT
THE BABCOCK & WILCOX COMPANY and McDERMOTT INC.,	
Defendants.	

STATE OF PENNSYLVANIA)
: ss.:
COUNTY OF DAUPHIN)

I have read the transcript of my deposition taken on December 3, 1981 and together with the attached corrections, it is accurate to the best of my knowledge and belief.

William J. Fels
William J. Fels

Signed and sworn to before me this

15th day of ~~August~~ September, 1982.

Barbara A. Rote, Notary Public
East Hempfield Twp., PA Lancaster County
My Commission Expires August 22, 1983

Barbara A. Rote
Notary Public

Corrections to Deposition of William J. Fels

December 3, 1981

Page	Line	Correction
5	10	"processes connected to cables in the computer" should read "processes is connected by cables to the computer"
5	15	"that checking" should read "the input checking"
5	24	"enunciator" should read "annunciator"
7	17	"that" should read "this"
7	21	"system in" should read "system, in"
23	23	"taking" should read "tagging"
27	24	"route" should read "root"
30	9	"unit" should read "user"
34	11	delete "because"
34	17	"doing" should read "during"
36	5	"enunciator" should read "annunciator"
36	8	"enunciator" should read "annunciator"
36	10	"as there" should read "as, there"
36	11	"group, there" should read "group, and"
36	14	"availability" should read "ability"
36	15-16	"an alarm display by pushing the the appropriate buttons and a limit display" should read "an alarm display and a limit display, by pushing the appropriate buttons."
36	19	"enunciator" should read "annunciator"

Page	Line	Correction
36	22	"enunciator" should read "annunciator"
36	23	"enunciator" should read "annunciator"
37	10	"enunciator"should read "annunciator"
37	12	"enunciator" should read "annunciator"
37	14	"enunciator" should read "annunciator"
37	25	"enunciator" should read "annunciator"
38	2	"limit request is" should read "limit request, it is"
39	8	"enunciator" should read "annunciator"

B&W EXHIBIT 329 FOR IDENT
12/3/81 N. A. RUDOLPH

RESUME

WILLIAM JOHN FELS

Address: RD #2 Rhoda Avenue
Mt. Joy, Penna. 17552

Birthdate: 2/6/44
(Married/3 Dependents)

Phone: (717) 653-8292

EDUCATION

Diploma	Electronics Technology	1960 RCA Institutes, Inc.
AAS Rank	Electronics Technology Top Third	1966 Pennsylvania State Univ.
BS Rank	Electrical Engineering Top Third	1971 Tri-State College
Certificate	Prodac 250 Maintenance	1972 Westinghouse
Diploma	GE EHC Large Turbines	1972 General Electric
Certificate	Management & Supervisory Seminar	1975 Indiana & Michigan Power Company
Certificate	Bailey 855 Computer Maintenance	1976 Bailey Meter Company
Certificate	Microprocessor Seminar	1977 American Institute
Certificate	Nova Series Computer Maintenance and Assembly Programming	1977 Data General Corp.
Certificate	Basic Supervisory Development	1978 Metropolitan Edison Company
Certificate	Engineer in Training (EIT)	1978 Pennsylvania Professional Engineering Review Board
Certificate	Computer Graphics	1979 Integrated Computer Systems, Inc.
Certificate	Max IV Assembly Language Programming	1980 Modular Computer Systems
Certificate	Max IV Operating Systems Users	1980 Modular Computer Systems

EXPERIENCE

10/79 to Present GPU Service Corporation

Promoted to Engineer Senior I after transfer to parent corporation of Metropolitan Edison Company. Duties included: Participation in system upgrade to TMI Unit 1 Plant Process Computer. Replaced existing printers with modern printers; from conception through design and fabrication of a microprocessor (Motorola 6800) interface with the Bailey 855 computer. Performed industry survey of multiplexing and remote multiplexing equipment for expansion and replacement of the existing front end equipment. Worked with software consultant to rectify problems with the data acquisition software to implement that software on a Mod Comp Classic computer.

1/76 to 10/79 Metropolitan Edison Co./GPU Service Corp.

1/76 to 10/79 -- Engineer II (Nuclear). Duties included: Organization and implementation of Standard Technical Specification requirements as applied to Plant Surveillance Procedures. Included identification of requirements and authorship of some of the procedures. Supervised field input checkout of large process computer (Bailey 855). This entailed test procedure generation, supervision of bargaining unit technicians and implementation of any required hardware or software changes. Started system design to replace existing process computer with a new system. Worked with A/E on necessary facilities design changes.

9/71 to 12/75 Indiana & Michigan Power Company (Cook Nuclear Plant)

3/73 to 12/75 -- Assistant Control and Instrumentation Engineer. Duties included: Direct supervision of approximately 20 technicians, all of the below, and responsibility for conducting some of the plant preoperational tests in a safe and complete manner. Was called upon to do trouble shooting on most sophisticated electronic control and test equipment.

9/71 to 3/73 -- Performance Engineer. Duties included: Large process computer installation, check out and operational maintenance, control systems testing for large diesel generator unit, automatic testing for solid state protection system, and computerized events recorder. Occasional direct supervision of Instrumentation Technicians, also made several engineering studies on technical systems. Designed and fabricated lake temperature monitoring system.

12/69 to 8/71 Arkwright's TV
Angola, Indiana

Duties:

Service Technician: Did trouble shooting and repair work on the following types of equipment: radios, television receivers, phonographs, radio control units, and some CB equipment. Also some sales and customer relations. During this time span, I was attending Tri-State College (BSEE).

EXPERIENCE (Continued)

6/66 to 8/69 Eastman Kodak Company
Rochester, New York

Duties:

Engineering Technician. Assisted senior design engineer in development of electronic servo system. This work involved the use of both linear and digital IC's. Spent some time working in the high frequency screen room on EMI research. Also worked one year in the Quality Control Group and had the responsibility for initial checkout and maintenance of large automatic test console, including the generation of numerical control tapes used with the console.

SUMMARY

Also worked 1½ years after graduating from high school as a Nasa Certified Assembler with RCA. Have spent 9 years in two different nuclear power plants and had responsibilities for installation, maintenance, and startup of the Plant Process Computers in both. In addition, I have supervisory experience with both bargaining unit and exempt personnel. Away from work I enjoy raquetball, occasional golf, and home remodeling.