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OFFICIAL TRANSCRIPT OF PROCEEDINGS

Agency: Nuclear Regulatory Commission
Incident Investigation Team

Title: Interview of Faust Rosa

Docket No.

LOCATION: Bethesda, Maryland

DATE: Friday, August 30, 1991 PAGES: 1 - 22

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ERRATA SHEET

ADDENDUM

Page	Line	Correction and Reason for Correction
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Date 9/20/91 Signature Janet Rosa

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2 UNITED STATES OF AMERICA

3 NUCLEAR REGULATORY COMMISSION

4 INCIDENT INVESTIGATION TEAM

5

6

7 INTERVIEW OF)

8)

9 FAUST ROSA)

10)

11

12 Nuclear Regulatory Commission

13 The Woodmont Building

14 8120 Woodmont Avenue

15 Bethesda, Maryland

16

17 Friday, August 30, 1991

18

19 The above-entitled interview convened, pursuant to

20 notice, in closed session at 10:06 a.m.

21

22 PARTICIPANTS:

23 JOSE IBARRA, NRC/IIT Team

24 JIM STONER, NRC/IIT Team

25

1 P R O C E E D I N G S

2 MR. IBARRA: This is Jose Ibarra. I'm part of the
3 IIT team and this morning we're going to be interviewing
4 Faust Rosa. With me also conducting the interview is Jim
5 Stoner.

6 Faust, if you would please state your name and
7 your position with the NRC.

8 MR. ROSA: My name is Faust Rosa and I am the
9 chief of the electrical systems branch, a division of
10 systems technology in NRR.

11 MR. IBARRA: Faust, can you describe the
12 involvement your group would have had in licensing of the
13 Nine Mile Point Unit 2.

14 MR. ROSA: My group would have reviewed all the
15 electrical power distribution systems, both AC and DC,
16 including the required offsite power circuits and the onsite
17 emergency distribution system, the diesel generators,
18 batteries and so forth.

19 MR. IBARRA: How much depth is put into the power
20 supplies, to what extent -- let's say both safety-related
21 and nonsafety-related?

22 MR. ROSA: Well, basically we have to assure
23 ourselves that the GDC and other supporting regulatory
24 guides and branch positions are met with regard to these
25 systems.

1 As far as the offsite power supply is concerned
2 and the onsite emergency supply, GDC-17 is the primary
3 criteria. We make sure that the two circuits called for by
4 GDC-17 from offsite power to the safety buses are available,
5 that one of them is available immediately following an
6 accident and the other one can be brought into play within a
7 short time, a matter of minutes.
8 MR. IBARRA: Can you describe to me the
9 differences between what kind of review one would put on 1-E
10 versus non 1-E?
11 MR. ROSA: Oh, 1-E is a much more intensive
12 review. We make sure that divisional separation is
13 maintained between the two primary divisions in BWRs, the
14 three primary divisions, and between the power provided to
15 the vital buses, usually four divisions of vital
16 instrumentation that are required for reactor protection and
17 engineer safety features actuation.
18 We don't go beyond making sure, for instance, that
19 division A inverters are fed from division A power
20 distribution system from the diesel generator bus of
21 division A all the way down. LIkewise in division B. We
22 don't get into the internals of something like an inverter
23 beyond making sure that perhaps its capacity, its rated
24 capacity, is sufficient for the load and that it's got a DC
25 input as well as an AC input and there is some means of

1 transferring from one to the other whenever the AC fails.

2 MR. STONER: Is there any difference in the extent

3 of your review for nonsafety systems if they're just

4 classified as not important to safety versus those that may

5 be classified as important to safety yet both are nonsafety-

6 related?

7 MR. ROSA: Well, I guess we view all nonsafety

8 electrical systems as having some importance to safety so we

9 don't make a distinction in a nonsafety area as to some

10 being more important than others.

11 For instance, about the only thing we get into in

12 nonsafety systems is now to make sure that there is a DC

13 system that's nonsafety that can take care of some of the

14 heavy DC loads, like the oil lift pumps for the turbine and

15 some of the other loads that early on in the nuclear

16 regulatory game were often fed from the safety DC systems.

17 Licensees have gotten away from that.

18 Beyond that, we make sure that there is no

19 inadvertent feeding of a class 1-E or a safety system from a

20 non class 1-E distribution system without there being some

21 manual actions required.

22 We know that safety inputs -- nonsafety inputs to

23 say inverters are available by means of manual switching.

24 Likewise on the battery chargers there is

25 sometimes nonsafety inputs provided with appropriate manual

1 switching.

2 Those are strictly controlled administratively and

3 they are only intended to be used when, say, the safety

4 inputs have failed for some reason and it's necessary to go

5 on a nonsafety.

6 Also these are used during maintenance, called

7 maintenance feeds for these safety systems.

8 MR. IBARRA: Reg Guide 1.97 calls for a reliable

9 power source which the AC is taken to be or to meet that, to

10 be on UPS. I mean I guess we accept that.

11 Have you all ever assisted in any way in some of

12 those determinations?

13 MR. ROSA: Well, Reg Guide 1.97 identifies the

14 required instrumentation as I think in three categories, or

15 maybe it's two.

16 MR. IBARRA: Two.

17 MR. ROSA: Two categories and the safety-related

18 ones are all fed -- are supposed to be fed from class 1-E

19 supplies. The others may be fed from non class 1-E

20 supplies.

21 I guess the basic assumption in our review is that

22 non class 1-E equipment in systems are provided and designed

23 to conservative industry standards and we rely on that to

24 get us the degree of reliability of nonsafety systems.

25 MR. IBARRA: What is the cutoff from, let's say

1 your -- the electrical responsibility and the IC --
2 instrument control. Where is the cutoff -- 120 or typically
3 how is that defined?
4 MR. ROSA: Well we look at the circuits, for
5 instance in this case here, all the way down to the
6 inverters. In the case of DC, all the way down to the
7 battery chargers and the DC buses and the loads on the DC
8 buses.
9 Beyond the inverters, there is the vital buses
10 that the inverter feeds and we follow it all the way down to
11 there.
12 At about that point where the power is fed to
13 individual instrument power supplies, that's I&C.
14 MR. IBARRA: In your review after Three Mile
15 Island, have you all had any inputs into the EOPs at all,
16 any electrical input?
17 MR. ROSA: No.
18 MR. IBARRA: What are the requirements or the
19 guidelines that the agency currently has, let's say on UPS
20 hardware or any UPS related equipment, and let's say
21 nonsafety-related?
22 MR. ROSA: Good conservative industry standards is
23 about all that we require. It's assumed that the licensee
24 will provide that for his own economic interest and in
25 general I'd say they have followed through on that. I don't

1 know of any slipshod type design or equipments that have
2 been supplied by -- Some may have gotten through
3 inadvertently but as a general rule nonsafety-equipment is
4 good conservative industry practice in equipment.
5 MR. IBARRA: Are there any guidelines that are
6 used or regulations that would specify the loading on some
7 of these nonsafety-related UPS?
8 MR. ROSA: Only to the extent that the UPS or any
9 other power supply has to have the capacity to power its
10 required loads, with some little margin. We expect a little
11 bit of margin, not -- A design that just exactly meets the
12 load requirements is looked on as being kind of
13 questionable.
14 MR. IBARRA: Since the number of UPS is a set
15 number for most utilities, is there a concern that they
16 might not distribute the loads correctly -- in other words,
17 they put all their eggs on one UPS versus maybe distributing
18 it?
19 MR. ROSA: You're talking nonsafety?
20 MR. IBARRA: Nonsafety.
21 MR. ROSA: I couldn't identify the specific plants
22 but I think that has been observed in the past, over the
23 past 20 years that I've been involved in this business, a
24 number of times, a few times, and when that has been
25 observed as I recall the loads have been redistributed so as

1 to get out of vulnerabilities that were recognized.

2 MR. IBARRA: As far as preventive maintenance on

3 any of the nonsafety-related UPS, are there any guidelines

4 on that?

5 MR. ROSA: There again we rely on good

6 conservative industry practices and we assume that the

7 licensees will follow them.

8 Now I might add one thing there. You know, we

9 have been conducting electrical distribution system

10 functional inspections -- EDSFIs -- and those inspection

11 teams look at both the safety and nonsafety distribution

12 systems and equipment and also look into the maintenance

13 practices.

14 Now about a year ago I received a request from the

15 division of systems inspection, I guess it is -- Bryan

16 Grimes' division -- to provide them with some guidance as to

17 what EDSFIs should look at with regard to maintenance

18 practices. We initiated a contract to develop this

19 guidance.

20 It just so happens that the final package, a

21 report issued by SAIC -- Safety Applications International

22 Corporation -- submitted and we formally submitted it to

23 Bryan Grimes within this past week.

24 It contains what the consensus of good preventive

25 maintenance practices are throughout the industry. It's

1 based on -- the report is based on manufacturers'
2 recommendations, utility practices as ASIC identified them,
3 I-EEE standards, I think NEMA standards and other
4 authoritative publications and documents in that area.
5 MR. IBARRA: The EDSFI, have they found anything
6 interesting for, let's say, UPS that you are aware of?
7 MR. ROSA: No. I don't recall any UPS items
8 coming out of the EDSFIs.
9 MR. IBARRA: What are the agency requirements and
10 guidelines on transformers, main transformers?
11 MR. ROSA: Main transformers? There again we
12 expect that the licensee will supply the best possible
13 transformer he can get commercially. You know, without a
14 good transformer, he doesn't make any money on his plant.
15 Beyond that, we expect that he will provide the
16 protective relaying necessary to make sure that the
17 transformer is protected in the event of faults either in
18 the transformer or on the system either upstream or
19 downstream, and that he follows the best maintenance
20 practices available. That's about it.
21 MR. STONER: Were you aware of any main stepup
22 transformer failures at other nuclear power plants similar
23 to the Nine Mile 2 event?
24 MR. ROSA: Oh, yeah. North Anna had a whole
25 series of main transformer failures on single phases. They

1 also had three single-phase transformers making up the main
2 output transformer and they had a series of faults in one of
3 those transformers, not the same one but I understand that
4 that's been corrected.
5 That was some years ago and there have been other
6 main transformer failures also. I can't recall the plants
7 right now but I'm sure there has.
8 MR. STONER: Do you recall whether during any of
9 these events there was any unexplained tripping or failure
10 of other equipment within the plant which was attributed to
11 the fault in the transformer?
12 MR. ROSA: No. Right offhand I couldn't give you
13 any details on that. There may have been.
14 MR. IBARRA: There were a lot of consultants
15 looking at the transformer at Nine Mile Point and a lot of
16 experience, a lot of years, and some of them said that
17 sometimes it is impossible to determine the root cause of
18 the fault.
19 Is that a statement that you would agree with or
20 what's your thoughts on that?
21 MR. ROSA: Well, I'd have to agree with that.
22 Sometimes you just can't determine a root cause. You know,
23 it could be a manufacturing defect, materials defect in the
24 winding or the insulation.
25 It could be insulating oil contamination. If

1 there were a series of tests made on the oil in the course
2 of preventive maintenance, that indicates that there was a
3 degree of contamination in the oil and that would lead to
4 something. You might be able to draw a conclusion about the
5 root cause.
6 But if it was a materials or a manufacturing
7 defect within the lining, I don't see how the heck you could
8 arrive at the cause given that usually things are pretty
9 well disrupted when one of those failures occurs.
10 MR. IBARRA: Is it possible to -- If there was
11 enough records on their maintenance, regular maintenance
12 that they do, like the oil analysis, gas analysis, measure
13 of temperature readings and so forth, could we draw a
14 precursor to an event like this?
15 MR. ROSA: Well --
16 MR. IBARRA: Can that tell you --
17 MR. ROSA: I guess the intent of good preventive
18 maintenance and all the testing that's done on the oil and
19 temperature readings and so forth is all intended to alert
20 licensees that something is wrong and whenever there is an
21 indication like that, then certainly some action should be
22 taken.
23 Sometimes licensees may be a little reticent to
24 shut down if one of those indications is sort of marginal.
25 I can understand that. It's strictly up to their own

1 judgment.

2 MR. IBARRA: On the monitoring of the voltages on

3 the plant site, is it common to have oscillographs and any

4 sort of instrumentation monitoring that?

5 MR. ROSA: Well, I understand that some plants

6 have it and others don't. We don't make any requirements

7 along that line.

8 MR. IBARRA: Jim?

9 MR. STONER: Do you know which groups within the

10 NRC, if any, would have been expected to know that the loss

11 of a single UPS system would cause a plant to trip due to

12 loss of feedwater and loss of control rod position and loss

13 of annunciators?

14 MR. ROSA: If you're talking about a trip of a

15 single nonsafety UPS, I don't know that anyone goes into it

16 in detail.

17 If anyone looked at it at all, it would be I&C,

18 the I&C branch, but keep in mind that there are no

19 requirements for meeting single failure in the nonsafety

20 systems.

21 If it's possible to get a design that's single

22 failure proof, it's a darned good thing to implement and I

23 would expect licensees might have looked at that. Perhaps

24 some of them have implemented it but to my knowledge we

25 don't insist on it or I think even look at it.

1 MR. IBARRA: There is nobody in the agency that
2 would look at the implications of the configuration of some
3 systems?
4 We look at the if they're safety-related, but if
5 they're not safety-related there is no group that actually
6 looks after that or is the ---
7 MR. ROSA: To my knowledge, there is no group that
8 looks at it. We do look at nonsafety systems as from the
9 grid on down to the safety buses and including the
10 intervening nonsafety systems with regard to the degraded
11 grid voltage concern.
12 You know, licensees are required to meet -- excuse
13 me -- branch position PSB-1, which states that given the
14 lowest voltage on the grid and the worst case loading in the
15 plant, your voltage at the downstream buses all the way down
16 to the 120 volts should be within the normal voltage range
17 which is 90 percent.
18 Likewise for the top of the grid voltage, too.
19 The downstream voltages should not exceed 110 percent, which
20 is what is normally called for.
21 We look at that and all licensees have come in and
22 said that in fact that's the case and they have installed
23 under voltage relays to trip the plant should you get below.
24 I think the first level gives you an alarm and
25 then five minutes later there's an automatic disconnection

1 from the grid.

2 Now there are some exceptions taken to that,

3 particularly in the northeast where the grid is kind of

4 tight and we do allow operator action to do the

5 disconnecting.

6 Right now we are finding that there are some other

7 plants where load growth on the system as well as in the

8 plant has now made their under-voltage trip setpoints no

9 longer adequate and we are in the process of looking at

10 that.

11 That's the only extent that we look at in great

12 detail in the nonsafety distribution system.

13 MR. IBARRA: The investigation of course is still

14 going on and we're in the data-gathering mode and almost

15 starting to think about that data and trying to digest what

16 happened. Basically, there was a transformer fault and

17 there were some UPS problems.

18 From what you know of the event, what concerns you

19 electrically or what would be your concerns?

20 MR. ROSA: Well, when the event first occurred,

21 myself and my two section chiefs and my boss, Ashok Thadani,

22 discussed this.

23 I suggested that it might be a problem of the

24 phase relationship of the inputs, particularly the sync

25 circuit input to the UPSs and the phase that had to follow.

1 I don't know whether that's been substantiated or not. I've
2 heard rumors to that effect. That's the only thing I can
3 think of.
4 Faults will occur on a main transformer as well as
5 on auxiliary transformers, both unit auxiliaries and
6 startup, and to try to distribute UPS inputs such that they
7 wouldn't all be vulnerable to a particular fault is a
8 difficult problem.
9 I really don't know what can be done about it.
10 It's possible that something might be done. If for
11 instance, in this case here it was determined that, yes, a
12 fault on this phase caused five UPSs to fail because the
13 control inputs to those UPSs all included that particular
14 phase, something might be done to distribute the control
15 inputs to the various UPSs so that they don't all have the
16 same phase input. Beyond that, I don't know.
17 MR. IBARRA: Jim, any more questions?
18 MR. STONER: Has your experience shown that the
19 propagation of high frequency disturbances from the
20 nonsafety systems to the class 1-E systems has been or is a
21 problem?
22 MR. ROSA: No, I'm not aware that it's a problem.
23 I'm aware that this sometimes happens. You can't tell what
24 a fault will generate, a fault or a lightning strike got in
25 the switchyard or something like that, but I'm not aware of

1 any significant damage that's been done.

2 We've had failures of some instrumentation due to

3 lightning strikes and usually, you know, the only fix for

4 that is to provide better lightning protection, especially

5 for the containment building and the switchyard. Not much

6 else you can do.

7 MR. IBARRA: Any other questions?

8 MR. STONER: Do you know of any other questions we

9 should have asked or do you have anything that you're aware

10 of that perhaps you would like to talk about?

11 MR. IBARRA: And to narrow it down, Faust, maybe

12 about transformers or UPS -- The event itself is not --

13 it's complicated. I don't know if we will ever know what

14 really happened but we do know that there was a fault and

15 that the UPS went down. That's known and now what caused

16 that, that's why we're here.

17 MR. ROSA: I can think of one thing with regard to

18 control inputs to the UPS systems, or maybe even the AC

19 power.

20 You know, there are surge suppressing reactors

21 that can be put in series with those inputs that allow 60

22 cycles to pass without any attenuation but will be quite

23 effective in suppressing any surges or higher frequencies.

24 That might be a possible solution to something like this

25 event.

1 As far as transformers are concerned, you know, a
2 very rigorous preventive maintenance program and protective
3 relaying scheme is what's called for.
4 If I may add a personal view about equipments like
5 the main generator, the main transformer and the switchyard
6 connections to the plant and so forth, it's my view that the
7 licensee should be more interested in obtaining the best
8 equipment possible and maintaining it in the best way that
9 he can for his own economic considerations.
10 There is very little that we as a regulatory
11 agency can do to make him improve that. If his own economic
12 concerns don't work, there is something wrong with the
13 licensee.
14 What else is there to do? IITs that investigate
15 things like this are very useful in that it focuses
16 attention on these things and certainly the rest of the
17 industry will become aware of what's going on and to that
18 extent it's good, but from then on they have to take the
19 initiative to do the fixes that need to be done, if any need
20 to be done in their own system. That's my view.
21 MR. IBARRA: On the power coming out, the AC
22 coming out of UPS, is the quality any different if it's from
23 the battery or if it's from the AC source? Do you know?
24 MR. ROSA: It's my understanding that three-phase
25 AC input, power input, to the UPS is first rectified and I

1 would expect that the filtering at the output of that
2 rectifier makes the DC output of that rectifier essentially
3 the same as the battery or close enough that the AC output
4 shouldn't be affected.
5 MR. IBARRA: For systems that are configured where
6 you have not only the battery and the normal AC supply but
7 you also have an alternate, let's say a maintenance supply,
8 do you still see any difference whatsoever coming out of the
9 UPS unit? Should the quality be any different of the AC?
10 MR. ROSA: No, it shouldn't be any different.
11 There may be a little bit of a difference but if there is it
12 should be within normal --
13 MR. IBARRA: Tolerances?
14 MR. ROSA: -- variations.
15 MR. IBARRA: After Three Mile Island there was a
16 lot of concern with an integrated approach to the whole
17 instrumentation and power distribution of let's say a
18 utility.
19 Since those years, have you seen any changes that
20 the agency has done in order to integrate the human factors
21 with instrumentation, with power supplies and so forth?
22 MR. ROSA: I think a lot has been done since Three
23 Mile Island. First of all, a whole bunch of design changes
24 were promulgated by Three Mile Island, particularly with
25 regard to the availability of safety-related power to

1 various instruments and various nonsafety components, like
2 the pressurized heaters, for instance.
3 The designs of the auxiliary feedwater system was
4 beefed up considerably as a result of Three Mile Island, and
5 operator training, EOPs and so forth, I think all of those
6 were the result of Three Mile Island, the operator training
7 with simulators and so on.
8 Yeah, I think there has been a lot of advances
9 made since then and all of these advances, plus a little bit
10 more, I think, have been reflected in the proposed advanced
11 light water reactor designs that we're reviewing now, the
12 evolutionary as well as passive.
13 One of the major advances that I can point to is
14 the generator breakers, main generator breakers. Now all
15 the advanced designs provide the main generator breaker so
16 that a plant trip will only require that the main generator
17 breaker is open and there is no loss of power to anything
18 else, given no other failure of course.
19 The loss of power to the nonsafety as well as the
20 immediate loss of power to the safety loads in present
21 designs is mostly due to generator trips for whatever
22 reason. If the automatic transfer of power to another
23 transformer doesn't occur -- and even if it does occur you
24 have a momentary loss there so that's a big advantage.
25 The DC systems of advanced designs are much, much

1 improved. More batteries, additional nonsafety batteries
2 that can be connected into a safety bus, for instance,
3 during equalizing charge of the safety battery.
4 In the existing designs, if you don't have a
5 battery to connect in during equalizing charge, you have to
6 over-voltage some of the equipment and in that case there
7 special equipment has to be bought that can take the for
8 instance 149 volts or 145 volts where normally the buses are
9 at 120, 125.
10 That sort of thing I think was partly a result of
11 the Three Mile Island incident.
12 MR. STONER: You mentioned EOPs, do you get
13 involved in the review of EOPs?
14 MR. ROSA: We have looked at some EOPs but --
15 that's my branch -- but not in great detail. EOPs look at
16 operating procedures with respect mostly to fluid systems
17 operation, plant parameters and given the condition there
18 actions are taken.
19 It's assumed in EOPs that the power systems are
20 available. Now there are EOPs that assume, you know, losses
21 of power to a bus, for instance, we know that, but loss of
22 power say to a safety bus, if the diesel generator starts
23 that's fine, you can go ahead normally.
24 If the diesel generator doesn't start, as far as
25 the electrical systems are concerned there are only a few

1 steps that can be taken given the design. You either have
2 another circuit from outside power that might be available
3 or you take steps to start the diesel generator or, in a few
4 cases where there's a crosstie available to the other safety
5 bus, if it's necessary to use that crosstie you would have
6 EOPs to cover the few steps that are necessary to do that.
7 Primarily EOPs look at plant parameters and
8 conditions and specify what actions have to be taken and we
9 don't get too involved in that.
10 MR. IBARRA: Faust, who takes care of
11 environmental qualification of electrical equipment?
12 MR. ROSA: Well, right now I believe the plant
13 systems branch has some mechanical engineers that look at
14 environmental qualifications.
15 Up until probably 1985, the qualification of --
16 environmental qualification of electrical equipment was done
17 by the electrical system branches.
18 You know, back in those days we had electrical,
19 instrumentation and control all in one branch. Then we
20 split electric power in one and I&C in another branch.
21 At about the time of that original split, the environmental
22 qualification went to plant systems branch.
23 MR. IBARRA: Are you all asked for help often in
24 this area or is it pretty well set?
25 MR. ROSA: No, sometimes we are asked for help.

1 We're asked for help in evaluating tests that may have been
2 performed to establish environmental qualification, say for
3 an accident condition or something like that. Cables,
4 primarily.
5 MR. IBARRA: Never ending, right?
6 MR. ROSA: Never ending, yeah.
7 MR. IBARRA: Jim, any more questions?
8 MR. STONER: I can't think of anything else at
9 this time.
10 MR. IBARRA: Okay, thank you, Faust.
11 MR. ROSA: Okay, feel free to call me if
12 necessary.
13 (Whereupon the matter concluded at 10:47 a.m.)
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REPORTER'S CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission

in the matter of:

NAME OF PROCEEDING: IIT Interview of Faust Rosa

DOCKET NUMBER:

PLACE OF PROCEEDING: Bethesda, Maryland

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Marilyn Estep

Official Reporter
Ann Riley & Associates, Ltd.

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OFFICIAL TRANSCRIPT OF PROCEEDINGS

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Date 9/20/91 Signature Frank Rosa

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2 MR. IBARRA: This is Jose Ibarra. I'm part of the
3 IIT team and this morning we're going to be interviewing
4 Faust Rosa. With me also conducting the interview is Jim
5 Stoner.

6 Faust, if you would please state your name and
7 your position with the NRC.

8 MR. ROSA: My name is Faust Rosa and I am the
9 chief of the electrical systems branch, a division of
10 systems technology in NRR.

11 MR. IBARRA: Faust, can you describe the
12 involvement your group would have had in licensing of the
13 Nine Mile Point Unit 2.

14 MR. ROSA: My group would have reviewed all the
15 electrical power distribution systems, both AC and DC,
16 including the required offsite power circuits and the onsite
17 emergency distribution system, the diesel generators,
18 batteries and so forth.

19 MR. IBARRA: How much depth is put into the power
20 supplies, to what extent -- let's say both safety-related
21 and nonsafety-related?

22 MR. ROSA: Well, basically we have to assure
23 ourselves that the GDC and other supporting regulatory
24 guides and branch positions are met with regard to these
25 systems.

1 As far as the offsite power supply is concerned
2 and the onsite emergency supply, GDC-17 is the primary
3 criteria. We make sure that the two circuits called for by
4 GDC-17 from offsite power to the safety buses are available,
5 that one of them is available immediately following an
6 accident and the other one can be brought into play within a
7 short time, a matter of minutes.
8 MR. IBARRA: Can you describe to me the
9 differences between what kind of review one would put on 1-E
10 versus non 1-E?
11 MR. ROSA: Oh, 1-E is a much more intensive
12 review. We make sure that divisional separation is
13 maintained between the two primary divisions in BWRs, the
14 three primary divisions, and between the power provided to
15 the vital buses, usually four divisions of vital
16 instrumentation that are required for reactor protection and
17 engineer safety features actuation.
18 We don't go beyond making sure, for instance, that
19 division A inverters are fed from division A power
20 distribution system from the diesel generator bus of
21 division A all the way down. LIkewise in division B. We
22 don't get into the internals of something like an inverter
23 beyond making sure that perhaps its capacity, its rated
24 capacity, is sufficient for the load and that it's got a DC
25 input as well as an AC input and there is some means of

1 transferring from one to the other whenever the AC fails.

2 MR. STONER: Is there any difference in the extent

3 of your review for nonsafety systems if they're just

4 classified as not important to safety versus those that may

5 be classified as important to safety yet both are nonsafety-

6 related?

7 MR. ROSA: Well, I guess we view all nonsafety

8 electrical systems as having some importance to safety so we

9 don't make a distinction in a nonsafety area as to some

10 being more important than others.

11 For instance, about the only thing we get into in

12 nonsafety systems is now to make sure that there is a DC

13 system that's nonsafety that can take care of some of the

14 heavy DC loads, like the oil lift pumps for the turbine and

15 some of the other loads that early on in the nuclear

16 regulatory game were often fed from the safety DC systems.

17 Licensees have gotten away from that.

18 Beyond that, we make sure that there is no

19 inadvertent feeding of a class 1-E or a safety system from a

20 non class 1-E distribution system without there being some

21 manual actions required.

22 We know that safety inputs -- nonsafety inputs to

23 say inverters are available by means of manual switching.

24 Likewise on the battery chargers there is

25 sometimes nonsafety inputs provided with appropriate manual

1 switching.

2 Those are strictly controlled administratively and

3 they are only intended to be used when, say, the safety

4 inputs have failed for some reason and it's necessary to go

5 on a nonsafety.

6 Also these are used during maintenance, called

7 maintenance feeds for these safety systems.

8 MR. IBARRA: Reg Guide 1.97 calls for a reliable

9 power source which the AC is taken to be or to meet that, to

10 be on UPS. I mean I guess we accept that.

11 Have you all ever assisted in any way in some of

12 those determinations?

13 MR. ROSA: Well, Reg Guide 1.97 identifies the

14 required instrumentation as I think in three categories, or

15 maybe it's two.

16 MR. IBARRA: Two.

17 MR. ROSA: Two categories and the safety-related

18 ones are all fed -- are supposed to be fed from class 1-E

19 supplies. The others may be fed from non class 1-E

20 supplies.

21 I guess the basic assumption in our review is that

22 non class 1-E equipment in systems are provided and designed

23 to conservative industry standards and we rely on that to

24 get us the degree of reliability of nonsafety systems.

25 MR. IBARRA: What is the cutoff from, let's say

1 your -- the electrical responsibility and the IC --
2 instrument control. Where is the cutoff -- 120 or typically
3 how is that defined?
4 MR. ROSA: Well we look at the circuits, for
5 instance in this case here, all the way down to the
6 inverters. In the case of DC, all the way down to the
7 battery chargers and the DC buses and the loads on the DC
8 buses.
9 Beyond the inverters, there is the vital buses
10 that the inverter feeds and we follow it all the way down to
11 there.
12 At about that point where the power is fed to
13 individual instrument power supplies, that's I&C.
14 MR. IBARRA: In your review after Three Mile
15 Island, have you all had any inputs into the EOPs at all,
16 any electrical input?
17 MR. ROSA: No.
18 MR. IBARRA: What are the requirements or the
19 guidelines that the agency currently has, let's say on UPS
20 hardware or any UPS related equipment, and let's say
21 nonsafety-related?
22 MR. ROSA: Good conservative industry standards is
23 about all that we require. It's assumed that the licensee
24 will provide that for his own economic interest and in
25 general I'd say they have followed through on that. I don't

1 know of any slipshod type design or equipments that have
2 been supplied by -- Some may have gotten through
3 inadvertently but as a general rule nonsafety-equipment is
4 good conservative industry practice in equipment.
5 MR. IBARRA: Are there any guidelines that are
6 used or regulations that would specify the loading on some
7 of these nonsafety-related UPS?
8 MR. ROSA: Only to the extent that the UPS or any
9 other power supply has to have the capacity to power its
10 required loads, with some little margin. We expect a little
11 bit of margin, not -- A design that just exactly meets the
12 load requirements is looked on as being kind of
13 questionable.
14 MR. IBARRA: Since the number of UPS is a set
15 number for most utilities, is there a concern that they
16 might not distribute the loads correctly -- in other words,
17 they put all their eggs on one UPS versus maybe distributing
18 it?
19 MR. ROSA: You're talking nonsafety?
20 MR. IBARRA: Nonsafety.
21 MR. ROSA: I couldn't identify the specific plants
22 but I think that has been observed in the past, over the
23 past 20 years that I've been involved in this business, a
24 number of times, a few times, and when that has been
25 observed as I recall the loads have been redistributed so as

1 to get out of vulnerabilities that were recognized.

2 MR. IBARRA: As far as preventive maintenance on

3 any of the nonsafety-related UPS, are there any guidelines

4 on that?

5 MR. ROSA: There again we rely on good

6 conservative industry practices and we assume that the

7 licensees will follow them.

8 Now I might add one thing there. You know, we

9 have been conducting electrical distribution system

10 functional inspections -- EDSFIs -- and those inspection

11 teams look at both the safety and nonsafety distribution

12 systems and equipment and also look into the maintenance

13 practices.

14 Now about a year ago I received a request from the

15 division of systems inspection, I guess it is -- Bryan

16 Grimes' division -- to provide them with some guidance as to

17 what EDSFIs should look at with regard to maintenance

18 practices. We initiated a contract to develop this

19 guidance.

20 It just so happens that the final package, a

21 report issued by SAIC -- Safety Applications International

22 Corporation -- submitted and we formally submitted it to

23 Bryan Grimes within this past week.

24 It contains what the consensus of good preventive

25 maintenance practices are throughout the industry. It's

1 based on -- the report is based on manufacturers'
2 recommendations, utility practices as ASIC identified them,
3 I-EEE standards, I think NEMA standards and other
4 authoritative publications and documents in that area.
5 MR. IBARRA: The EDSFI, have they found anything
6 interesting for, let's say, UPS that you are aware of?
7 MR. ROSA: No. I don't recall any UPS items
8 coming out of the EDSFIs.
9 MR. IBARRA: What are the agency requirements and
10 guidelines on transformers, main transformers?
11 MR. ROSA: Main transformers? There again we
12 expect that the licensee will supply the best possible
13 transformer he can get commercially. You know, without a
14 good transformer, he doesn't make any money on his plant.
15 Beyond that, we expect that he will provide the
16 protective relaying necessary to make sure that the
17 transformer is protected in the event of faults either in
18 the transformer or on the system either upstream or
19 downstream, and that he follows the best maintenance
20 practices available. That's about it.
21 MR. STONER: Were you aware of any main stepup
22 transformer failures at other nuclear power plants similar
23 to the Nine Mile 2 event?
24 MR. ROSA: Oh, yeah. North Anna had a whole
25 series of main transformer failures on single phases. They

1 also had three single-phase transformers making up the main
2 output transformer and they had a series of faults in one of
3 those transformers, not the same one but I understand that
4 that's been corrected.
5 That was some years ago and there have been other
6 main transformer failures also. I can't recall the plants
7 right now but I'm sure there has.
8 MR. STONER: Do you recall whether during any of
9 these events there was any unexplained tripping or failure
10 of other equipment within the plant which was attributed to
11 the fault in the transformer?
12 MR. ROSA: No. Right offhand I couldn't give you
13 any details on that. There may have been.
14 MR. IBARRA: There were a lot of consultants
15 looking at the transformer at Nine Mile Point and a lot of
16 experience, a lot of years, and some of them said that
17 sometimes it is impossible to determine the root cause of
18 the fault.
19 Is that a statement that you would agree with or
20 what's your thoughts on that?
21 MR. ROSA: Well, I'd have to agree with that.
22 Sometimes you just can't determine a root cause. You know,
23 it could be a manufacturing defect, materials defect in the
24 winding or the insulation.
25 It could be insulating oil contamination. If

1 there were a series of tests made on the oil in the course
2 of preventive maintenance, that indicates that there was a
3 degree of contamination in the oil and that would lead to
4 something. You might be able to draw a conclusion about the
5 root cause.
6 But if it was a materials or a manufacturing
7 defect within the lining, I don't see how the heck you could
8 arrive at the cause given that usually things are pretty
9 well disrupted when one of those failures occurs.
10 MR. IBARRA: Is it possible to -- If there was
11 enough records on their maintenance, regular maintenance
12 that they do, like the oil analysis, gas analysis, measure
13 of temperature readings and so forth, could we draw a
14 precursor to an event like this?
15 MR. ROSA: Well --
16 MR. IBARRA: Can that tell you --
17 MR. ROSA: I guess the intent of good preventive
18 maintenance and all the testing that's done on the oil and
19 temperature readings and so forth is all intended to alert
20 licensees that something is wrong and whenever there is an
21 indication like that, then certainly some action should be
22 taken.
23 Sometimes licensees may be a little reticent to
24 shut down if one of those indications is sort of marginal.
25 I can understand that. It's strictly up to their own

1 judgment.

2 MR. IBARRA: On the monitoring of the voltages on

3 the plant site, is it common to have oscillographs and any

4 sort of instrumentation monitoring that?

5 MR. ROSA: Well, I understand that some plants

6 have it and others don't. We don't make any requirements

7 along that line.

8 MR. IBARRA: Jim?

9 MR. STONER: Do you know which groups within the

10 NRC, if any, would have been expected to know that the loss

11 of a single UPS system would cause a plant to trip due to

12 loss of feedwater and loss of control rod position and loss

13 of annunciators?

14 MR. ROSA: If you're talking about a trip of a

15 single nonsafety UPS, I don't know that anyone goes into it

16 in detail.

17 If anyone looked at it at all, it would be I&C,

18 the I&C branch, but keep in mind that there are no

19 requirements for meeting single failure in the nonsafety

20 systems.

21 If it's possible to get a design that's single

22 failure proof, it's a darned good thing to implement and I

23 would expect licensees might have looked at that. Perhaps

24 some of them have implemented it but to my knowledge we

25 don't insist on it or I think even look at it.

1 MR. IBARRA: There is nobody in the agency that
2 would look at the implications of the configuration of some
3 systems?
4 We look at the if they're safety-related, but if
5 they're not safety-related there is no group that actually
6 looks after that or is the ---
7 MR. ROSA: To my knowledge, there is no group that
8 looks at it. We do look at nonsafety systems as from the
9 grid on down to the safety buses and including the
10 intervening nonsafety systems with regard to the degraded
11 grid voltage concern.
12 You know, licensees are required to meet -- excuse
13 me -- branch position PSB-1, which states that given the
14 lowest voltage on the grid and the worst case loading in the
15 plant, your voltage at the downstream buses all the way down
16 to the 120 volts should be within the normal voltage range
17 which is 90 percent.
18 Likewise for the top of the grid voltage, too.
19 The downstream voltages should not exceed 110 percent, which
20 is what is normally called for.
21 We look at that and all licensees have come in and
22 said that in fact that's the case and they have installed
23 under voltage relays to trip the plant should you get below.
24 I think the first level gives you an alarm and
25 then five minutes later there's an automatic disconnection

1 from the grid.

2 Now there are some exceptions taken to that,

3 particularly in the northeast where the grid is kind of

4 tight and we do allow operator action to do the

5 disconnecting.

6 Right now we are finding that there are some other

7 plants where load growth on the system as well as in the

8 plant has now made their under-voltage trip setpoints no

9 longer adequate and we are in the process of looking at

10 that.

11 That's the only extent that we look at in great

12 detail in the nonsafety distribution system.

13 MR. IBARRA: The investigation of course is still

14 going on and we're in the data-gathering mode and almost

15 starting to think about that data and trying to digest what

16 happened. Basically, there was a transformer fault and

17 there were some UPS problems.

18 From what you know of the event, what concerns you

19 electrically or what would be your concerns?

20 MR. ROSA: Well, when the event first occurred,

21 myself and my two section chiefs and my boss, Ashok Thadani,

22 discussed this.

23 I suggested that it might be a problem of the

24 phase relationship of the inputs, particularly the sync

25 circuit input to the UPSs and the phase that had to follow.

1 I don't know whether that's been substantiated or not. I've
2 heard rumors to that effect. That's the only thing I can
3 think of.
4 Faults will occur on a main transformer as well as
5 on auxiliary transformers, both unit auxiliaries and
6 startup, and to try to distribute UPS inputs such that they
7 wouldn't all be vulnerable to a particular fault is a
8 difficult problem.
9 I really don't know what can be done about it.
10 It's possible that something might be done. If for
11 instance, in this case here it was determined that, yes, a
12 fault on this phase caused five UPSs to fail because the
13 control inputs to those UPSs all included that particular
14 phase, something might be done to distribute the control
15 inputs to the various UPSs so that they don't all have the
16 same phase input. Beyond that, I don't know.
17 MR. IBARRA: Jim, any more questions?
18 MR. STONER: Has your experience shown that the
19 propagation of high frequency disturbances from the
20 nonsafety systems to the class 1-E systems has been or is a
21 problem?
22 MR. ROSA: No, I'm not aware that it's a problem.
23 I'm aware that this sometimes happens. You can't tell what
24 a fault will generate, a fault or a lightning strike got in
25 the switchyard or something like that, but I'm not aware of

1 any significant damage that's been done.

2 We've had failures of some instrumentation due to

3 lightning strikes and usually, you know, the only fix for

4 that is to provide better lightning protection, especially

5 for the containment building and the switchyard. Not much

6 else you can do.

7 MR. IBARRA: Any other questions?

8 MR. STONER: Do you know of any other questions we

9 should have asked or do you have anything that you're aware

10 of that perhaps you would like to talk about?

11 MR. IBARRA: And to narrow it down, Faust, maybe

12 about transformers or UPS -- The event itself is not --

13 it's complicated. I don't know if we will ever know what

14 really happened but we do know that there was a fault and

15 that the UPS went down. That's known and now what caused

16 that, that's why we're here.

17 MR. ROSA: I can think of one thing with regard to

18 control inputs to the UPS systems, or maybe even the AC

19 power.

20 You know, there are surge suppressing reactors

21 that can be put in series with those inputs that allow 60

22 cycles to pass without any attenuation but will be quite

23 effective in suppressing any surges or higher frequencies.

24 That might be a possible solution to something like this

25 event.

1 As far as transformers are concerned, you know, a
2 very rigorous preventive maintenance program and protective
3 relaying scheme is what's called for.
4 If I may add a personal view about equipments like
5 the main generator, the main transformer and the switchyard
6 connections to the plant and so forth, it's my view that the
7 licensee should be more interested in obtaining the best
8 equipment possible and maintaining it in the best way that
9 he can for his own economic considerations.
10 There is very little that we as a regulatory
11 agency can do to make him improve that. If his own economic
12 concerns don't work, there is something wrong with the
13 licensee.
14 What else is there to do? IITs that investigate
15 things like this are very useful in that it focuses
16 attention on these things and certainly the rest of the
17 industry will become aware of what's going on and to that
18 extent it's good, but from then on they have to take the
19 initiative to do the fixes that need to be done, if any need
20 to be done in their own system. That's my view.
21 MR. IBARRA: On the power coming out, the AC
22 coming out of UPS, is the quality any different if it's from
23 the battery or if it's from the AC source? Do you know?
24 MR. ROSA: It's my understanding that three-phase
25 AC input, power input, to the UPS is first rectified and I

1 would expect that the filtering at the output of that
2 rectifier makes the DC output of that rectifier essentially
3 the same as the battery or close enough that the AC output
4 shouldn't be affected.
5 MR. IBARRA: For systems that are configured where
6 you have not only the battery and the normal AC supply but
7 you also have an alternate, let's say a maintenance supply,
8 do you still see any difference whatsoever coming out of the
9 UPS unit? Should the quality be any different of the AC?
10 MR. ROSA: No, it shouldn't be any different.
11 There may be a little bit of a difference but if there is it
12 should be within normal --
13 MR. IBARRA: Tolerances?
14 MR. ROSA: -- variations.
15 MR. IBARRA: After Three Mile Island there was a
16 lot of concern with an integrated approach to the whole
17 instrumentation and power distribution of let's say a
18 utility.
19 Since those years, have you seen any changes that
20 the agency has done in order to integrate the human factors
21 with instrumentation, with power supplies and so forth?
22 MR. ROSA: I think a lot has been done since Three
23 Mile Island. First of all, a whole bunch of design changes
24 were promulgated by Three Mile Island, particularly with
25 regard to the availability of safety-related power to

1 various instruments and various nonsafety components, like
2 the pressurized heaters, for instance.
3 The designs of the auxiliary feedwater system was
4 beefed up considerably as a result of Three Mile Island, and
5 operator training, EOPs and so forth, I think all of those
6 were the result of Three Mile Island, the operator training
7 with simulators and so on.
8 Yeah, I think there has been a lot of advances
9 made since then and all of these advances, plus a little bit
10 more, I think, have been reflected in the proposed advanced
11 light water reactor designs that we're reviewing now, the
12 evolutionary as well as passive.
13 One of the major advances that I can point to is
14 the generator breakers, main generator breakers. Now all
15 the advanced designs provide the main generator breaker so
16 that a plant trip will only require that the main generator
17 breaker is open and there is no loss of power to anything
18 else, given no other failure of course.
19 The loss of power to the nonsafety as well as the
20 immediate loss of power to the safety loads in present
21 designs is mostly due to generator trips for whatever
22 reason. If the automatic transfer of power to another
23 transformer doesn't occur -- and even if it does occur you
24 have a momentary loss there so that's a big advantage.
25 The DC systems of advanced designs are much, much

1 improved. More batteries, additional nonsafety batteries
2 that can be connected into a safety bus, for instance,
3 during equalizing charge of the safety battery.
4 In the existing designs, if you don't have a
5 battery to connect in during equalizing charge, you have to
6 over-voltage some of the equipment and in that case there
7 special equipment has to be bought that can take the for
8 instance 149 volts or 145 volts where normally the buses are
9 at 120, 125.
10 That sort of thing I think was partly a result of
11 the Three Mile Island incident.
12 MR. STONER: You mentioned EOPs, do you get
13 involved in the review of EOPs?
14 MR. ROSA: We have looked at some EOPs but --
15 that's my branch -- but not in great detail. EOPs look at
16 operating procedures with respect mostly to fluid systems
17 operation, plant parameters and given the condition there
18 actions are taken.
19 It's assumed in EOPs that the power systems are
20 available. Now there are EOPs that assume, you know, losses
21 of power to a bus, for instance, we know that, but loss of
22 power say to a safety bus, if the diesel generator starts
23 that's fine, you can go ahead normally.
24 If the diesel generator doesn't start, as far as
25 the electrical systems are concerned there are only a few

1 steps that can be taken given the design. You either have
2 another circuit from outside power that might be available
3 or you take steps to start the diesel generator or, in a few
4 cases where there's a crosstie available to the other safety
5 bus, if it's necessary to use that crosstie you would have
6 EOPs to cover the few steps that are necessary to do that.
7 Primarily EOPs look at plant parameters and
8 conditions and specify what actions have to be taken and we
9 don't get too involved in that.
10 MR. IBARRA: Faust, who takes care of
11 environmental qualification of electrical equipment?
12 MR. ROSA: Well, right now I believe the plant
13 systems branch has some mechanical engineers that look at
14 environmental qualifications.
15 Up until probably 1985, the qualification of --
16 environmental qualification of electrical equipment was done
17 by the electrical system branches.
18 You know, back in those days we had electrical,
19 instrumentation and control all in one branch. Then we
20 split electric power in one and I&C in another branch.
21 At about the time of that original split, the environmental
22 qualification went to plant systems branch.
23 MR. IBARRA: Are you all asked for help often in
24 this area or is it pretty well set?
25 MR. ROSA: No, sometimes we are asked for help.

1 We're asked for help in evaluating tests that may have been
2 performed to establish environmental qualification, say for
3 an accident condition or something like that. Cables,
4 primarily.
5 MR. IBARRA: Never ending, right?
6 MR. ROSA: Never ending, yeah.
7 MR. IBARRA: Jim, any more questions?
8 MR. STONER: I can't think of anything else at
9 this time.
10 MR. IBARRA: Okay, thank you, Faust.
11 MR. ROSA: Okay, feel free to call me if
12 necessary.
13 (Whereupon the matter concluded at 10:47 a.m.)
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REPORTER'S CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission

in the matter of:

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PLACE OF PROCEEDING: Bethesda, Maryland

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Marilyn Estep

Official Reporter
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