UNITED STATES
NUCLEAR REGULATORY COMMISSION

IN THE MATTER OF: **DOCKET NO:**

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

COMBINED MILLSTONE NUCLEAR POWER
STATION UNIT 3/RELIABILITY AND
PROBABILISTIC ASSESSMENT
SUBCOMMITTEE MEETING

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BEFORE THE
UNITED STATES
NUCLEAR REGULATORY COMMISSION

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

COMBINED MILLSTONE NUCLEAR POWER STATION
UNIT 3/RELIABILITY AND PROBABILISTIC
ASSESSMENT SUBCOMMITTEE MEETING

Howard Johnson's Conference
Center
Yankee Trader West Room
Windsor Locks, Connecticut

Tuesday, August 28, 1984

The committees and subcommittees convened at 2:00 p.m., Dr. William Kerr presiding.

ACRS MEMBERS PRESENT:

DR. CHESTER SIESS
DR. CARSON MARK
MR. CARLYLE MICHELSON
DR. FORREST REMICK
DR. WILLIAM KERR
DR. DAVID OKRENT
MR. JESSE EBERSOLE

N U MEMBERS PRESENT:

MR. ROBERT BUSCH
MR. RICHARD WERNER
MR. JAMES CROCKETT
MR. WILLIAM COUNSIL
MR. RICHARD LAUDENAT
DR. FREDERICK SEARS
MR. JOHN OPEKA

CONSULTANTS:

MR. ALLEN CAMP
DR. CHARLES MUELLER
DR. PAUL POMEROY
MR. MYER BENDER
MR. MICHAEL BOHM

MR. SAM DURAISWAMY, Designated Federal Employee
MR. RICHARD SAVIO, Staff
MR. WANG, Staff

P R O C E E D I N G S

DR. KERR: The meeting will come to order.

This is a combined meeting of the Advisory Committee Reactor Safeguards, the Site Committees on Millstone Nuclear Power Station, Unit 3, and the Reliability and Probabilistic Assessment Subcommittees.

My name is William Kerr; I am the subcommittee chairman.

The other ACRS members who are present or who are expected to be present for the meeting are David Okrent, Chester Siess, Jesse Ebersole, Forrest Remick, Carlyle Michelson and Carson Mark.

As consultants we have Myer Bender, Charles Mueller, Paul Pomeroy, Allen Camp and Michael Bohm.

The purpose of the meeting is to review the application of the Northeast Nuclear Energy Company for a license to operate Millstone Nuclear Power Station Unit 3, and to examine and discuss the results of the probabilistic safety study performed by the applicants for Millstone Nuclear Power Station Unit 3.

The meeting is being conducted in accordance with provisions of the Federal Advisory Committee Act and the Government in the Sunshine Act.

Sam Duraiswamy is the Designated Federal Employee for the meeting. Mr. Savio and Mr. Wang of the ACRS staff are also present.

Rules for participation in today's meeting have been announced as part of the notice of the meeting previously published in the Federal Register on Tuesday, August 14, 1984.

A transcript of the meeting is being kept and will be made available as stated in the Federal Register notice. I would request that each speaker identify himself or herself and use a microphone.

We have received no written comments from members of the public. We have also received no requests for time to make oral statements from members of the public.

For the benefit of those who may have wandered in here, thinking that this is a Saturday night bingo game -- I can't imagine why else we'd have such a large group -- I emphasize that this is a meeting of an ACRS Subcommittee.

I also call to your attention -- and this is for members of the subcommittee -- that we have a rather extensive agenda, a somewhat larger-than-usual subcommittee. And my task will be to endeavor to keep things on schedule. I can't very well do anything about the schedule, except I can ensure that it stops this evening at 8:00 p.m., which I propose to do.

I also call to your attention that, contrary to our usual custom, the meeting tomorrow morning is scheduled to begin at 8:00 a.m. rather than our occasional 8:30 meeting.

To begin today's meeting I call upon Ms. Elizabeth Doolittle of the Nuclear Regulatory Commission Staff.

Ms. Doolittle.

NRC STAFF PRESENTATION

MS. DOOLITTLE: Good afternoon. My name is Elizabeth Doolittle and I am the NRC Licensing Project Manager for Millstone 3.

Other NRC Staff members with me here today are Mr. Joe Youngblood --

DR. KERR: Excuse me, Ms. Doolittle. You're going to have to stay close to that mike, I think.

MS. DOOLITTLE: Other NRC Staff members with me here today are Mr. Joe Youngblood, Chief, Licensing Branch Number One, Mr. Ted Rebelowski, Senior Resident Inspector at Millstone 3, Mr. E. B. McCabe, Section Leader, Region I, Mr. Ed Greenman, Branch Chief, Region I, and Mr. David Terrow from the Mechanical Engineering Branch at NRR.

This afternoon I plan to give a brief overview of the Staff's licensing review, and I'll highlight the major differing technical issues between the Staff and the Applicant which resulted from the safety review.

(Slide.)

Major licensing activities and when they were or will be completed are shown on this slide. Ten years ago the NRC Staff issued the construction permit for Millstone 3. In February of 1983 the operating license application was docketed, and in July of 1984 both the Draft Environmental Statement and the Safety Evaluation Report were issued by the Staff.

The Draft Environmental Statement included the Staff's conclusions on environmental impacts of postulated accidents which were based on its review of the Applicant's probabilistic safety study which was submitted in August of 1983. As of June 25, 1984, construction of Millstone 3 was about 86.5 percent complete. The Applicant plans to be ready to load fuel on November 1 of 1985.

I would like to point out that although hearings were held at the construction permit stage, there have been no requests for hearing at the operating license stage, and therefore no hearing is scheduled on Millstone 3.

(Slide.)

The Staff safety review was based on Millstone 3 FSAR, eight amendments, and five other reports submitted as part of the operating license application. Additionally, approximately 40 site visits, audits and meetings were conducted as part of the review from the time the application was docketed until the SER was issued last month.

(Slide.)

At the time the Safety Evaluation Report was issued there were 93 items for which the Staff had not completed its review. The review of 19 of these items was incomplete because some information was not resolved with the Applicant. These were classified as open items.

Review of 70 of these items was incomplete because the Applicant had not yet submitted certain confirmatory information, although it was clear how the items would be resolved technically. These were classified as confirmatory items.

Review of four of these items was incomplete and contained conditions which must be met in order to obtain the license. These were classified as license conditions.

(Slide.)

As a result of the Millstone 3 safety review to date, four of the items classified as open remain open due to differing technical positions between the Staff and the Applicant. These are load acceptance test requirements and protection of exhaust piping for the diesel generator, design and construction of component supports, fire protection in the cable spreading room, and limitation on overtime for personnel who perform safety-related functions.

Schedules for resolution of three of these remain to be determined; however they will all be resolved prior to licensing.

MR. MICHELSON: Excuse me. Is there going to be any further discussion of these items other than what you just presented?

MS. DOOLITTLE: Yes. I plan to discuss these in more detail tomorrow.

MR. MICHELSON: Thank you.

MS. DOOLITTLE: And additionally there will be technical Staff members here.

Because of the full agenda I don't plan to discuss these in detail now but I do plan to discuss them tomorrow.

If there are no further questions, I would like to introduce Mr. Ed Greenman from Region I to discuss construction experience.

DR. KERR: Are there questions from members of the Subcommittee?

(No response.)

DR. KERR: I see none.

Thank you, Ms. Doolittle.

NRC STAFF PRESENTATION, CONSTRUCTION EXPERIENCE

MR. GREENMAN: Thank you. My name is Ed Greenman; I am chief of Project Branch I with project inspection responsibility for the Millstone site.

My involvement with Northeast Utilities and Millstone goes back to 1973, and I participated in the initial inspection. I'd like to very briefly discuss what Region I has done since our initial meetings at this site, provide a few of the salient highlights.

In the interest of time-saving, the Staff has prepared background information supplemental material for the Subcommittee's use.

(Slide.)

Our initial inspection was in March of 1973 and really focused on QA aspects for a then virtually brand new Appendix B program. While we had a number of difficulties at that time, as did other utilities and licensees, in interpreting the criteria in Appendix B and how to implement that, a series of management meetings resolved those issues to the point that the region and NRR were satisfied that a satisfactory QA program had been developed.

Since that time we have looked at a broad spectrum of normal construction activities: The concrete work, all the safety-related structures, piping and welding, electrical activities, the safety-related mechanical components and instrumentation. This effort is still ongoing from our perspective and the requirements of our own inspection and enforcement program. We are nominally 80 percent complete with our effort. That tracks and compares favorably with the latest information that I have from the utility as far as Phase II testing is concerned. They have approximately 236 tests to run and 138 of those have been scheduled to date. So we are tracking with both of those efforts.

The resident inspector, the first resident inspector assigned to Millstone Unit 3 was located there on site in June of 1981. He left in 1983. Mr. Rebelowski was assigned at that time, spent his first year in a half-time effort commuting between Haddam Neck and the Millstone Unit 3, and then moved over there permanently and has been there ever since that time.

In addition, the region conducts specialist inspections as well as project-oriented inspections, using inspection resources from our Philadelphia office to provide supplemental inspector effort. Most notably our team efforts to date have been in the area of non-destructive examination and our construction team inspections. These have provided an in-depth look, very, very broad in scope, equivalent in time to about ten man-weeks worth of effort on the part of one senior resident inspector; one very, very concentrated look. Both of those have been done, one in 1983, and the construction team inspection in 1984.

The only other effort that the region has planned to date really involves systems interactions use of PRA. While we do not have a dedicated group of resources in the region that's looking just at system interactions, we do have a number of people that have experience in PRA and we're looking at its applicability to the inspection program, and not to duplicate the efforts that are going on in NRR, but to let us more efficiently allocate our inspection resources.

We have done this at Susquehanna; we have made comparisons between the technical specifications and the as-built systems. We have looked at the man-machine interface. We're looking at the intent of the technical specifications; how procedures interrelate with the operator. And we're doing those efforts approximately a month to six weeks prior to any near-term operating license deliberation.

From the standpoint of investing or allocating inspection resources, I have given you a comparison of what Region I has done at Susquehanna, both Units 1 and 2, and how that compares with Millstone Unit 3. I would predict that we're probably going to run somewhat more at Millstone 3 than we did at Susquehanna Unit 1, where we had 7100 inspection hours versus 6700 inspection hours today.

(Slide.)

To give you an idea of the NDE van inspection and what it entailed, we used a dedicated team of regional inspectors to look at samplings of piping systems, components, pipe sizes, materials, various shop and field welds. We radiographed ourselves 26 welds. We also did mag-particle examinations of 26 safety-related pipe weldments. We did visual examinations; we did UT; we did thickness measurements, ferrite measurements, hardness measurements, metallurgical and chemical analysis and concrete compression testing.

Based on these inspections and some comparisons that we made with data that the Licensee had taken, we were in a position where we could confirm the adequacy of the QC program for NDE through our own independent testing work from Region I. We do not see anything abnormal in the results that we had. We had 460 hours of on-site inspection effort and approximately 160 hours off-site where we really verified the documents and the paper tracking processes and components through from initiation to conclusion.

The inspection results disclosed two violations. However in this case they were isolated cases. We didn't find any programmatic problems. And the results of that effort indicated very, very good agreement between our own independent verification and the determinations that had been made by the Applicant.

(Slide.)

In 1984 -- March of this year -- we also did a regional construction team inspection and looked at some rather broad areas both from a hardware perspective as well as a programmatic perspective and documentation regarding construction and management effectiveness. The broad areas that this team examined were management controls, QA, design control and construction. Although there were a half a dozen violations that the team inspection identified, they were diverse in nature and also did not indicate any programmatic problems.

(Slide.)

From an overview aspect, to characterize the strengths and weaknesses from the standpoint of this single inspection, one of Northeast's strengths was performance trending, another one is inspector training, their document control system and their management information system. Weaknesses that the team identified had to do with design change tracking, QA program and engineering design change request handling.

DR. KERR: Excuse me. What is performance trending?

MR. GREENMAN: Performance trending -- And I will use my phraseology and then defer to Northeast if they care to add any additional comments -- is a mechanism that many licensees use to take key parameters to assess where they are at a various point in a process or in a program as to judge how well they are doing.

They will pick out — For an operating plant as an example, if one is looking at performance in the area of radioactive releases, you might look at a number of different parameters and judge how you're processing radioactive waste versus what you should be doing. You would do the same thing with productivity and plant generation capacity.

DR. KERR: Could I interpret, then, the statement that they were strong in performance trending to mean that they know what they're doing?

MR. GREENMAN: Yes, sir, that is correct.

DR. KERR: Thank you.

(Slide.)

MR. GREENMAN: Just to capture enforcement status for this applicant I provided a comparison of three separate utilities: Millstone Unit 3, since docketing a total of 40 items of non-compliance or violations, versus Shoreham with 77, and Susquehanna Unit 1 with 103. What is important is that Region I has not identified any significant programmatic weaknesses other than those weaknesses that we identified in our very, very major QA effort back in the early years at this particular site.

In trying to determine whether or not there is any statistical information that is of interest in enforcement history, my own involvement with all three of these sites leads me at least to think that from the standpoint of Northeast Utilities, the staffing that they have on site, the corporate activity involvement in their particular management indicates that we don't see repetitiveness in problems that are identified by the NRC. If a problem develops -- and problems do, did and will continue to develop -- this particular Licensee takes rather aggressive action to resolve those problems so they don't repeat and they don't recur. And I think that probably contributes in part to the lower number of enforcement actions.

MR. MICHELSON: Excuse me. Could you tell us roughly the inspection hours in these three cases?

MR. GREENMAN: Yes. Back on the first slide, Susquehanna Unit 1 is nominally 7000 hours versus 6700 hours on Millstone 3. Susquehanna Unit 2, the second plant, Pennsylvania Power and Light Company ran 4800 hours.

I don't have any direct inspection statistics for Shoreham.

(Slide.)

Other parameters that the NRC uses to evaluate licensee performance and to make managerial decisions regarding allocation of regional resources is the SALP process, the Systematic Appraisal of Licensee Performance. That product is prepared by Region I, with a board member from NRR as a full voting member of the board, with inputs from all the various sources that the inspection force uses to have an overview of any licensee, both the resident inspectors, the regional based inspectors, NRR project managers, NMSS and AEOD inputs. It captured the Millstone 3 SALP results for all four cycles to date: and there are some trends there. Cycle five, which is just ending this Friday, that SALP board will be meeting shortly.

But you will note that for Millstone 3, in cycle one they were average or above average in 13 out of the 16 areas that we evaluated. Cycle number two they were above average in ten of 12. In cycle number three they were above average in seven of nine. In cycle number four, above average in seven of nine.

The bottom line: I consider this utility to be by and large a category one performer. I happen to know for a fact that Northeast Utilities uses the SALP report and the SALP categories as part -- another one of their performance indicators in their own performance elements and standards, and that they seek to achieve category one performance in all areas.

(Slide.)

The last item of interest is the containment fire that occurred back in 1981 as a result of some wooden staging between the crane wall and the containment liner that did result in some damage. The steel liner for the containment buckled and there were some plates and anchors that required replacement. Mr. Rebelowski has looked at that, Mr. Mattio before him, and I have looked at that myself.

The evaluation and all the work that was done indicated that there wasn't any weakening of the concrete while there was some melted plastic on the spray system spray ring. After cleaning that was found to be okay. And some of the pipe spools that showed some damage were all evaluated and judged to be acceptable for use.

These pipe spools that were involved are not really as simplistic as that slide shows.

DR. KERR: Mr. Greenman, what is a pipe spool?

MR. GREENMAN: These are dimensions of pipe, segments of pipe that contain U-bends, Ts, spray nozzles, segments between flanges.

DR. KERR: Thank you.

MR. GREENMAN: The lessons that were learned from this particular experience -- and construction fires do occur on construction sites -- was the necessity to re-emphasize good housekeeping practices: Get all the non-fire-retardant material out of there, remove all the non-essential wood from areas where it didn't really need to be and store it outdoors; improve the electrical system drawings; provide for exhaust ventilation for containment; get the fire hydrant system released; and put checks in place from the fire safety organization. There has not been any reoccurrence of an event that was similar to this one.

(Slide.)

Region I's overview of management capability is pretty much as follows:

Management effectiveness I believe is evidenced by first of all a very, very excellent enforcement history. There have been relatively few violations and non-conformances. Consistently this utility has had high SALP ratings. No category three findings in SALP. In the most recent SALP seven of possible nine category one's. They pay serious attention to NRC concerns. Northeast has been a leader in commenting constructively on a number of NRC issues.

From the inspection standpoint they routinely solicit input from our inspection forces, from section chiefs, from the resident inspectors, from project inspectors and specialist inspectors that are onsite. The feedback that I have is that Northeast is constantly asking for regional input on 'What do you see at other utilities; how do we comare; how do we stack up with other licensees that you look at.'

I perceive that there is a continuous management attention to quality. That's based on the good results that we have had in our team inspections; the fact that over a period spanning more than ten years we've had very, very few allegations with respect to this plant -- seven up until about a week ago.

The project managers visit various sites where the utility is having problems; the fact that high level corporate management -- the operations vice president and the senior vice president -- frequently are onsite, are very much aware of overall project status. They are adhering to schedules. They have an aggressive program and attitude for system turnover and testing. And they have had a history of meeting all of their schedules.

DR. REMICK: Using your words, that they provide constructive criticism, if I recall they have provided construction criticism of some of the SALP evaluations in the past.

MR. GREENMAN: Right. While I say the criticism has often and usually is constructive, we don't necessarily agree.

DR. REMICK: That's what I was wondering. Has that resulted in any changing of SALP evaluations --

MR. GREENMAN: Yes, in the last SALP and the way

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the SALP process works.

The SALP board sits down in session and deliberates for a number of hours before coming up with its overall assessment. That report is forwarded to the utility. Managers from afar do not necessarily have all of the facts. And in the case of this particular SALP there were areas where Northeast provided additional information, additional clarification at the meeting and in follow-up conversations, and we did alter our findings. I would say by and large in most cases we do not, and the packages stand unaltered as written by the board with page changes for those areas where we change.

Thank you, gentlemen.

DR. KERR: Thank you, Mr. Greenman.

Are there questions?

DR. OKRENT: I have a few speculative kinds of questions.

If I recall correctly, back when Millstone 1 was first being proposed for construction there was rather little nuclear or fossil construction experience, management experience in the group that were proposing Millstone 1. I may be wrong, but that's a recollection I have which I think is valid.

I hear you today telling me that via your SALP studies you're finding them doing a rather good job, well above average.

Do you have some fundamental trait or capability that has been built in or something in the company that you think has led to the situation which you now seem to have evaluated?

MR. GREENMAN: My comments will be somewhat subjective, and I have had some prior involvement with Millstone Unit 1 as well as Millstone Unit 2, and they are as follows:

I think Northeast Utilities to some extent has had the luxury of time on their side in that certainly the experience level today is not the same as it was back in the days when Millstone Unit 1, the BWR, was first licensed. I think that from the standpoint that two of the very, very senior management level people within that organization have on-site hands-on practical experience in facility management and in the operation of that station and have had an opportunity to face a number of problems, whether it be operationally-oriented, whether it be construction-oriented or in the area of modifications, I think that serves them well.

And I think they have learned their lessons extremely well. We don't find that they make many mistakes, and the ones that they make, they don't make them a second time. And I think that probably contributes in large part to the way they pursue problems and in the way that they understand problems.

I think you see that aspect fostered throughout their organizational structure. In the operations force, the people that are actually operating the plant that have been there for a number of years, the impact of those people that have those years of experience as they sit on various safety committees and go about their day-to-day activities.

DR. OKRENT: Well, you're now taking a look, relatively late in the construction, at one or two percent construction. Do you think you could have taken a look and been able to provide a judgment with some basis as to whether or not a good job would be done in designing and constructing Millstone 3?

MR. GREENMAN: If I understand your question, you're equating it back to Millstone 1 and --

DR. OKRENT: No, no. I'm now talking about Millstone 3, but I'm asking if you had been required to look at the personnel, how they were functioning, the whole management organization and the existing capability at the time of about one percent construction, really at the beginning, do you think you would have been able to make an evaluation then with some reasonably sound basis as to how well or poorly this particular nuclear power reactor was going to do on its construction?

somehow they have a way of building these which is focused on quality and on performance more so than on quality assurance. I think I'm not misinterpreting what I read.

MR. GREENMAN: I think --

DR. OKRENT: Can you comment on that suggestion, assuming that it has been made?

MR. GREENMAN: Right. Assuming that it has been made, it is a true statement that you have to build quality into a nuclear power plant. You don't inspect it into it. It has to start from the ground up.

I don't know whether that adequately answers the question or not.

DR. OKRENT: No. The question I really would like to get an answer to is:

Could the Nuclear Regulatory Commission Staff live with a system whereby they were relying on the utility building quality and achieving performance based on some kind of an assessment done by the Staff very early in the process, and which, if it were successful, would relieve certain of the paperwork that goes into quality assurance, and hopefully not in any way lead to lesser quality?

MR. GREENMAN: From my perspective I don't think that is feasible, nor do I think that would be necessarily desirable from the standpoint that the checks and balances and the other pairs of eyes I think are very, very necessary in looking at that overall process.

DR. KERR: Are there other questions?

(No response.)

DR. KERR: Thank you, Mr. Greenman.

MR. GREENMAN: Yes, sir, thank you.

DR. KERR: The next item on my copy of the agenda calls for Mr. Counsil from Northeast Utilities.

Mr. Counsil.

After that glowing description of your organization, I hope you will bow in the direction of NRC Staff.

MR. COUNSIL: I'm not noted for bowing in the direction of the NRC.

DR. KERR: Maybe just a curtsy then.

APPLICANT'S PRESENTATION

MR. COUNSIL: Once again, good afternoon. I'm Bill Counsil, the Senior Vice President for Nuclear Engineering and Operations.

(Slide.)

Northeast Utilities has a hierarchy of policies, goals and objectives.

(Slide.)

The slide is an excerpt of our mission statement and states:

"Northeast Utilities is dedicated to

providing safe, dependable and reasonably priced energy and related services."

My Nuclear Engineering and Operations Group has further translated that mission statement into group policies, any and all procedures, and finally, divisional and nuclear station procedures.

(Slide.)

An excerpt from one of our nuclear policies states:

"Northeast Utilities fully recognizes its responsibilities and accountabilities to operate its nuclear plant safely, effectively and with a minimum impact on the environment, the public health and safety and the health and safety of company personnel."

As senior officer responsible for nuclear activities of end-use system companies, I have full responsibility, authority and accountability for the design, engineering, construction, operation and maintenance of the nuclear generating units for which Northeast Utilities is responsible.

To effectively implement this mandate, the nuclear engineering and operations groups is structured into three distinct divisions.

(Slide.)

A brief description of each division is as follows:

The generation and construction division, headed by Richard P. Werner, is responsible for the design and construction of Millstone Unit 3. In addition, this division is responsible for providing engineering support to our operating nuclear plants. This group is principally headquartered in Berlin with a satellite facility that is operating at the Millstone construction site for the duration of the Millstone Unit number 3 project.

The nuclear and environmental division, under Dr. C. Frederick Sears, has responsibility for providing a number of support activities to our nuclear operating plants, along with support of the Millstone 3 project. This division contains many specialized nuclear functions, which include radiological assessment, reactor engineering, licensing, fuel management, nuclear safety engineering, nuclear materials, chemistry, reliability engineering and nuclear training.

The nuclear operations division, headquartered in Berlin, provides line management of both operating sites. Mr. John F. Opeka, Vice President of Nuclear Operations, has the station superintendents of Connecticut Yankee and Millstone reporting to him, as well as a group of operational specialists located in our Berlin headquarters who provide support for the daily operation of our nuclear units.

At Northeast Utilities we have established a management commitment that quality and safety must be engineered into our plants and not added on later. For this reason our quality assurance and control functions are integral parts of our line organization. However the quality assurance manager provides reports directly to me on all issues related to quality and quality assurance.

We have also established a nuclear review board for each of our nuclear units. The NRBs represent an independent corporate review and are provided to assist and advise me in providing additional assurance that our nuclear plants are being constructed and operated safely. Each of our boards is comprised of carefully selected nuclear professionals from various disciplines who have experience in construction and operation of our nuclear units so that they can provide effective oversight of nuclear activities.

In addition, each of our four nuclear review board chairmen report directly to me functionally. These four people are selected based on their extensive nuclear experience and their personal commitment to nuclear safety. In their role as NRB chairmen they are given wide organizational freedom to resolve any issues of safety significance.

The Millstone Unit number 3 NRB was formed and is currently operating well in advance of any regulatory requirements to have such a board in place. This board is comprised of NU nuclear professionals who have significant experience in the areas of probabilistic risk assessment, mechanical, electrical, nuclear and civil engineering.

A significant strength possessed by Northeast Utilities is the depth of experience and expertise gained by industry involvement and participation.

DR. KERR: Excuse me, Mr. Counsil. There is a question.

MR. COUNSIL: Yes.

MR. MICHELSON: On your nuclear review boards are there any outside members, or are they all from within the company?

MR. COUNSIL: All of the nuclear review board members are within the company. We have provisions to bring in outside assistance if ever necessary.

MR. MICHELSON: Do you have any particular reason why you don't bring in some amount of outside viewpoint?

MR. COUNSIL: We are, in the three divisions, relatively diverse. In other words, many of the nuclear review board personnel are in the nuclear and environmental engineering division. Those people where we would normally want to bring in outside help, such as radiological

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assessment or nuclear safety engineering and so forth, these people are out of the power production chain all together. And in my opinion, as long as I have the detailed expertise in house, I do not intend to go outside and look for assistance.

DR. OKRENT: Are there three or four significant changes in the design as it was first conceived that resulted from recommendations of the Nuclear Review Board, or whatever title it has?

MR. COUNSIL: As I understand the question, you are asking were there three or four significant areas of design that the NRB suggested.

DR. OKRENT: Three or four is obviously a number pulled out of the air.

MR. COUNSIL: I don't think there have been any recommendations that the NRB of Unit Number 3 has suggested to date. However, the Operating Boards of Connecticut Yankee, Millstone 1 and Millstone 2 have made generic suggestions that have been subsequently reviewed by our Nuclear Safety Engineering Group, and those suggestions have been incorporated or are being incorporated into Unit Number 3.

DR. OKRENT: I am not clear then. What is it this Nuclear Review Board might recommend?

MR. COUNSIL: Right now the NRB, as charged by me, is reviewing all of the preoperational test program. They are looking through selected of the safety, preoperational test procedures as opposed to the acceptance test procedures. They are doing something of a quality check from the point of view of using their expertise and the design basis of the plant to insure that we are actually testing the plant to the acceptance criteria that we should be testing to.

DR. OKRENT: And when they are done with that, that's it?

MR. COUNSIL: No, that is not it. Then they go into the operational mode, in accordance with our standard charter for NRBs.

DR. OKRENT: But NRBs don't look at the design and construction then?

MR. COUNSIL: No, our Quality Assurance people by and large look at design and construction as well as for operational type problems. The Nuclear Safety Engineering Group looks at the design and construction of what we're building as opposed to what occurred in the industry.

DR. OKRENT: And the Advisory Committee on Reactor Safeguards, what is its charter?

MR. COUNSIL: You're asking me what your charter is, sir?

DR. OKRENT: No. I have something here with pictures-- Oh, I see. They're not members of the Advisory Committee. They are just your people. My error.

You have a Nuclear Review Board and you have an Operations Review Board.

MR. COUNSIL: The Plant Operations Review

Committee.

DR. OKRENT: I'm trying to find the group that might look at the design of the plant to see whether there were changes to be recommended. I'm not quite sure which--

MR. COUNSIL: You will have your opportunity on the next presenter, because the Generation Engineering and Construction Division is responsible to review the design of the new plant as being designed by Stone and Webster Engineering.

We incorporate that in a line function, so consequently that division has been charged with doing not just an audit but a selected review of areas of the plant where we, for instance, might do an entirety of a stress calculation independent of Stone and Webster and then compare that stress calculation to their results. And that does fall under Mr. Werner, and he is the next speaker.

MR. EBERSOLE: May I ask a question?

All too often we find that the utility seeks to attain the minimum levels of design adequacy and quality required by NRC, in short, find the D-grade, not the A-grade of performance, and thus get a license to operate just as well as if they did an A-grade job.

Can you cite a few cases where you saw the beginnings of a problem which were not really required of you in the regulatory process, but you saw it and fixed it without the pressures of the regulatory process to fix it?

MR. COUNSIL: I might steal some of my people's thunder, but I'm going to lay a few of them on you.

Back in late 1976, we were one of the first people in the industry, with the help of Westinghouse, to recognize the denting phenomenon. Northeast Utilities was instrumental in getting the Steam Generator Owners' Group formed. I started as Project Manager on Millstone 3 in 1976. In late '76 I started following the denting problem.

In late 1977 I had recommended upgrading the Millstone steam generators to at that time the D-5 steam generator, away from the D-4 preheat steam generator. That was to incorporate the 405 broached tube plates, thermally treated Inconel tubes, additional inspection ports in the generator, and so forth.

Fortunately for us at the time in late 1977, we further deferred the unit until 1986. That put me into a negotiating phase with Westinghouse Electric at that time, and we were fortunate to upgrade the purchase order for D-5 steam generators to the F-type steam generator.

In the F-type steam generator we further specified additional inspection ports, additional areas for sludge lants, the total closing of the tubes into -- the unrolling of the tubes into the tube support plate. In other words what we basically did was totally change out our steam generators at the major cost increase on the project.

Now coupled with that we also totally gutted the condensers, changed the condensers out to titanium tubes, intermediate tube support plates, and inwardly-grooved tube sheets which are pressurized by condensates such that we cannot get seawater leakage into our condensers.

We had already made the decision at Northeast Utilities to put full-flow condensate polishers on our unit. We had eliminated all copper nickel on the secondary side in order to preserve the integrity of the steam generators.

Now the one area where we could not do that was the moisture separater reheaters which still have copper nickel tubes. However, the state of the art has gone to the point where we could now incorporate stainless tubes, and I can assure you that will be looked at for future cycles. It is too late prior to startup of this unit.

But those are just some of the things that we have done that have gone far beyond NRC requirements.

MR. EBERSOLE: Thank you.

DR. KERR: Please continue, Mr. Counsil.

MR. COUNSIL: A significant strength possessed by Northeast Utilities is the depth of experience and expertise gained by industry involvement and participation, one group of which I've just mentioned. Northeast Utilities is

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recognized as one of the key leaders in the nuclear power field as evidenced by the continuing requests for NU participation in key industry activities.

NU personnel serve on appropriate industry and technical committees where they share the knowledge gained by NU and participate in shaping industry policy. At Northeast Utilities we are constantly reassessing our goals and objectives for the forthcoming years. We have established several key criteria with which we manage our business. Paramount in this is the dedication to excellence for which we believe NU has become noted.

We are entering into a transitory period whereby we are completing the final stages of construction of our last nuclear unit, and entering into a period of maturing operational skills and striving for continuous improvement of plant safety and reliability. These new challenges require that we constantly reassess our organizational strength and readjust our organizational structure to meet the demands being placed upon us.

The Northeast Utilities nuclear organization is an extremely flexible organization, one which is able to respond rapidly to the needs of our nuclear units and the corporation. Our track record on nuclear outage management is one of the finest in the country. At the present time we are focusing a large bulk of our resources on the completion of the Millstone Number 3 project while at the same time striving to maintain excellence in our operating units.

To give you a better overall view of Northeast Utilities, however, the NE&O group has the following characteristics:

The approximate number of personnel within my group, 2,020, the approximate number of college degrees, 948, and we have over 14,000 man-years of nuclear experience.

To break that down even further, out of the total staff, 276 people in management, 615 professionals, 681 technical, 216 operators, 50 craft, and 182 people in the administrative end. Our degree distribution, 232 associate degrees, 42 bachelors of arts, 537 bachelors of science, 218 masters, and 22 doctoral degrees.

Our years of experience are broken down in 3,780 in the military, 7,533 in engineering, and 2,751 in plant operations.

As a further insight into Northeast and its strengths, all presentations that you will be hearing over the next two days are those of Northeast Utilities personnel, a very positive indication of the in-house strength that we have maintained to insure that public health and safety is not adversely impacted by the

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operation of any of our nuclear units.

A brief review of the experience profiles of some of the key management personnel who have been selected to provide presentations to you during these next two days is indicative of the strength and experience of Northeast Utilities, and they are in your binders.

We look forward to a very purposeful and open meeting with you to share our views of the Millstone Unit Number 3 project.

If there are no further questions of me,--

DR. KERR: Mr. Ebersole.

MR. EBERSOLE: Yes.

One of the popular things which is recognized as very important in this business is the reduction of safety challenges which has a double-edged benefit. It saves a lot of money. Operationally it reduces the hazard potential because you don't ask the critical equipment to do anything more often than it has to.

How do you stand on the progressive improvements of ship islands and trips, and you know what I mean. I don't need to say any more.

MR. COUNSIL: No, you don't.

We have established a fairly aggressive program, and I say "fairly aggressive." I think we are leading the industry by about one year. Since the Numark formation, they have established goals for 1985. We established goals in 1984 of no more than three trips per plant, and our '83 results, I think we were under two per plant in '83. So far in 1984, at the end of August, I've had one trip on Connecticut Yankee and I've had one trip on Millstone Number 2, none on Millstone 1.

Now the one trip on Millstone Unit Number 2 occurred as a result of a reliability improvement we put in, and we were testing it, and that was a changeover on the automatic feedwater at very low flows, and we hadn't quite got it tuned properly and it tripped us off on a low steam generator level. But that's the only trip, and that was on the startup test of it.

And on Connecticut Yankee, we tripped in an automatic trip after we were off-line, coming down for the refueling outage after 417 days on line.

MR. EBERSOLE: I guess that puts you at the top or pretty much in the lead role in that area. Right?

MR. COUNSIL: I hope if we are in a lead role -- I'm not entirely sure that's true but if we are in a lead role, there's a whole bunch of the industry clamoring to be right with us.

MR. EBERSOLE: Thank you.

MR. MICHELSON: Is there anything specifically, Bill, you did on Unit 1 to reduce the number of trips? Did you replace sharways or anything like that?

MR. COUNSIL: Primarily what we have found on Unit Number 1, we have had instrument trips -- all right? -- as far as our testing is concerned. Now what we have done is upgraded many of the instrument and control procedures for surveillance, to human-factor engineer them, if you will. In other words, if I've had a problem we go back and look at the root cause and quite often what we're finding, it's a procedural root cause.

Occasionally we have found personnel as the root cause. And in both cases we've changed the training program, we've changed the procedures.

Now I still have a problem on Unit Number 1, to be quite frank with you, and that's HFA relays. You know, the old GE system was just a mass of HFA relays in the reactor protection system.

One of the things we are doing is we're engineering-- The project is not that active right now. We had it almost completed and ready for procurement, but to change to an analogue in the digital reactor protection system. Now that will probably be done some time in the near future in order to upgrade the reliability of the unit.

MR. MICHELSON: Thank you.

DR. KERR: Are there other questions?

(No response.)

DR. KERR: Thank you very much, Mr. Council— Mr. Bender.

MR. BENDER: I couldn't resist the opportunity to ask what has been the track over the last — what? — half dozen years? How much have you changed the frequency of trips over the period? And to what do you really attribute the reduction?

MR. COUNSIL: Well, it's a combination of many things. Number one, it's aggressively chasing root causes, and that can be personnel, it can be equipment, and it can be procedural.

One of the areas where we have found problems before that have taken us off-line is the instrument systems, the instrument air systems. That's got a high probability of ending up with a trip if, for instance, the feed reg. bell sticks, because of the instrument — most of our instruments are air-operated, or if you lose instrument air to the system.

We have upgraded and are upgrading our instrument air systems.

I can't give you the exact details on our track record but I could get it tonight and have it tomorrow. But we have come down markedly in the numbers of trips per year.

MR. BENDER: Well, since we are going to have

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some statistical discussions here before this meeting is over, I think that is one that might be interesting.

MR. COUNSIL: We can get that for you tonight and have it prepared for tomorrow.

DR. KERR: Any other questions?

DR. SIESS: Mr. Chairman, I can hear Mr. Counsil perfectly well, but I am having some trouble hearing members of the Subcommittee. I won't comment on the appropriateness of that, but I wonder if you could do something about it.

DR. KERR: I didn't understand your statement.

(Laughter.)

DR. KERR: Thank you, Mr. Counsil.

MR. COUNSIL: Dick Werner will now present the Generation Engineering and Construction Division.

CORPORATE ORGANIZATION

MR. WERNER: Good afternoon. My name is Dick Werner and I am Vice President of Generation Engineering and Construction.

The basic role of the GE&C Division is to provide engineering design and construction services to NU generation facilities, including nuclear, fossil, and hydro. Our work includes both new projects such as Millstone Unit Number 3 and also backfit work on existing units.

For example, our backfit budget for Millstone Units 1 and 2 is about $47 million, and on CY, about $20 million.

Our basic company philosophy is to have sufficient staff to perform most of the backfit work in-house, essentially free from requiring the services of AEs and consultants. This philosophy of course does not extend to large projects such as Millstone Unit 3, requiring vast resources.

To accomplish this we have expanded our staff from about 50 people in the early 1970s to over 500 people at the present time. In addition, about 10 percent of these people service on various industry task force committees and groups.

The GE&C Division is organized into three departments, plus a Millstone Unit 3 project group. The Generation Projects Department is responsible for the overall management of generation projects, setting project priorities, providing cost and schedule control services, and providing outage planning services to the operating units. It is organized into a project management group and a cost and schedule control group.

The Generation Engineering and Design Department provides engineering and design services and technical support to our generating units. It is organized by the three technical disciplines: mechanical, electrical and civil, and that also includes the organization of the

Design Department.

The Generation Construction Department is responsible for construction, construction management, and QC functions to the generating facilities. The Department is organized into three groups: a betterment group responsible for backfit projects; a new site construction group whose prime responsibility at this time is Millstone 3; and a construction QC group.

What I have just described to you is the basic organization of the GE&C Division that supports our operating nuclear units.

(Slide.)

This next slide shows the project team for Millstone 3 and it is headed up by Mr. Robert Busch, the Project Manager. It consists of an engineering group, a construction group, and a cost and schedule group. In addition, the project team is supported by technical personnel from the home office as required.

Mr. Busch will discuss in more detail and roles and function of this group during his presentation.

Are there any questions?

DR. KERR: Questions?

(No response.)

DR. KERR: I see none.

MR. WERNER: I would now like to introduce

Fred Sears, Vice President of Nuclear and Environmental Engineering.

DR. KERR: Thank you, Mr. Werner.

DR. OKRENT: I'll try one question if I can.

When Mr. Counsil was up I asked which group, if any, looked at the original design, to the extent that there is an original design at any one time, and evaluated it and made recommendations, if any, for significant changes in the design. And I think he said that the man who is up next is the one, meaning you.

MR. WERNER: We have had for many years a project team on the Millstone 3 project since its inception back in 1973, and the roles and responsibilities of this project team of course has been to review the design and provide an overview of the work that Stone and Webster, our AE, performed for us.

In addition, and Mr. Busch will elaborate on this, since the inception we have had an active participation of our operating personnel to look at the designs from maintainability and operations characteristics.

DR. KERR: Thank you, sir.

Mr. Sears.

Let me urge that when you are talking to members of the ACRS that you never hesitate because you'll get another question.

(Laughter.)

MR. SEARS: The Nuclear and Environmental Engineering Division is comprised of approximately 420 personnel with over 3,000 man-years of nuclear experience. It is divided into four departments.

The Environmental Programs Department is responsible for the environmental programs of Northeast Utilities, not only the nuclear plants but also for fossil and hydro, and also deals with other things such as the discharge permits, hazardous waste, and the general area of environment.

The Nuclear Engineering and Operations Services contains the Nuclear Records Group, Quality Assurance, Reliability Engineering which also includes the ISI and NDT examinations, Nuclear Safety Engineering, which is the group charged with reviewing our own operating experiences as well as those of the rest of the industry, and Nuclear Materials and Chemistry.

Nuclear Engineering is the conventional functions associated with nuclear energy, in particular radiation protection, fuel management, reactor engineering, which includes probabilistic risk assessment, transient analysis, LOCA, steady-state analysis, and liaison with the plant reactor engineer, as well as generation facilities licensing, which is responsible for the licensing of our three operating plants, Millstone 3, and our fossil and hydro generating facilities.

The Nuclear Training Department has the function of training for all of the NE&O group. This includes Connecticut Yankee, the Millstone site, and Berlin training. When we have completed our simulators, the simulators will also be part of this Nuclear Training Department.

Are there any questions regarding the Nuclear and Environmental Engineering Division?

DR. KERR: Questions?

Just a matter of curiosity. I notice that you are Vice President of Nuclear and Environmental Engineering, and under your direction is environmental programs but not environmental engineering, or do environmental programs include environmental engineering and environmental -- a lot of other things?

MR. SEARS: It includes environmental everything. It includes the engineering as well as the programs, and that just happens to be the titling that we have.

DR. KERR: Thank you.

Thank you, Mr. Sears.

MR. BENDER: Mr. Chairman, could I--

DR. KERR: Excuse me. Mr. Bender.

MR. BENDER: You've got three nuclear plants here. Is the organization divided so that there are a certain number of people supporting each plant, or do they work on a random basis with all the plants?

MR. SEARS: It depends upon the organization. Nothing that we do is random, but we do have in some areas people specifically assigned to a given plant.

For instance, the Nuclear Safety Engineering Group is broken up and does have some people specifically assigned to each of the operating units as well as people supporting the overall area. We do have project assignments in which people are given a specific assignment to a plant, then backed up by their organizations.

And we do have assignments-- For instance within the Quality Assurance area, there is a construction QA group specifically charged with looking at Millstone 3, and then the remainder of the organization supports them as well as supporting the operating units.

But we have a little bit of each, depending upon the specific function.

MR. BENDER: Does a new plant require more or less people than an operating plant that's been in service for ten years, say?

MR. SEARS: It depends upon the particular area that you are looking at. In the Quality Assurance area, we have -- I believe it's about 23 people full-time within our own QA group which is roughly equal to the number of people we have in the rest of the QA area. It depends upon the particular function that is being done as to whether the plant under construction involves more or less people.

Right now you will hear, later on in our presentations tomorrow morning, about the PRA group and the work they've been doing. That has almost entirely been devoted to Millstone 3 over the past year or so. That will be spreading out within the other groups as we go through time.

MR. BENDER: Thank you.

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MR. EBERSOLE: Mr. Sears, I don't see Mr. Renfrow in the program later on to maybe discuss more detials of the environmental programs. so I will ask you. Just what do you mean by environmental programs? Is this this complex business of environmental problems relative to equipment? How do you mean? It can mean many things. Would you just clarify it a bit?

MR. SEARS: The Environmental Programs Department is associated with looking at our impact or potential impact on the environment around us. This is external to the plant.

MR. EBERSOLE: Just the general environment?

MR. SEARS: This is the nature, fish, wildlife, things of this nature.

MR. EBERSOLE: It's the large-scale aspects. You know, we have a very difficult environmental program in the design of the equipment. It has nothing to do with that?

MR. SEARS: It has nothing to do with that. This is the environs around the plant.

MR. EBERSOLE: Right. Thank you.

If there are no further questions--

MR. REMICK: I'm afraid I have one.

I noticed that nuclear training is in your division and not in operations. I would like to know the basis or the philosophy that separates training out of operations, and what you will be doing to assure that plant operations is involved in the training of future operators.

MR. SEARS: Certainly.

The movement of nuclear training out of the station organizations took place approximately a year ago, and we had looked at ways of standardizing our programs, and also of reducing the administrative burden of the site staffs. We made a decision to consolidate all of nuclear training into one organization so that we might bring all the resources that we have at each of the sites as well as Berlin under a single program, so we could take the best of the training organizations and put it into all of them. And we can indeed reduce the administrative burden of the plant site.

The trainers are drawn from throughout the NE&O Group and we-- In general, the people training the operators are licensed or in the process of being licensed. A number of them are former operators, and we have staffed the simulator accordingly with that. We have drawn people from the operating staff in order to assure we have the operating experience.

We do intend to maintain those licenses. We have a constant, day-to-day interchange between our various training supervisors and the trainers and the plant staff to ensure that we are meeting their needs. They are, in the long run, responsible for the operation of that plant, and it is their needs that we must meet. So we work with them daily to assure that we meet those needs.

We also have our people go on shift for periods of time, and one of the programs that we are looking to develop in the future is to have those people, our trainers, rotate onto the shifts for a while, and to encourage rotation among all the people so that we have a continual influx of operating experience and training experience back into the plant.

DR. KERR: Dr. Okrent.

DR. OKRENT: I'm sure that as operators and owners of the plant you are very interested in avoiding as much as possible events that would lead to long-term loss of its availability, and let me include among those something that damaged a sizable portion of the fuel.

Are there any steps that have been taken with regard to changes in design specifically to reduce that likelihood? And are you the vice president under whom such things would be initiated or is it a different vice president?

MR. SEARS: We are not limited to any single vice president and his area in coming up with changes. We expect changes to come from any area that recognizes a need. In many cases as we look at the analysis of the plant, and in particular the safety analysis or reviewing past experiences, either that we have had or that have taken place in the industry, there are recommendations made to modify procedures, to modify practices, or to modify the design of the plant.

We have in the past, as a result of various analyses, made specific plant design changes. A good example which came about a number of years ago was on looking at the reliability of the isolation condenser, a decision was made to change several of the valves in that isolation condenser from AC power to DC power in order to insure the availability of an isolation condenser.

You will see, during our PRA presentation, a number of instances of the use of PRA in making decisions on plant changes.

We also have a like input as we have gone through various safety analyses and looked at functional requirements of systems, and as we have reviewed proposed design changes to ensure that those design changes do not impact the original design basis. These are on-going.

I don't know if that fully answers your question.

DR. KERR: Do you want any more?

DR. OKRENT: I don't want any more, and it doesn't fully answer the question.

MR. SEARS: With that then I would like to introduce John Opeka, Vice President of Nuclear Operations.

DR. KERR: Thank you, Mr. Sears.

(Slide.)

MR. OPEKA: Good afternoon. My name is John Opeka. I'm the Vice President of Nuclear Operations.

The Nuclear Operations Division, which has an authorized complement of 1108 personnel, is responsible for operating and maintaining the Connecticut Yankee, Millstone 1 and Millstone 2 nuclear plants, and is responsible for startup and eventual operation of the Millstone Unit 3 plant.

Ed Mroczka, the Millstone Station Superintendent, provides line management for the Millstone operating site, and Dick Graves, the Connecticut Yankee Station Superintendent, provides line management for the Connecticut Yankee operating site, and will provide a broader overview of the functions of his group, which includes Millstone Unit 3, in his discussion.

(Slide.)

The Northeast Utilities Service Company section of the Nuclear Operations Division has an authorized complement of 19 personnel and is responsible for preparing performance monitoring data on NU's nuclear plants, reporting the performance and status of NU's nuclear plants to the board of trustees and senior management, developing the engineering data base and routinely reporting failures to impose nuclear plant reliability data system on NU's nuclear plants, providing security screening for access control to NU's nuclear stations for all contractor personnel, providing operational support for the nuclear stations, including coordinating the review and dispcsition of NRC bulletins, circulars, information notices and inspection reports, providing commitment follow-on on Nuclear Operations Division's assignments which may result from regulatory/industry, which includes INPO or company sources, providing INPO network reporting, and auditing the operating plant's response to industry bulletins and notices.

Approximately three of the 19 NUSCO staff personnel were added to absorb the added support workload expected by the addition of Millstone Unit 3 to NU's Nuclear Operation Division.

With the added NUSCO Nuclear Operations personnel and 303 plant personnel, we intend to operate and maintain Millstone Unit 3 to the same high standards used in operating and maintaining Connecticut Yankee, Millstone 1 and Millstone 2. We believe that our commitment to operate and maintain our nuclear plants to high standards have been confirmed by the 1983 NRC SALP ratings which listed

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Connecticut Yankee Category 1, which is the highest category, in seven of eight areas, the Millstone 1 plant Category 1 in six of nine areas, and Millstone 2 plant Category 1 in six of nine areas.

No areas were rated Category 3, which is the lowest rating, in any of our nuclear plants.

Earlier there was a question on trip data, and I have some statistics here.

In 1981 for our three plants, we averaged 5.7 trips per year. The industry average was 5.6.

In 1982 the three plants averaged 5.3 trips per year. The average for the industry is 5.2. So for those two years we were basically at the average.

In 1983, we averaged 2.3 trips per year, and the industry average was 4.4, so there was significant improvement in that year.

For 1984, we obviously don't have the industry statistics but as Bill Counsil indicated, for the three plants we have a total of two trips at this point, which is less than one per plant. And the Numark goal for 1985, which is three trips per year-- Our goal is to hopefully have no trips in any year, and the trend indicates that that could be possible.

That completes my formal discussion.

DR. KERR: Mr. Bender.

MR. BENDER: Since the number of trips you have had is a very small number in any one year, something between three and five, it is unlikely that you are going to be able to reduce the number of trips by any statistical judgment about whether -- about what causes them.

What's the strategy for cutting them down? Is it just to fix everything that's in sight?

MR. OPEKA: We did an analysis of the trips over the last four or five years. Sixty percent of our trips are due to equipment failure, so there's an area that we can put our resources on and hopefully reduce those trips to something closer to one per year or less.

And that's the type of action we're taking on right now, is that when we have a trip we want to make sure we do a thorough evaluation on what caused that trip, find the root cause and correct it. And that should minimize recurrences of such trips in the future. That's our main strategy.

MR. BENDER: But if you had the same cause of tripping every time, I think that would be good strategy. If it turns out that each trip is caused by something different, then-- I don't want to belabor this point because I'm sure it's a detail. But somewhere along the way, I would expect that you would have to have some other approach than just looking at what the equipment failures are.

DR. KERR: Mr. Bender, you both should remember that it was in New England that the deacon built his wonderful one horse shay.

MR. BENDER: Sounds great.

DR. KERR: Mr. Remick.

MR. REMICK: Two questions on your NPRDS reporting.

Are all of your plants reporting, and how current are you on that data reporting?

MR. OPEKA: Yes, we have one person assigned per plant to report on NPRDS. We currently have the engineering data base in all three operating plants basically up to date.

INPO changed their program to include some secondary systems such as feedwater system condensate. We don't have all that data in but we are essentially up to date in reporting failures within a three-month time period of occurrence.

On Millstone 3 we are now in the process of putting together the engineering data base, and we'll be reporting such— Well, we're reporting events that occur during startup as well as after operation.

MR. REMICK: Thank you.

DR. KERR: Are there any other questions?

Mr. Ebersole.

MR. EBERSOLE: Dr. Kerr's reference to the wonderful one horse shay certainly makes us think that we don't want to have that sort of objective with redundancy as our primary means of recourse. Certainly we don't want to have everything wear out absolutely at one point in time.

DR. KERR: No, just the year after the plant has shut down, Mr. Ebersole.

MR. EBERSOLE: As a matter of fact, we want the opposite effect. If something fails, for heaven's sake let something else work.

But I wanted to ask you, do you have in place any sort of I guess philosophy about the nature of the scrams you have and your control over whether they are, to the extent possible, benevolent scrams versus non-benevolent scrams? To give you a case in point, if I have a generator problem and if I have to trip, we've found a variety of designs in which the way-- Compared to getting out of an airplane, instead of landing it as you should and getting out the door, you jump out with a parachute.

Do you have in place a philosophy that says if I have a trip which may be spurious, I try desperately not to have to invoke safety equipment use but try to retain normal heat sinks and normal coolant supplies and thus not really have a challenge of the kind we worry about? Or do you say oh, I've got to us the aux. feedwater, or whatever, because I've had a trip?

Do you design with the intent of not challenging the safety systems any more than you have to, even in the trip mode?

MR. OPEKA: Well, when we go into a trip mode, we have emergency operator procedures which we have to follow which includes using safety systems.

MR. EBERSOLE: Are they absolutely necessary?

MR. OPEKA: Well, I'm not absolutely sure whether they are necessary but by procedures they are necessary and the operators are required to follow procedures.

MR. EBERSOLE: Then they become a non-benign recovery because you have to use the systems.

DR. KERR: That's not a question.

MR. EBERSOLE: I just said that.

For instance, do you retain main feedwater and ramp down and hold your coolant supply when you have a trip?

DR. KERR: Do you understand the question?

MR. OPEKA: Yes. But you're talking about Millstone 3 I guess at this point.

MR. EBERSOLE: That could be the model if you wish.

MR. OPEKA: Yes. Well, we ramp down on main feed when we have a reactor trip.

MR. EBERSOLE: And you hold the condenser bypass and you don't need anything beyond that?

MR. OPEKA: That's correct.

MR. EBERSOLE: I call that benign.

On the other hand, if you had to have aux. feedwater I would not. Do you follow me?

MR. OPEKA: I understand.

MR. EBERSOLE: Do you make that a sort of a general philosophy across this and your other plants?

MR. OPEKA: Yes.

MR. EBERSOLE: You do. Good. Thank you.

DR. KERR: Any further questions?

(No response.)

DR. KERR: Thank you, sir.

Next?

MR. OPEKA: Our next speaker is Ed Mroczka, who is the Station Superintendent of Millstone.

DR. KERR: If each member of the Subcommittee can take about five minutes per speaker, we will be on schedule.

NUCLEAR ORGANIZATION

MR. MROCZKA: Good afternoon. My name is Ed Mroczka. I am the Station Superintendent for Millstone Nuclear Power Station. I will briefly present an overview of our station organization.

Jim Crockett, our Unit 3 Superintendent, will follow with a more detailed description of the Unit 3 organization.

Millstone is a multi-unit Nuclear Power Station. However, it is different from most other multi-unit sites because the three units are not similar. Unit 1 is a General Electric boiling water plant. Unit 2 is a Combustion Engineering pressurized water plant. Unit 3 is a Westinghouse pressurized water plant. Because we have three different plants, our site organization is different from most other multi-unit site organizations.

Over the past 18 years, Millstone site organization has undergone a gradual transformation as the site was transformed from a single-unit operation to a multi-unit multi-design operation.

The original organization was a typical Plant Superintendent and Assistant Plant Superintendent organization. All department supervisors reported to them. This concept was modified with the addition of Unit 2. At that time the Plant Superintendent became the Station Superintendent. The Assistant Superintendent became a Unit Superintendent. One Unit Superintendent was assigned to each plant and was responsible for the startup, operation, maintenance and engineering of a specific unit.

Common site services such as quality assurance, security, radiation protection and chemistry control became the responsibility of a Station Services Superintendent.

This organization demonstrated its effectiveness and therefore was expanded by the addition of a third unit Superintendent when Unit 3 construction began.

It is significant to note that the existing station organization does not require any changes when Unit 3 achieves commercial operation. The Station Superintendent is responsible for the safe operation of the overall site, and reports to the Vice President, Nuclear Operations.

(Slide.)

Four superintendents report to the station superintendent. There are three unit superintendents and one station services superintendent. Each unit superintendent is responsible for the safe operation of a specific unit. Again the station services superintendent is responsible for providing common site services to all three units.

(Slide.)

Reporting to each unit superintendent is an operation supervisor, a maintenance supervisor, an instrumentation and control supervisor, and an engineering supervisor.

(Slide.)

The services department such as quality assurance, security, health physics, chemistry, and other site services report to the station services superintendent through either the quality services supervisor or the radiological services supervisor.

One reason for our success in the area of nuclear plant operations is the fact that responsibility and accountability rest with line supervision. The station superintendent is responsible and held accountable for the quality of plant operations including the security and radiation protection measures required to support plant operations. In order to effectively carry out these responsibilities, the station is staffed with quality, security, and radiation protection personnel.

To provide for consistency in the application of corporate policies and procedures, each station services department head receives functional direction from the counterpart corporate support organization. The corporate groups also formally audit the station staff to insure the various programs are implemented effectively and to insure production goals do not conflict with nuclear safety goals.

The administrative control procedures presently governing the operations of Units 1 and 2 are applicable for the most part to to Unit 3 at this time, and are. being implemented by the Unit 3 staff.

There are some exceptions due to construction and turnover activities. These exceptions are controlled by either the Unit 3 startup manual or free service unit procedures. The number of exceptions are decreasing with time and will be eliminated once Unit 3 achieves commercial operation.

It is significant to note that the administrative control programs and both the corporate and site organizations which have been responsible for the safe operation of Millstone 1 and 2 for 13 and 8 years, respectively, have been expanded and augmented to insure the safe start-up and operation of Unit 3.

Jim Crockett, our Unit 3 superintendent will now describe the Unit 3 organization in more detail.

DR. KERR: There's a question here, sir.

DR. OKRENT: If there were some serious event -- and by serious I mean complicated, not clearly diagnosable immediately, whatever -- going on in one of the stations and both the unit superintendent and the station superintendent were in the control room, who would be the boss?

MR. MROCZKA: The shift supervisor of the control room would be in charge of the plant at the time.

DR. OKRENT: And the unit superintendent would not tell him what to do?

MR. MROCZKA: Normally, no, unless he had good reason why he would want to -- he would advise him and talk to him and discuss the situation. But the shift supervisor would be in control of the unit.

DR. OKRENT: Would the unit superintendent be supposed to have a deeper knowledge than the shift supervisor of not only the day-to-day operations but broader perspectives or --

MR. MROCZKA: A broader perspective, yes, he would. But as far as detailed, hands-on knowledge of the unit, the shift supervisor being intimately closer to the unit and its operation on a day-to-day basis would be more familiar. But it would be a sharing. But the shift supervisor is in charge of the unit unless -- and he could be relieved of that responsibility by the unit superintendent either by taking over control himself, since he would have a current license, or he would be able to take another senior license person and put him in charge of the unit.

DR. OKRENT: But the station superintendent does not need to have a current license?

MR. MROCZKA: No, not for the three dissimilar units, no.

DR. KERR: Mr. Ebersole.

MR. EBERSOLE: There's about 10 or 12 systems at the station that are needed for supportive roles in shutting down and staying shut down, service waters at the bottom of the line and when they probably should be at the top. These are normally required by NRC in simple redundant configuration and they run a lot of them all the time. Therefore, failure ultimately is assured of one of the two trains.

This, in many cases, produces a transient. And then the plant is faced with the necessity of recovering from that transient without what is normally thought to be redundant capability or diverse capability. This is perhaps the flow of water, or whatever.

In your design here -- as it evolved piece by piece -- do you have any helping functions, such as if one unit begins to be starved of these critical services but the other unit has an abundance of them they can help each other at all? Electrically or by water flow, by whatever?

MR. MROCZKA: Not in the basic design of the plant. We are not interconnected from unit to the other. If there was a contingency and there was a problem, we would give consideration to being able to use resources of one unit if it made sense and didn't jeopardize the safety of that unit.

DR. OKRENT: Well, if one unit goes to the ultimate level of degredation it'll probably carry the rest of them with it by virtue of being on the same site.

For instance, if you have an accident of some sort and you don't have a fully effective containment closure you will suffer environmental radiation levels, probably beyond the design basis of the other two unit's control rooms. And you have to deal with that problem someplace.

Let me ask you this: In the electrical area out in the switch yard, do you have any program in place for the electrical assistance of one unit to another? Is it an integral three-unit station or simply three different units that happen to be on the same acreage?

DR. KERR: Do you understand the question?

MR. MROCZKA: Yes.

MR. COUNSIL: Bill Counsel of Northeast Utilities. I understand the question and we are prepared to address that question when Mr. Pitman gives his presentation later on.

MR. EBERSOLE: That'll be fine.

DR. KERR: Any other questions?

DR. REMICK: You might have answered this but I missed it. Are your unit superintendents licensed SRO's?

MR. MROCZKA: Yes, they are. The unit superintendents maintain their licenses.

DR. KERR: Any other questions?

(No response.)

DR. KERR: Thank you, sir.

(Slide.)

APPLICANT'S PRESENTATION

Operations Staffing and Training

MR. CROCKETT: Good afternoon. My name is Jim Crockett. I'm the Millstone 3 Unit Superintendent. My presentation this afternoon concerns the Millstone 3 Unit organization.

I'd like to point out before I start that I intend to present the operating unit organization. I'd like you to recognize that during the start-up phase the testing of Millstone 3 beginning with component testing on operations side of the company is responsible for start-up testing of Millstone 3 beginning with component testing on turnover through pre-operational and start-up testing. So we have a full functioning staff right now in the start-up mode and also in the operations and training mode. But I indent primarily to discuss the operating organization.

(Slide.)

What I have depicted on the slide shows the line organizations involved directly in Millstone 3, the four line departments, Maintenance, INC, Engineering, and of course, the Operations Department responsible for the routine operations, the maintenance and the refueling of Millstone 3. That organization consists of approximately 200 people who are now on board.

In addition, as Mr. Mrocska indicated, we are augmented. Each of the units is augmented by the station services organization for support in the areas of quality assurance, quality control, health physics, chemistry, store support, nuclear records, ALARA engineering support, station engineering, and also computer services. That group dedicated to Unit 3 consists of approximately 100 people. They are also assigned in the start-up effort of Millstone 3.

Moving to the four line departments. The Operations Department is the department responsible for the day-to-day operations of Millstone 3 on a shift basis and also is responsible for conducting the startup testing during the startup phase.

The Operations Department is headed by Mr. Ken Burton, who has a bachelor's degree in Aeronautical Engineering. He also has a master's in Business Administration. He has 17 years of nuclear experience, 10 years of that is at Millstone, and nine of those years he has been the Operations Supervisor. He's currently SRO licensed at Zion Units 1 and 2.

Directly working for him, he has six operating shifts. The Millstone 3 site, as are the other NU nuclear units, are staffed to support a full six shift rotation. Each of the shifts includes a second SRO-licensed individual who's the supervising control operator. Working also on those shifts a minimum complement of two licensed reactor operators, or the control operators. And also a minimum of three plant equipment operators. We actually have more than that number of plant equipment operators assigned to each shift to bring a total complement for the department of 67.

The Operations Department interfaces with all plant groups and controls all plant activities on turn over systems during startup and eventually during operation on all plant systems.

The second department is the Engineering Department, Millstone 3. The Engineering Department supervisor is Mr. Jim Harris. He has a bachelor's degree in Mechanical Engineering. He also has an MBA. He has 18 years of nuclear experience, 10 of those years at Millstone and he has been previously SRO-licensed at Millstone 2. Working directly for him, he has three assistant superviors and in addition the reactor engineer.

The plant engineers and technicians amongst the assistant supervisors and are responsible for providing systems engineering support to all of the other departments in the station. They are the primary interface within the unit with corporate engineering staff. They have frequent inter-station interface with the health physics department, chemistry, services engineering, the ALARA group, and also computer services. They also provide engineering interface with vendors.

The plant reactor engineering function is primarily involved in the day-to-day activities associated with reactor core performance and monitoring of the reactor core performance. We also have in this group the ISI and reliability engineering coordinator to monitor plant performance and trend equipment history. And finally, this group is the on-site interface with our nuclear safety engineering group.

(Slide.)

The third department is the Maintenance Department. The Maintenance Supervisor is Mr. Carl Clement.

He has a bachelor's degree in Mechanical Engineering, 18 years of nuclear experience, 8 years at Millstone. He was previously SRO-licensed on Millstone 2 and at the Ford Nuclear Reactor. He's also an associate member of the ASME.

Working directly for him, he has four assistant maintenance supervisors. Working for the assistant maintenance supervisors we have the mechanics assigned to this department, responsible for all mechanical maintenance in the plant. And 10 electricians responsible for all electrical maintenance in Millstone 3.

In addition, we have a planner assigned to each department entitled the PMMS Planner or Production Maintenance Management System. The planner is responsible for our automated planning system and maintenance control system that all of our generating facilities in Northeast Utilities have in place at this time.

The Maintenance Department also has two full-time engineers assigned for day-to-day engineering support of the department. A total staff of 59 people. The Maintenance Department provides direct support of operations. They conduct all of the preventive maintenance programs for both mechanical and electrical equipment at Millstone 3. They are responsible for the corrective maintenance in the case of equipment malfunction, refueling outage support and conducting the disassembly and reassembly of the primary system for refueling outages, surveillance testing for all the mechanical and the electrical equipment. And their primary interface within the unit is with the Engineering Department, Quality Control Department, Health Physics, vendors for their equipment, and also with ALARA engineering for job and task planning. The average years of total experience and nuclear exprience are shown on the slide.

(Slide.)

The fourth department, line department on Millstone 3, is the Instrument and Control Department. The I & C supervisor is Mr. Mike Brown. He has 19 years of nuclear experience, 12 of those years are at Millstone Station and 6 of those years are on Millstone 3. He's the current chairman of the Southeastern Connecticut Instrument Society of America. And also the New England Nuclear I & C Supervisors Association.

Directly working in that department are three assistant supervisors with 24 I & C techs split up amongst the supervisors. We also have a similar planning function in this department and a full-time PMMS planner assigned. In addition we have a full-time engineer assigned for day-to-day engineering support.

The I & C Department is responsible for providing again direct support of the Operations Department, the conduct for the preventive maintenance program for the instrument and process controls, corrective maintenance for their equipment, refueling outage support, surveillance testing for all the I & C equipment. And their primary interface is with the Engineering Department within the unit, quality assurance, quality control, vendors for their equipment, ALARA, again, for job and task planning analysis, and also with the computer services department.

MR. EBERSOLE: May I ask a question. In this department -- you were talking a while ago about the shutdown, the scram frequencies -- and I think the popular notion is a lot of the problems come out of the instrumentation and control area rather than actual equipment, major equipment failures. Do you have any comment to make about the degree of influence or control this unit has in your intended program to reduce the shutdown trips, or the trips in shutdowns?

DR. KERR: Do you understand the question?

MR. CROCKETT: No, I'm sorry.

MR. EBERSOLE: Is it this department that generally carries the lead role in examining the causitive aspects of serious reactor trips and shutdowns?

MR. CROCKETT: In the event that it's a process control related shutdown or an instrumentation related shutdown, this department would be involved with that.

MR. EBERSOLE: Have you not found that to be the predominant source of such shutdowns?

MR. CROCKETT: I don't have specific statistics on -- Mr. Opeka mentioned 60 percent of the trips are caused by equipment failure. I do know a large number of the trips are not directly caused by instrumentation, per se. They're caused by such things as instrument error and other things he was discussing.

DR. KERR: Equipment failure.

MR. EBERSOLE: Thank you.

DR. KERR: Mr. Remick?

DR. REMICK: You provided information on experience for the Maintenance Department and Instrumentation Control Department, but not for the Operations Department. Will that come later?

MR. CROCKETT: Yes. My next presentation is on selection and training of operators.

DR. REMICK: Thank you.

DR. KERR: Mr. Siess?

DR. SIESS: Are all the Health Physics and Chemistry support under station services or are some of that under the unit?

MR. CROCKETT: All of the Health Physics support, Chemistry support, Stores and similar common site services are under the services --

DR. SIESS: They're assigned to the units. There are some people dedicated to --

MR. CROCKETT: The bulk of the people are assigned directly to Unit 3. The Stores Department, obviously, and some of the other station engineering group people are a common site. But the Health Physics people for routine operations are assigned directly to Unit 3. Chemistry the same way.

DR. KERR: Mr. Bender?

MR. BENDER: Since you're probably not going to cover this later, what kind of training approach do you have for the Maintenance and Instrumentation Organizations?

MR. CROCKETT: That's the subject of my next presentation.

MR. BENDER: Oh, you're going to cover that next.

DR KERR: Any other questions?

(No response.)

DR. KERR: Please continue.

MR. CROCKETT: Thank you.

(Slide.)

My next presentation concerns selection and training, including experience level of our operations staff, including licensed and non-licensed operators and also our maintenance staff, which includes the mechanics, the electricians and I & C technicians.

The first portion concerns the operators.

(Slide.)

I've divided this into what our staffing objectives are and our selection process for our operators and the hiring of our operators for Millstone 3 and also our training program.

Our staffing objectives for the Operations Department deal with the following points. We wanted to maximize the experience transfer from our other three operating nuclear plants. Secondly, we wanted to provide for the shift technical advisor function consistent with our other operating plants, which is to provide for that function on-shift with an individual having the equivalent of a bachelor's degree.

Thirdly, we would have a firm company commitment to six shift rotation for a variety of reasons. One of them being a good training program. Secondly, backup in case of unexpected outages and some other reasons.

Startup support, we wanted to staff Millstone 3 early with the Operations Department because the operating company is responsible for the startup. Under the Millstone 3 project the sooner we could staff, the sooner we could get writing on our test procedures and complete our training program to support startup of the unit.

And finally, we wanted to staff sufficiently to allow for progression and also for attrition over the two- to three-year period we would be in startup.

The selection process we used for our Operations staff, again, the operating unit transfer was looked at to the maximum extent possible, yet, allowing the operating units to maintain their full training program to meet all their commitments, and to adequately staff their units.

As the result of this, six of our shift supervisors are degreed individuals. Two additional shift supervisors are direct transfers from the operating units.

Secondly, the selection process looked heavily at cold license eligibility. Essentially, all of our operators from the control operator level up are cold license eligible, that is, having previously held that license or equivalent.

The shift supervisors as I previously mentioned, six of those shift supervisors have degrees and two of them are transfers from the operating units with SRO licenses. The supervising control operators, those individuals are looked at as being very experienced people. The best we could get from our operating units. Five of those individuals have previously held SRO licenses and been SCO's and one of them has an RO license, has previously held a reactor operator license.

The reactor operators are plant equipment

2 WRBpp

operators who we hired into the company assigned to the operating units for a full qualification on the operating units up to a year, as fully qualified plant equipment operator. And then transfered directly back to Unit 3 and start the training program.

The plant equipment operators are, for the most part, ex-Navy experienced operators.

DR. KERR: Mr. Crockett, what is an SCO?

MR. CROCKETT: I'm sorry. That's a supervising control operator. That is the second SRO-licensed individual in the control room. That's equivalent to a shift foreman.

DR. KERR: Thank you.

MR. EBERSOLE: You have three units here of different types, the boiler, the combustion and this thing. What sort of prohibits do you have on interplant transfer and use of operators?

MR. CROCKETT: Each of the plants are totally separate as far as staffing goes in the four line departments.

MR. EBERSOLE: So you don't consider an operator at one unit to be an operator at another unit?

MR. CROCKETT: No, it would be permissible if they were licensed on both units, but we have no individuals in that category with current licenses.

MR. EBERSOLE: Do you intend to keep it that way?

MR. CROCKETT: Yes.

(Slide.)

The training program -- to briefly go over the training program that our operations, however, has gone through, and is currently still in to achieve the cold licensing status next year, to complete cold licensing next year. The first part of the training program concerns nuclear fundamentals for all of our people. It includes nuclear theory, thermohydraulics, heat transfer and fluid flow. We sent all of our operations staff, including our staff individuals who are going to be licensed, to a classroom portion and a simulator course on the SNUPPS plant to familiarize all individuals with a large four loop Westinghouse plant. So we had a common training base from which to start. All of our people in training operations and staff licensees attended a three-month site school which was systems oriented, both interpolous and balance of plant, primarily.

We have an additional -- because we have the six shift rotation every sixth week is a training week. Consequently we are running six additional training shift weeks in preparation for cold licensing to cover such topics as Chemistry, Health Physics, transient and accident analysis, general operating procedures, and emergency procedures.

We also have currently ongoing, I might mention that we're in our second of those six additional training weeks, so we're up to that part of the training program. Ongoing within the Operations Department, we have the on-the-job training program, which is heavily systems oriented, check-out oriented on the systems. That is approximately 40 percent complete.

Similator training, we went through the simulator building today. Millstone 3 will be the first simulator received and testing will start -- training on that simulator will start in January of 1985 in order to support our license schedule.

Folded in with that simulator training are some final training and evaluation programs which have to do with oral exams and certification by the management, both in-station and also corporately, that the individuals are ready to sit for the exam.

Of paramount importance, because we are a startup unit, we will have gained some two- to three-year's experience for the majority of our operations staff in startup testing. And that experience is invaluable to our people.

DR. KERR: What do you use as guidance for STA training beyond the SRO, the true STA?

DR. REMICK: We have in our company a very comprehensive STA program. It started out with teaching college level courses on site to people that we took off shift and dedicated to STA training. It consists of a 60 semester hour engineering based, nuclear engineering based course, what is called the STA level I certification. Following completion of that, which takes in the neighborhood of one year on the original course -- I might also mention that now we have a contract and a curriculum set up with Thames Valley State Technical College to conduct this program for the company and our first class is in that program right now.

Following this course, the STA level two certification commences, which is again college level courses in such things as management, communications, communications skills. That in conjunction, we feel, with the individual's SRO-license and plant experience to be the equivalent of a bachelor's degree. And that's how we provide our STA on shift.

DR. KERR: Do all of your STA's have SRO licenses?

MR. CROCKETT: Speaking for Millstone 3, all of our STA's will sit for the SRO-license, yes.

DR. KERR: Thank you. Mr. Ebersole?

MR. EBERSOLE: When you go through the plant you see a myriad of variety of functions. For instance, cable trays, piping systems, switchboards, and so forth. Where, in your training of operators do you give them the plant familiarization work. I think the Navy over a long period of time, requires that its people know in intimate detail where everything is and what it does apart from the academic aspects, however that works, where it is, what it is, and what happens when it goes bad. There was a terrible moment in history when a bunch of people at a certain plant stared for six hours at a fire and were fearful of attempting to put it out because they thought they would ruin whatever function they had. It reflected on the fact that the operators didn't know what was where. What do you do about that?

MR. CROCKETT: We have built into our training program a variety of means to get the operators the knowledge that they need to operate the plant. Paramount in the system's familiarization in knowing where everything is is what I had on the board --

(Slide.)

-- previously which is called on-the-job-training. It's actually called OJST, on-the-job-system-training. We have split the Millstone 3 systems into approximately 130 checkouts wherein a qualified individual at an SRO level or higher checks out every individual in the plant. All the operators must complete the training. And that includes walkdowns, it includes physical simulation or actual operation of the equipment at the location. It includes being able to draw the drawing of the system and explain in detail how the operating procedure is to be followed.

MR. EBERSOLE: Does it include hypothetical situation like: I've got a fire in this room but I have certain functional capabilities elsewhere?

MR. CROCKETT: As far as alternate shutdown capabilities specifically?

MR. EBERSOLE: Right.

MR. CROCKETT: Yes.

MR. MICHELSON: Does it include though, what would happen if I were to put the fire hose on a specific piece of equipment in terms of its impact on safety?

MR. CROCKETT: No. We cover specific fire training in our fire brigade training program. We have on shift a minimum of a five-member qualified fire brigade. Their training is extensive. It not only includes basic fire brigade training, but each shift has a fire brigade leader who receives more training. Included in that training is hands-on firefighting experience in Connecticut with real fires and in smoke-filled situations.

In addition, the basis for much of the training program in the site school is the fire protection evaluation report which includes all fire zones in Millstone 3, including strategies, primary and backup suppression methods in each of the zones.

MR. MICHELSON: I don't recollect though, I haven't seen the details of that, but did that study include the effects of water sprays on equipment in terms of malfunctioni-g?

MR. CROCKETT: I'm afraid I can't answer that.

MR. MICHELSON: I think if treated --- what happens when you lose that particular function, but it's the malfunctioning, I think, that's the concern being raised here.

MR. CROCKETT: If you're looking from the systems interactions standpoint, the effects of flooding and use of water sprays on equipment, we have looked at that in the systems interaction and the effects on the equipment in Millstone 3.

MR. MICHELSON: Your systems interactions studies, then, determine the effect of water sprays on equipment in terms of what types of mal-operations might occur as a consequence?

MR. CROCKETT: The systems interaction study does some of it. It's part of the overall hazards analysis program on Millstone 3.

MR. OKRENT: How is that done?

MR. CROCKETT: Which part?

MR. OKRENT: What you just said.

MR. CROCKETT: The hazards analysis program?

MR. OKRENT: Including the effects of water sprays on equipment. I don't recall reading about it in the Millstone PRA. Was there some page I should have looked at?

MR. COUNSIL: Tomorrow Dr. Bonaca and Dr. Bickel are going to cover that portion of the topic. In addition to that, the training program they're devising for the operators on this particular subject, so if we can hold those questions until tomorrow, I'd appreciate it.

MR. MICHELSON: Is the fire protection brigade then going to be trained on the consequences that might have been derived from such a study?

MR. COUNSIL: We're setting up a course to train all of our operators, which is predominantly the fire brigade, on the consequences of what was learned through the PRA study.

MR. OKRENT: Well, a PRA is really a set of methods into which you put information and take out information. And at the moment we are really talking about the information you would put into the PRA, namely what kind of malfunction, if any, could occur by sprays getting onto various things. And this is really a study that has to be done preceding one putting it into the PRA, if you were to put it in, and I assume it would be something that would be of particular interest to the fire brigade, and the guy who supervises the fire brigade, and the guy who supervises him.

DR. KERR: I'm going to guess that you have not done this in the details that these gentlemen are asking about it. But I think you understand the question and perhaps by tomorrow you can have some response. Is that a reasonable way to handle it?

MR. COUNSIL: Yes, Dr. Kerr. We intend tomorrow to discuss failure modes and effects analysis that went into the PRA in addition to this. I believe we'll be able to.

DR. KERR: Thank you. Other questions?

(No response.)

DR. KERR: Please continue, Mr. Crockett.

(Slide.)

MR. CROCKETT: As far as the experience levels of our operations department, looking at nuclear experience for our licensed shift supervisors, supervising control operators and control operators, we have a 292-year total experience, nuclear experience. Our non-licensed operators, 122. With the experience that our operators are going to gain in the start of Millstone 3, that amounts to some 114 years spread amongst the department for a total of 528 years of experience.

Secondly, of just as much importance as straight nuclear experience, we have a — tried to — maintain and achieve a high level of management experience on each of our shifts. Including for our shift supervisors, six of our shift supervisors have degrees and have been previously in the Navy and an engineering officer of the watch capacity, and most are engineer-qualified also. Or two of the eight have actual shift supervisor experience and SRO licenses.

Our supervising control operators, again, are all previously NRC licensed. Five were previously SCO's. All have completed the STA level-two qualification.

And finally, one of the most important parts of the experience concerns the startup experience gained by operators, which I'll mention again. All of our operating procedures were written by the operations staff. All system operation for the test is performed through the Operations Department. We will have gained over three years of ongoing experience during the startup test program and finally the basis of all of our pre-operational acceptance test procedures and our startup test procedures are the actual operating procedures used to operate the system.

DR. REMICK: If I wanted to get the average nuclear experience I would divide that 528 by how many personnel?

MR. CROCKETT: 57. That's the people that are actually assigned a shift. I have not included the staff.

DR. REMICK: Thank you.

MR. OKRENT: Do all shift supervisors have what some people called hot commercial power operating experience?

MR. CROCKETT: Two of the eight shift supervisors have hot commercial experience.

MR. OKRENT: Will there be senior licensed operators on shift on every shift that has such experience?

MR. CROCKETT: Yes. It's either the combination of the shift supervisor or that experience is by the supervising control operators. Each shift will have at least one.

DR. KERR: Please continue.

(Slide.)

MR. CROCKETT: The next section concerns the Maintenance staff, which is the Millstone Unit 3 mechanics and the electricians. Our staffing objectives: First to staff the department with highly qualified assistant supervisors. We feel that this is extremely important within these line organizations who are going to have to be responsible for the maintenance of the unit and the surveillance testing of the unit.

Secondly, we looked at maximum experience transfer throughout the department from all of our generating stations a breadth of skills. It's important that we have within the Maintenance Department people who have a large number of skills and also specialize skills such as welding, NDE examination techniques, or any of the other special skill areas.

Thirdly, we wanted the staff to support the startup program as early as possible because the operating company, again, is responsible for startup. And finally, we wanted a staff with adequate numbers of people early enough so that we could implement the full preventive maintenance program at the time of system turnover.

Our selection process looked again at the operating plant transfer, at critical skills -- which I previously mentioned -- welding, diesel generator skills, prior training. And also we looked heavily into industrial experience so that we had a broad base in the Maintenance Department.

Our training program for the Maintenance Department consists of systems familiarization for the Millstone Unit 3 systems, the basic department training which consists of administration, tagging control, workorder systems, Health Physics, discipline training including mechanical maintenance and electrical maintenance, specialized training, such as AVAC, refrigeration, welding, NDE, on-the-job-training including participation in startup and finally the participation of all of our people in startup testing.

MR. MICHELSON: Before you leave that slide will you tell us a little bit about what you're going to do prior to operation in terms of color coding, labeling and so forth, of the various components throughout the plant.

MR. CROCKETT: What are we going to do about color coding and labeling?

MR. MICHELSON: Yes, and then also tell me how that's going to tie into your maintenance training program and whatever.

MR. CROCKETT: Well, to start with Millstone 3 is highly color coded to begin with. If you noticed on the walkthrough today, we have two safety trains indicated, orange and purple. Orange being train A, purple being train B. So it's readily apparent whenever you walk through the plant by color code stickers or by cable color itself, what train you're dealing with.

Secondly, we do have four instrumentation channels of our four vital AC systems. They are similarly color coded.

Thirdly, we do have a program in place to consistently label all equipment with standard nomenclature throughout the plant. That is a function of both the Operations Department -- excuse me -- of the I & C

Department and the Maintenance Department for equipment. We also have in place a color coded valve tag system for all valves in the plant on embossed aluminum labels which are tagged at the time of the system turnover.

MR. MICHELSON: Most of the tags are not on there yet, I guess, because I looked at a number of valves and I couldn't tell anything about the valve.

MR. CROCKETT: All valves on turnover are generally tagged within two weeks of the turnover date.

MR. MICHELSON: Those will have unique colors?

MR. CROCKETT: Unique colors.

MR. MICHELSON: Identification that makes some sense and not just a combination of numbers and letters?

MR. CROCKETT: It will have 3 being the unit number -- 3 alpha character, which is the system number, such as FWS which is feedwater system, and then the valve, V-B, indicating valve 177, for instance. Pumps would be the same type of thing. The system nomenclature followed by -- the system code followed by the number. You also have the English name of the valve or the pump or whatever it is.

MR. MICHELSON: Will the valve handles or other things like that be color coded?

MR. CROCKETT: No.

DR. KERR: Please continue.

MR. CROCKETT: Finally, the experience levels of the Maintenance Department consist of 276 years total nuclear experience and the assistant supervisors, mechanics, electricians, their experience levels are shown on the slide.

(Slide.)

The I & C Department, looking at our staffing objectives for I & C, looked heavily again at highly qualified assistant supervisors. Staffing for I & C is somewhat different than Maintenance. I'll go into the reasons. It has primarily to do with training and experience.

We looked at a broad depth of process controls experience. It is, we feel, very important that our people all have a good, solid basis in process controls from which to build. A breadth of skills, we looked at people that had experience in analog process controls, in pneumatic controls, so that we had a department which was capable of maintaining all of Unit 3 in the process and control area. Diversity, in that we had people that were both digital qualified or solely digital qualified, analog qualified when they came into the department. Again we staffed early, as soon as possible to support the startup test program. And again, for the PM program at the time of system turnover.

Our selection process for the Operations -- I & C people included looking for this analog-digital background.

We found these people either from operating unit transfer or from out in the industry or from the military.

We looked for people, again, with strong process controls background and we also looked at the individual's prior training to see if he could participate in our training program and complete it.

The training program for the I & C Department consists of systems familiarization, basic department training including work orders, tagging, work control, Health Physics, discipline training, specific I & C training, specialized training in such areas as microprocessor controls, software, and on-the-job-training program which is quite extensive. And then, of course, participation in a startup test program.

The I & C Department, our experience levels show, we have 206 years nuclear and for our assistant supervisors and technicians our experience profiles is as shown.

DR. KERR: Mr. Crockett, my reading of my watch and our agenda would show that you and Mr. Burton between you, have another 10 minutes.

MR. CROCKETT: I think we can complete it in time. This concludes my presentation.

(Laughter.)

DR. REMICK: Mr. Crockett, I would find it helpful if you could provide us with the average nuclear experience by category of shift supervisor, your senior control operator, and so forth, by category. You've done it in Maintenance, you've done it in instrumentation. It need not be done now or it need not be done tomorrow if that's not reasonable. But for the full committee meeting, it'd be interesting to see a breakdown of experience by level.

MR. CROCKETT: Specifically for the Operations Department?

DR. REMICK: I'm thinking of Operations, yes. Similar to what you have for Maintenance, instrumentation and control. You have the gross figures but you don't --

MR. CROCKETT: Well, I can give you what I have.

DR. KERR: Why don't you give it --

MR. CROCKETT: You want me to give that separately?

DR. KERR: Please. In the interest of time. Any further questions?

(No response.)

DR. KERR: Thank you, Mr. Crockett.

MR. CROCKETT: I would now like to introduce Mr. Ken Burton, the Operations Supervisor, who will cover the emergency operating procedures.

OPERATIONS STAFFING AND TRAINING,

TRAINING TO HANDLE SEVERE ACCIDENTS

MR. BURTON: Good afternoon. My name is Ken Burton. I am the operations supervisor for Millstone 3.

(Slide.)

I'll be discussing severe accident conditions and emergency operating procedures.

The method used by Millstone 3 to address severe accidents consists of two approaches:

The first approach is the use of functional response procedures to respond to critical safety function challenges. Severe accident conditions are further addressed by activation of the emergency plan which allows access to corporate and industrial resources. I will be addressing the emergency operating procedures of the in-plant approach.

(Slide.)

The Millstone 3 emergency procedures are based on a Westinghouse owners group revision one guidelines. These procedures address functionally oriented responses to unexpected plant conditions, as well as optimal event recovery procedures.

The emergency procedure development was coordinated with a control room design review and a safety parameter display system to ensure an integrated approach.

This serves to avoid discontinuity with the interface between the operator and the plant. The procedures will have an extensive review cycle, partly due to the coordination from above and by use in training on a site specific simulator.

(Slide.)

The emergency procedures were task analyzed for the control room design review. This ensured that all the functions required to be performed from the control room could be performed in an unambiguous manner.

The safety parameter display system is consistent with the emergency procedures. An alarm shows the function being challenged. The status trees are then displayed with the end result. Operations personnel transferred the guide information to emergency procedure format. This provided both a training tool and the operators' input into the wording. This gives us confidence that the procedures are meaningful to the operators.

The review and development cycle utilized recommendations from the owners group and INPO, adjusted for in-plant activities, such as the control room design review, and the use of a site specific simulator being made available in 1985.

Detailed training will start in November with support from courses in transient accident analysis and mitigating core damage. This training is followed by the use of the emergency operating procedures on a site specific simulator. The use of the Millstone simulator provides an opportunity to exercise procedures in a real-time basis to check that operators are provided the correct level of detail.

(Slide.)

A subsection of the emergency procedures exist.

DR. OKRENT: Excuse me. Before you go on, are these emergency operating procedures now complete?

MR. BURTON: I'm sorry?

DR. OKRENT: Are they completed?

MR. BURTON: At the present time we are preparing for a submittal for October 1st. The emergency operating procedures have been reviewed, they have been task analyzed. In the present state they have not been finally typed. We are awaiting some data input on the decision points from Westinghouse; that's the engineering analysis as far as what the actual plant specific decision points are. We're in the process of getting that information together right now.

DR. OKRENT: What kind of vessel level indicator do you use?

MR. BURTON: Millstone 3 will be using the heated junction thermocouple vessel level.

DR. OKRENT: That's the one put out by the other guys?

MR. BURTON: That's correct.

DR. OKRENT: I see.

(Laughter.)

DR. OKRENT: Did you have to write some special EOPs because of this? Because Westinghouse writes theirs in terms of their own instrument, if I recall.

MR. BURTON: What that requires is a look at the various decision points where they get the operator to the functional response, which, when they're trying to determine the vessel level you have to adjust -- the question is is the reactor cooling pump running, is the delta-P, et cetera, to look strictly at the level that is being indicated from the heated junction thermocouple.

DR. OKRENT: And who is making these decisions?

MR. BURTON: That's going back to the bases document.

DR. OKRENT: But who is writing this and -- You said setting set points for operators to do things and so forth. Is that Westinghouse?

MR. BURTON: Yes, that is.

DR. OKRENT: Why is it not the utility, since they are going to run it? Don't you understand the plant well enough?

MR. COUNSIL: Bill Counsil, Northeast Utilities. We are doing that work in house.

DR. OKRENT: So you're not looking to Westinghouse to do that?

MR. COUNSIL: No, we are not looking to Westinghouse. That's a function of our transient analysis group at Northeast Utilities. If you would like, Dr. --

DR. OKRENT: No. I just wanted to understand...

Let me ask, have you run into any situations where in your opinion the information to the operator could be less than completely unambiguous with the emergency operating procedures?

DR. KERR: Do you understand the question?

MR. BURTON: Yes, I do.

Right now, no, we have not. When you're writing emergency operating procedures they are balanced between the amount or level of detail and between providing so much detail that an individual cannot go through the procedures within the time frame desired.

At the present time we hope to resolve those issues by use of -- One, we have had a walk-through in the control room by the operators of the emergency operating procedures, and that has not indicated any problem in that area. We further refine that when we use our procedures on a simulator to determine if a problem area exists. It will be looked at from either a training aspect, an equipment problem or a procedural problem.

DR. OKRENT: Would your testing of the procedures include the presence of faulty instrumentation? In other words, that not all signals are in fact necessarily accurate and you don't know which?

MR. BURTON: I don't believe that's been incorporated.

MR. BENDER: Could I ask a corollary question? If you are writing your own procedures are you doing it in conjunction with other utilities, or is this a completely independent effort?

MR. BURTON: No. We have -- What we are doing is we are converting the Westinghouse Owners Group Revision One guidelines into plant specific procedures, which is a requirement that all utilities incorporate them to the actual nomenclature of the plant and to the various set points that are respective to the plant in particular.

MR. BENDER: I know that's necessary. I'm interested in the question of how to avoid mistakes when only one group is doing it and whether you can have the advantage of other people's thinking and translational capability?

MR. BURTON: We are using the recommendations from the INPO. As far as the transfer, we have developed a writer's guide.

As far as the incorporation or the transfer or the information from the emergency response guidelines to the emergency operating procedures, with the use of that we have had the individuals draft those procedures. Once we have had them drafted we have had a verification program, we have had an independent individual go through and review the procedures against the guidelines using the criteria based in the writer's guide to ensure that we have a consistent approach.

MR. EBERSOLE: In the emergency procedures do you go to severely degraded states, not just the classical state where a residual function is automatically supplied?

DR. KERR: Do you understand the question?

MR. BURTON: Yes, I do. Do we go to severely degraded states.

The owners' group guidelines take the plant to a large number of conditions that are far from off-normal. The procedures are really based on mitigating core damage and protecting the various products, fission product barriers. This is what the operator would be expected to do. To go beyond that we activate the emergency plan when we are into that type of situation and we would be drawing upon the resources of various members of the industry, the NRC and the whole nuclear community.

MR. EBERSOLE: Let me ask you just a couple of examples.

Not too recent -- as a matter of fact, some time ago an incident occurred at I think it was Hatch, which in fact revealed that the dump volume could in fact be blown into the containment. And the procedures that followed that were nothing short of spectacular. Are you acquainted with that event?

MR. BURTON: I'm not familiar with the event at Hatch.

MR. EBERSOLE: Well, it illustrated a degraded state not anticipated by anybody and for which there were no particular procedures available.

Do you have in place some sort of recovery mode from such an unexpected cascade of events as that?

DR. KERR: You mean a procedure for an unexpected emergency?

MR. EBERSOLE: I'm talking about a procedural approach to things that you didn't expect.

Another case in point: We've had a rash in the last few weeks, as a matter of fact, of a total loss of AC power.

MR. BURTON: We do have a procedure on the loss of all AC power. One of the ways the emergency procedures do address is they have a group of critical safety functions that intend to protect those functions and they direct you at functionally related procedures so you do not have to know the event or the exact cause of the problem. That is I believe the answer or the type of approach that resolves the condition that you don't really know where you are.

MR. EBERSOLE: Is it the recovery of critical functions that you aim toward?

MR. BURTON: I'm sorry, I didn't hear you.

MR. EBERSOLE: I say is it a recovery of critical functions that is your goal if you lose all of them?

MR. BURTON: The recovery of the critical functions is not the final goal. Once you recover the critical functions you can then go through your optimal event recovery.

MR. EBERSOLE: But the first goal is the recovery of a given critical function: like service water?

MR. BURTON: That's correct.

DR. KERR: Further questions?

(No response.)

DR. KERR: Please proceed, Mr. Burton. You have now minus-three minutes.

(Laughter.)

MR. BURTON: The last section I wanted to talk about is the subsection of the emergency procedures that exist to implement the emergency plan.

(Slide.)

This system is in place for the operating units and has been used and refined in drills over the past several years. These procedures are not directed toward in-plant activities but, rather, the interaction of the emergency support organizations.

If there are no further questions I would like to re-introduce Jim Crockett, who will discuss communications.

DR. MARK: A question: This last thing sounds as if it might be rather similar to what would apply in the case of Millstone 1. Are there differences?

MR. BURTON: On this procedure? There are. The primary differences are in the emergency action levels of what starts an emergency action level. That's in the assessment category. In most cases we'll be activating the emergency plan, and then the procedures on various groups of how the different groups interact and what their various responsibilities are.

DR. MARK: Well, I meant that it doesn't sound like a problem for Millstone 3 as distinct from the rest of the units in the plant.

MR. BURTON: No, it's not.

DR. KERR: Other questions?

(No response.)

DR. KERR: Thank you, Mr. Burton.

You're going to give us a model of short time communication, Mr. Crockett?

MR. CROCKETT: Yes, I am.

OPERATIONS STAFFING AND TRAINING, COMMUNICATIONS

MR. CROCKETT: Good afternoon. My name is Jim Crockett, Millstone 3 Superintendent.

I intend to cover plant communications, specific hardware related to Millstone 3. It is a short presentation. All I have indicated on a slide is the multitude of communication systems that we have built into the Millstone 3 Unit, essentially identical to Millstone 1, Millstone 2 and CY. And I will quickly go through those.

Inter-plant. We have the plant switching network, which is an onsite dial telephone network; a voice paging system for either Millstone 3, total station or selected areas such as office buildings, the maintenance jack system; a five channel system to handle all maintenance within the plant between the control room and various stations; a dedicated separate maintenance jack system for fuel handling operations; a sound powered system which provides communications not dependent on AC or DC power for safety grade cold shutdown purposes located with the prime station at the auxiliary shutdown panel; and we also have an O&M or operation and maintenance UHF onsite radio system primarily for use by the operators and also secondarily by the maintenance people.

Inter-site off-site communications: Within the Millstone site itself we have the plant switching network identical to part of the interplant communication system. We also have the message network system which connects us with the Southern New England Telephone Company network; the evacuation alarm system, a separate system; the microwave communications data link, both data link and communications with our corporate offices in Berlin and all of Northeast Utilities' system; our emergency notification system tie line to operations headquarters in the NRC; multiple dedicated automatic telephone, ringdown telephones for such purposes as direct contact with State Police, the Waterford Police and all of our various stations in the emergency organization; our Connecticut Valley Electric Exchange System, which is our power dispatcher for our system; a party line loop for all generating facilities; control room intercoms between units 1, 2 and 3.

And there are also multiple radio systems: our inter-company system for CL&P; our UHF onsite system, and also a dedicated system to the State Police.

And that concludes my presentation.

MR. MICHELSON: How many of those systems would remain operable in the case of an earthquake, or are likely to remain operable?

MR. CROCKETT: None of those systems are seismically qualified. However with the diversity of the systems I would suspect that a large number would.

MR. MICHELSON: Thank you.

DR. KERR: Are there other questions?

MR. MICHELSON: None of them are actually seismically qualified?

MR. CROCKETT: That's correct.

DR. KERR: Other questions?

(No response.)

DR. KERR: Thank you, Mr. Crockett.

I declare a ten-minute break.

(Recess.)

DR. KERR: Mr. Busch.

OVERVIEW OF PLANT

(Slide.)

MR. BUSCH: This gives you an overview of the project team. Over the years this team worked closely with the unit superintendent and his staff. We believe this management structure, one which promotes a high level of open communication between the builders and the operators, is an important factor in the strength and success of Millstone 3.

(Slide.)

The project team has the responsibility for controlling the cost, schedule, purchasing, engineering, quality control and construction at Millstone 3. As the project has evolved, the project team has coordinated the Northeast Utilities' review and approval of design specifications, equipment purchase requirements, engineering methods and procedures, construction procedures, and most other facets of the project.

The project team has continuously monitored the performance of all major contractors and subcontractors. We function to support and implement design changes recommended by the unit superintendent and his staff.

I should mention, by the way, that Millstone 3 is what is commonly termed a force account construction project. This means almost all of our craft workers are employed by the general contractor, Stone and Webster Engineering Corporation. As you might expect, this has made our job of managing the overall project substantially easier, and allow tighter control.

One example of our involvement in the design and engineering of the project is the Project Office which we have maintained in the Stone and Webster Engineering headquarter's office in Boston.

I might also point out that Mr. Crockett, the Unit Superintendent, assigned some of his key operations personnel to work with project personnel stationed in Boston.

Throughout the design and engineering of Millstone 3, we have attempted to incorporate the experience gained through our many years of operating Connecticut Yankee and Millstone Units 1 and 2.

An example of this is the construction in 1975 of a full-scale mockup of the ma'n control boards for Millstone 3 This mockup was used as a design aid and incorporated the recommendations of experienced operators to optimize the layout of the instrumentation and controls. Note that this was done well before the TMI-created spotlight on this area.

Since early in 1983, the entire project team has been resident at the job site. This further enhances our ability to coordinate our efforts with the operations staff and provides still closer control over the remaining engineering and construction work.

I would like to turn now to a very brief summary of the startup program and our progress to date.

Millstone 3 today is making good progress toward the scheduled commercial operation date of May 1, 1986. Currently the project is almost 90 percent complete, and 126 of the units, approximately 228 system turnovers, have been released for testing by the unit operations staff.

(Slide.)

This slide briefly summarizes the latest installation status of commonly measured physical commodities, and you can see by observation that most of the numbers are well over 80 and in some cases into the 90 percent range.

As Mr. Crockett explained, the startup and test program——

DR. KERR: Excuse me, Mr. Busch. That is a percent of what?

MR. BUSCH: That's a percent of the remaining or total amount of work, so by looking at that percentage you can determine roughly how much is left to be completed.

DR. KERR: Work measured in units of dollars, pounds?

MR. BUSCH: It's a measure of the physical commodities in general in the terms that you would normally use. For example,--

DR. KERR: I don't know what terms I would normally use. That's why I'm asking the question.

MR. BUSCH: Well, for concrete it would be yards of concrete, cubic yards.

For large pipe it would be linear feet of large pipe.

And for pipehangers and some of the other different areas that this slide indicates, there are somewhat more sophisticated methods of adding up all the various widgets.

DR. KERR: Thank you. That's helpful.

MR. BUSCH: As Mr. Crockett explained, jus' to recoup for a second, the startup and testing program for Millstone 3 is performed by the unit's startup and operations staff. By doing this work ourselves and minimizing the use of contractor personnel, we have the clear advantage of keeping the experience gained during startup in-house.

The startup program draws from Northeast Utilities' favorable experience on Millstone 2. Let's look for a second at the basic structure of this program.

(Slide.)

Very simply as you can see, there are three major phases, and I will spend just a second talking about each one.

(Slide.)

We start with component testing, and this means that we work on various individual components. These are straightforward checkouts of valves and motors and circuit breakers, et cetera.

Once the component testing has been accomplished, we work into system-level or preoperational testing, as this slide shows. This is normally a progression from electrical testing working into more and more complicated power testing.

(Slide.)

With preoperational testing complete, the final phases of the test program are then carried out. These begin with pre-fuel load, hot functional testing, and ultimately include final power ascension testing.

(Slide.)

This chart indicates some of the major milestones in the test schedule.

DR. OKRENT: Excuse me.

Before you go on, the Millstone site was the one I believe where an undervoltage problem developed during operation, and much more recently, by looking at things with pencil and paper and computer, I think they found an undesirable electrical tie-in at Indian Point 3.

Have you changed your method of testing all things electrical as a consequence of your own experience, othor people's experience? If so, how? And is there reason to think that it would indeed be a remote event that something that would be missed by your current method?

MR. BUSCH: Dr. Okrent, I'm not sure I am really the one that should be answering a question like that. And I am going to ask Mr. Counsil to respond to that.

MR. COUNSIL: We may address that right now with our system manager, generation and electrical engineering, Mr. Robey, or tomorrow when he is on the program, as you wish.

DR. OKRENT: As you wish.

MR. COUNSIL: We will wait until tomorrow then.

MR. MICHELSON: While you are interrupted, can you tell me roughly the number of years from the start of construction until you anticipate commercial operation?

MR. BUSCH: It would be about 11 years.

MR. MICHELSON: That is kind of a little longer than the industry average, I guess, for this type of installation, isn't it?

MR. BUSCH: Well, it certainly is an indication that the unit has had a variety of troubles over its years, and those mainly deal with delays associated with providing financing for the project.

MR. MICHELSON: These were not engineering problems you're saying but, rather, financial problems?

MR. BUSCH: In general that's correct.

DR. KERR: Please continue.

MR. BUSCH: Just quickly reviewing this slide you can see that the plant has been on permanent power for some time. The service water system has become available and as we look at the slide, we can see some of the other, more major preoperational and startup testing which will take place.

Just focusing for a second on where we're going in the near future:

(Slide.)

You can see that within a reasonably short period of time we will have the turbine on turning gear. Cold hydrostatic testing of the reactor system is scheduled for mid-February of next year. Hot functional testing will begin in July of next year, with fuel load scheduled for November 1st, 1985. And of course finally once again, commercial operation is scheduled six months after fuel load, May 1st, 1986.

In summary, Northeast Utilities has played a major role in assuring Millstone 3 is designed and constructed in accordance with our requirements. It is a unit which reflects years of engineering, construction, and operations experience developed by our own people on commercial nuclear units.

DR. KERR: Are there questions?

(No response.)

DR. KERR: Thank you, Mr. Busch.

MR. BUSCH: That concludes my presentation. I would like now to introduce our next speaker, Mr. Orefice, our Project Engineer.

MR. OREFICE: Good afternoon. My name is Sal Orefice. I am the Northeast Utilities Project Engineer for Millstone Unit 3.

I would like to spend a few minutes to present some of the principal design features of Millstone Unit 3. Later presentations and discussions will expand on and provide more details on these design features, as well as describing the operation of the unit.

(Slide.)

Millstone Unit 3 employes a four-loop closed-cycle nuclear steam supply system manufactured by Westinghouse with a designed thermal power rating of 3425 megawatts.

Millstone Unit 3's NSSS is similar in design to that of the Comanche Peak and the Maguire Nuclear Power Plants. Each of the four loops of the NSSS contains reactor coolant pump, associated piping with loops stop valves, and Model F steam generators.

The Model F steam generator represents the current state of the art in steam generators with design characteristics that have been developed from years of accumulated experience of previous designs.

The turbine generator is a tandem, compound, six-flow, 1800 rpm unit manufactured by General Electric. It utilizes two moisture separator reheaters, two 100-percent capacity steam air ejectors, three 50-percent capacity condensate pumps, three 50-percent capacity feedwater pumps of which two are turbine driven and one is motor driven. The unit is capable of 50 percent load rejection without reactor trip.

Millstone Unit 3 has a full flow condensate policy demineralizer. The condenser is a single-pass unit manufactured by Westinghouse. It has titanium tubes and integrally grooved tube sheets.

(Slide.)

Cooling water is provided from Long Island Sound.

Millstone Unit 3 has a subatmospheric containment similar in design as the North Anna Nuclear Power Plant. The containment is a steel-lined reenforced concrete structure which provides a barrier against the escape of fission products and is designed to be maintained between 9.5 and 11.5 pounds per square inch absolute during normal operation.

The containment structure has been designed to withstand temperatures and pressures resulting from a spectrum of LOCAs and secondary system breaks.

Millstone Unit 3 is designed to be returned to subatmospheric conditions by utilization of the quench spray and containment resurf spray systems within 60 minutes of initiation of an accident.

Water supply for the quench spray system is from the refueling water storage tank which has a capacity of 1.2 million gallons. This compares favorable to that of similar units which have a capacity of between 300,000 and 400,000 gallons.

The containment structure is housed--

DR. KERR: Excuse me. When you make the statement that it is capable of restoring subatmospheric within an hour of an accident you refer to the design -- the classic design basis accident spectrum, do you not?

MR. OREFICE: That's correct.

DR. KERR: Thank you.

DR. MARK: When you say the water capacity is two or three times, or one and a half to two times bigger than customary, now where was that decision made? That wasn't made by Westinghouse. It must have been made by Northeast Utilities or one of those departments we've been hearing about.

MR. OREFICE: That's correct. It was made by Northeast Utilities and Stone and Webster. In looking at one of the scenarios for large-break LOCAs, we have a secondary peak where we required the 1.2, the additional capacity water.

DR. MARK: It is an example, it seems to me, of an answer to a question that was raised earlier: To what extent does your own organization enter into the design business and decide we want the design different than the one that is on the street?

MR. OREFICE: Northeast Utilities is an integral part of the design of Millstone Unit 3. We, in combination with Stone and Webster, have designed the nuclear power plant. It is a joint effort, and it is not where Stone and Webster proposes a design to Northeast Utilities and we approve or disapprove.

We review, in process, in all aspects, the power plant and make joint decisions.

MR. MICHELSON: I need a clarification on your answer.

Are you saying that there were design -- there were accident situations wherein you needed this much water?

MR. OREFICE: Yes, sir.

MR. MICHELSON: So therefore it is by design that it is 1.2, not by preference?

MR. OREFICE: That's correct.

On the other hand, because we have the additional capacity for smaller accident scenarios, we have the additional capacity to preclude any--

MR. MICHELSON: But you need 1.2 million gallons to meet your design basis?

MR. OREFICE: That's correct.

MR. MICHELSON: So it is not by preference that you have that?

MR. OREFICE: That's correct.

MR. MICHELSON: Thank you.

MR. EBERSOLE: How did you strike a balance that led you to the subatmospheric containment? Because it may have future maintenance problems? It has certain advantages and disadvantages? Could you tell us how you converged to that sort of containment?

MR. OREFICE: The subatmospheric containment was one of the design features that Stone and Webster has in their design of nuclear power plants, and at the time when we were docketing we saw that as having some advantages and some disadvantages, and chose to go with the subatmospheric containment.

MR. EBERSOLE: Do you feel there might be a potential disadvantage in the future in getting maintenance people in under the condition where you have no purge ventilation?

MR. OREFICE: Yes.

DR. KERR: Are there other questions?

(No response.)

DR. KERR: Please continue.

MR. BENDER: A question about the one-hour recovery. That is premised on what kind of condition existing in the containment? No leakages?

DR. KERR: He said it was based on the spectrum of classical design basis accidents in response to my question.

Did you want more detail than that?

MR. BENDER: The classical design basis accidents are those accidents that--

DR. KERR: It assumes, for example, a certain leakage.

MR. BENDER: They assume no leakage. Let's put it that way. Is that the basis?

MR. OREFICE: We do have a supplementary enclosure building around the containment which allows for some leakage.

MR. BENDER: Well, I won't pursue the matter. Thank you.

DR. KERR: Please continue.

MR. OREFICE: The containment is housed within an enclosure building. A supplementary leak collection and removal system removes air from the containment enclosure building and contiguous areas and filters particulate and gaseous radioactive materials and releases air through an elevated stack at Millstone Unit 1.

Millstone Unit 3 has been designed for safety grade cold shutdown capability. The auxiliary shutdown panel located in the purple switch gear room of the control building has the controls available with the capability of achieving and maintaining a safe shutdown in the event the main control room is inaccessible.

Millstone Unit 3 has two full capacity offsite power sources. During normal operation, station service is provided by the main generator through the normal station service transformers.

Startup and shutdown service is provided from the 345 Kv switchyard through the main and normal station transformers with the generator breaker open.

DR. KERR: What is meant by full capacity in this context?

MR. OREFICE: By full capacity it means it is enough to power the emergency buses for operation.

DR. KERR: Thank you.

Mr. Ebersole.

MR. EBERSOLE: You say you have two-- You have a safety grade cold shutdown capability. Is that right?

MR. OREFICE: That's correct.

MR. EBERSOLE: Can you describe the transition mode in the context of whether it is safety grade in getting from the high temperature shutdown capability to the cold shutdown capability? How do you make the transition to get into the mode of using this, using safety grade equipment?

MR. OREFICE: Can I defer that to Jim Crockett, the plant superintendent?

DR. KERR: Do you want detail in how you do it or just--

MR. EBERSOLE: I just want to know how you get from here to there. It is one thing to have a capability but it is another to get to it.

MR. CROCKETT: To answer your question, we have both hot shutdown safety grade capability and also cold shutdown. The transition in fact is going into a normal cooldown and eventually winding up on the safety-related RHR system.

MR. EBERSOLE: But you don't go from-- You don't do that with safety grade equipment, do you? From the hot condition to the cold condition?

MR. CROCKETT: Yes.

MR. EBERSOLE: And how do you do it?

MR. CROCKETT: We have designed into the plant the train separation, all of the requirements to achieve a safety grade cold shutdown. By cooldown, the preferential method of course is to use the normal non-safety related equipment, being the main condenser steam dumps. However, we do have safety grade atmospheric dump capability to achieve cold shutdown.

We also have a dedicated 340,000-gallon water source for the auxiliary feedwater pumps which are, under safety grade cold shutdown, a heat sink water source.

MR. EBERSOLE: So you say you make the transition by going to safety grade secondary PRVs?

MR. CROCKETT: If required. Normally you would not use—

MR. EBERSOLE: I know you don't normally. Are you telling me the safety reliefs on the secondary side are safety grade?

MR. CROCKETT: We have two sets of atmospheric steam relief valves. One set is non-safety related and normally used, and the other set is a motor-operated valve that can be used for safety grade cold shutdown.

MR. EBERSOLE: That's the way you depressurize if you have to?

MR. CROCKETT: Yes.

MR. EBERSOLE: Thank you.

DR. KERR: Please continue.

MR. OREFICE: The alternate power source is from the 345 Kv switchyard through the reserve station service transformer. As a result of experience gained in the operation of Millstone Units 1 and 2 and Connecticut Yankee Nuclear Power Plant, Northeast Utilities has incorporated design features to enhance both the maintainability and the safeguards of the unit.

That concludes my presentation.

DR. KERR: Are there questions?

(No response.)

DR. KERR: I see none.

The next presenter.

MR. OREFICE: I would like to reintroduce Jim Crockett, Millstone 3 Superintendent, who will discuss maintenance, inservice inspection and preoperational testing.

MAINTENANCE, INSERVICE INSPECTION AND PREOPERATIONAL TESTING

(Slide.)

MR. CROCKETT: My presentation concerns maintenance, inservice inspection and preoperational testing on Millstone 3.

(Slide.)

The first topic concerns the maintenance program. I previously discussed the maintenance program in the context of our production maintenance management system which is a common system used by all of our generating facilities within the Northeast Utilities system.

That system, which forms the cornerstone of our preventive maintenance and our corrective maintenance and our predictive maintenance program, consists of a common data base per unit, an automated data base. It consists of machinery history filed on all the equipment in that data base. It consists of an automated work order system to generate work orders for both preventive and also corrective maintenance. It consists of spare parts files to support all of that equipment, and it also consists of a corrective maintenance history for use in trending.

Our maintenance program in use on Millstone 3 includes a preventive maintenance program which keys off the vendor-recommended PM program requirements in addition to our extensive experience on the other operating units, both nuclear and fossil, an extensive predictive maintenance program which includes such elements as in-service testing for pump and valve performance, and also PMS keys directly onto rotating equipment vibration analysis and signature analysis, which is done in-plant and also backed up by our corporate reliability engineering group, plus a formalized trend program for both our safety-related and our balance-of-plant equipment.

Finally, our corrective maintenance program, which again is under the PMS, or Production Maintenance Management System, is proceduralized both for safety-related equipment and also for balance-of-plant equipment. It is controlled via an automated work order under the Production Maintenance Management System released through the Operations Department.

And we also have a highly trained staff who are assigned as system experts, both in the Operations Department and in the Engineering Department directly, to follow corrective maintenance on systems that are assigned to them. And that maintenance, as I mentioned previously, is also trending.

The inservice inspection program for Millstone 3 currently, as I think you saw on your tour today, is in the process of performing the baseline preservice inspection program which will form the baseline for our inservice ISI program.

I think you saw -- most of you saw the in-vessel UT machine for conducting the psi on the vessel. That is in the process right now. That program is under Northeast

Utilities' scope through a subcontractor.

Our baseline pump, motor and value data are taken as part of the preoperational test program. One of the purposes of that preoperational test program is to take that data which does form the bases for our inservice inspection program.

Finally, under the ISI we have dedicated--

DR. KERR: Mr. Crockett, you have a question.

MR. EBERSOLE: When you talk about baseline data on valves in particular, having tried to do that a long time ago, I wonder what you mean. Do you take time, amperes, current draw, or other performance--

MR. CROCKETT: The two key things we take on valves are stroke time and also -- and then in the other case of check valves, the fact that they do open, pass flow.

MR. EBERSOLE: In the case of the valves, this is merely in an unloaded state, isn't it?

MR. CROCKETT: Unloaded in the sense on recirc?

MR. EBERSOLE: The valves, they are operating open to close without any hydraulic fluid flow?

MR. CROCKETT: Under the ISI program, that is correct. However, as an additional part of the preoperational test program, we are required to verify that those valves will function as called out in the FSAR. In other words they must meet the design criteria. If the criteria are that those valves close under full flow conditions, they will be tested to do so.

MR. EBERSOLE: You are going to test valves under full flow conditions, faulted flows? How are you going to manage to do that?

MR. CROCKETT: Design flows on the system.

MR. EBERSOLE: Oh, those are not equivalent to open circuit faulted flows which, when the valves are designed to isolate, for instance, pipe failures?

MR. CROCKETT: There is probably no conceivable way you could get that flow other than inducing that break.

MR. EBERSOLE: That's right. How do you satisfy yourself that you will get valve closure when you have an emergency condition?

MR. CROCKETT: One of the ways we do it for the critical valves is by our program for valve and pump operability specifications to the vendor, either through a test program or engineering analysis. There are a number of valves which are tested and required to be tested under those conditions.

MR. EBERSOLE: Do you have a table somewhere of the valves that have and have not been tested under full flow hydraulic conditions, anticipating the emergency flows?

MR. CROCKETT: We can probably get that

information.

DR. KERR: Is it in the FSAR?

MR. CROCKETT: I don't know.

DR. KERR: Thank you.

Are there further questions?

MR. MICHELSON: Could we get the table for the full Committee meeting?

MR. CROCKETT: We can get the information that you want.

MR. MICHELSON: You do understand the question?

MR. CROCKETT: Yes, I do.

Primarily what I'm thinking of is our relief valves. We have some relief valves--

MR. MICHELSON: I'm thinking not of relief valves. I'm thinking of the auxiliary feedwater steam isolation valves. I'm thinking of the letdown valves. What we are saying is that if the pipe breaks downstream of these valves and they are required to close under pipe break flow conditions, what assurance do you have that they will close?

DR. KERR: Now wait a minute. This is a different question.

MR. MICHELSON: I don't think so.

DR. KERR: Mr. Ebersole wanted the ones that had been specified as being tested. You're asking--

MR. MICHELSON: Yes. And I want to know, are those--

DR. KERR: You're asking whether all the ones that should have been specified have been, which it seems to me is a different question.

MR. MICHELSON: It may be, yes. But you understand my question. I mean I assume these will be on your list.

MR. CROCKETT: I am talking primarily relief valve performance.

MR. EBERSOLE: I'm not talking about those. I'm talking about faulted flow conditions, an exhibit of the capability of the valves so that it may be put in the PRA study.

DR. KERR: I don't understand the question that you're raising.

MR. EBERSOLE: Let me state it so he will understand.

I have a pipe break. Maybe it's a reactor water cleanup system.

DR. KERR: I understand that, but which valves do you want to know about, and what is it that you want to know about them?

MR. EBERSOLE: I want to know which ones have the full flow test results for these faulted conditions and which one has simply been analyzed on the grounds that you don't need to test them, because it is hard to do.

MR. CROCKETT: I don't have the answer to that right now.

MR. EBERSOLE: But that can be done later; is that right?

MR. MICHELSON: And which ones do you think need to have such information?

MR. EBERSOLE: Let me comment. In the PRA studies you will attribute certain reliability to these studies under faulted conditions. In nine cases out of ten, or higher than that, there has never been any proof test to show that they will function in that mode. It may have been a more or less analytical approach, more or less believable.

DR. KERR: Remember, this plant is not being licensed on the basis of PRA; it is being licensed on the basis of the regulations that don't include specified conditions for PRA.

So I mean I think you can raise the question as to....

DR. OKRENT: Well, I don't think the question really is a PRA-related question.

DR. KERR: It is not a PRA-related question. I am simply trying to put— Mr. Ebersole discussed how PRAs use the results, and then I was trying—

DR. OKRENT: That was an aside. I think he wants to know whether those valves that need to close in anger have been tested or have been analyzed, or neither, and which are those valves.

MR. EBERSOLE: That's correct.

MR. BENDER: Mr. Chairman, it might be useful to know whether the Regulatory Staff has any requirements for testing valves under those conditions. My recollection is that they don't.

DR. KERR: I sort of am reluctant to ask a question that is this open-ended, but Mr. Ebersole asked it so....

Do you think you understand the question being asked, so if you do have the information you can get it?

MR. MICHELSON: I believe there are regulatory requirements that say that these valves, when they receive automatic isolation signals to close under certain conditions, that they are indeed capable of closing under the conditions. That's a regulatory requirement.

DR. KERR: Of course. Where regulations require that they close, that's a regulatory requirement.

MR. MICHELSON: And there are a number of those I expect to find on the list.

DR. KERR: Other questions?

(No response.)

DR. KERR: Please continue.

MR. CROCKETT: Thank you.

In addition on the in-service inspection program, I will reiterate the fact that we have on staff in Millstone 3 a full-time ISI coordinator on the engineering staff and corporate support in our Reliability Engineering Department, both for rotating equipment support and vibration signature analysis and the total ISI program.

A very short presentation on the preoperational testing program which Mr. Busch previously covered, but reiterating:

The operating company does have the responsibility for the full preoperational and startup test program, and that includes all of the component individual testing. None of the tests essentially are complete at the time of turnover. The operating company assumes the responsibility for the test program.

MR. MICHELSON: In the case of your requirement to be able to operate from the remote control center, whatever you call it, are you going to do that as a test wherein you suddenly vacate the control room, leaving people behind just to keep an eye on things but not -- but performing the normal emergency operations and go to that center and operate the plant completely from that center?

MR. CROCKETT: Yes, that is a required test by Reg. Guide 168 on the preoperational test program. And we have that test scheduled in plant.

MR. MICHELSON: Thank you.

DR. OKRENT: On your baseline preservice inspection, how are you allowing in what you do, if you are, for the differences in results obtained in various round robins for certain kinds of samples that are being performed around the world?

I mean there are questions now as to whether the requirements of ASME are adequate for finding certain kinds of faults, and so forth and so on. Do you factor this at all into what you are doing? I'm trying to understand where what you do relates to the frontier of the issues, non-destructive testing I'm talking about.

MR. CROCKETT: I'm sorry, I don't think I quite understand the question.

DR. OKRENT: Well, you have heard of a program called PISK, for example.

MR. COUNSIL: We have Mr. DeBarba in the audience and he is prepared to address that question now, or he can address it when he comes up.

DR. OKRENT: Is it on the agenda later?

MR. COUNSIL: No, it wasn't, but it will be.

DR. OKRENT: Well, maybe now is the time then, because I have a short memory.

MR. CROCKETT: This is Mr. Eric DeBarba.

Assistant Manager of Mechanical Engineering.

MR. DE BARBA: We've been following the test program for several years now, and we're very active with the EPRI NDE Center, following--

DR. KERR: Excuse me. I want to be certain that the Recorder did get your name.

MR. DE BARBA: The name is Eric DeBarba, and I'm Assistant Manager of Mechanical Engineering.

DR. KERR: Thank you.

MR. DE BARBA: I also happen to be on the subgroup of NDE for ASME Section 11, and have been for a number of years, working with Dr. Spence Bush.

We are very familiar with what has been happening with PISK and some of the criticism that has been received by Marshall and others, particularly in the UK, and have incorporated many of the recommendations, particularly relative to near-surface examination on reactor vessels, into our programs. So therefore, you know, we have a high confidence that the inspections that are being performed on Millstone 3 right now are of a great deal of accuracy.

So we have been following what has been happening throughout the industry with the PISK plates as they travel around the world, and have been modifying our procedures, particularly in the near-surface zone, to assure ourselves that we can find these flaws that are in fact shallow and on the near surface.

DR. OKRENT: Let's see. There have been some questions about how well one can do with stainless steel. Has this resulted in anything different that you are doing here?

MR. DE BARBA: By stainless steel do you mean stainless steel cladding on the vessel?

DR. OKRENT: No, I mean welding and piping and trying to find flaws, and so forth.

MR. DE BARBA: That's quite apart from the vessel inspection?

DR. OKRENT: Yes.

MR. DE BARBA: Yes, we have been following a number of issues relative to stainless steel. As you know, the BWR IGSCC problem has been one that has received a lot of attention over the past several years, and we have been actively engaged in not only following the developments but actually causing certain changes on Millstone 1, which just completed a refueling outage this past May or June, I guess it was.

We utilized an ultrasonic data recording and processing system. It is the first time it had ever been used on stainless steel, and it proved highly successful, essentially employing computer-aided type processing for signals using automated scanners. We found that to be a great improvement over the typical manual scans.

Additionally, all the people we have been using for stainless steel exams have been run through the EPRI NDE Center qualification program where they are actually qualified and trained on actual cracked samples as opposed to side-drilled whole specimens or calibrated notches, and that type of thing.

DR. OKRENT: I wonder to what extent does the Staff factor what I will call "new research information" which suggests that prior procedures are possibly inadequate into changes in in-service and baseline inspection requirements prior to the ASME getting around to making the change that they're going to?

DR. KERR: I would describe that as a hortatory question.

MR. YOUNGBLOOD: I will have to get that answer for you, Dr. Okrent. I don't have it.

DR. KERR: At the full Committee meeting would that be okay?

DR. OKRENT: It would be fine, but I would like a sort of a crisp answer, not a hand-waving one. Okay?

MR. YOUNGBLOOD: Certainly.

DR. KERR: And if it is hand-waving, wave them crisply.

(Laughter.)

DR. KERR: Please continue.

MR. CROCKETT: Indicating all testing, as I previously mentioned, is a responsibility of the operations staff either directly or under our coordination with our own test procedures developed by the operating company.

The operating procedures themselves form the basis for the test procedures in that the pre-operational test procedures actually test the operating procedures to confirm that the system will operate with the procedures.

And, finally, we use a common administrative system for the test program such that wherever possible we use the same administrative controls in effect on the operating unit so that at the completion of start-up we don't have to shift gears and go into a different system. In other words, we use the same tagging system, we use the same work order system, we use the same health physics, chemistry, proceduralized control systems.

That concludes my presentation.

DR. KERR: Are there questions?

MR. MICHELSON: Yes. I have a question on your maintenance program.

There are in the plant a number of components which have been environmentally qualified. What is going to be your approach to assure that during maintenance that the provisions on those components to make them qualified have not been violated and then properly restored?

MR. CROCKETT: One of the things I did not mention is one of the pieces of the data base for the production and maintenance management system is EEQ data and the fact that the equipment that is EEQ qualified is identified in the data base.

We also have an automated system which schedules EEQ maintenance itself within that system. In other words--

MR. MICHELSON: Are you getting the information from the vendors or from those who are doing the qualification so that you know the particular unique feature, it's a particular kind of a seal or whatever that must be used in order to meet the qualification?

MR. CROCKETT: Yes.

MR. MICHELSON: And then you're cataloguing that into a maintenance procedure for that particular component?

MR. CROCKETT: That's correct.

MR. MICHELSON: And you're putting a signal or a sign on that component saying 'This is a special component; read the instructions before you work on it'?

MR. CROCKETT: Yes. In fact --

MR. MICHELSON: Thank you.

MR. CROCKETT: Yes.

(Laughter.)

DR. KERR: Other questions?

(No response.)

DR. KERR: Thank you, Mr. Crockett.

MR. CROCKETT: Thank you.

I would like to introduce Mr. Don Nordquist, our NUSCO manager of quality assurance.

DR. KERR: Mr. Nordquist, on the agenda which was given to you there was a "C" which refers to a "Response to the Notice of Violation." When we prepared this agenda we did not have your letter to the NRC. It strikes me as being detailed enough so that, if you aren't disappointed, I'm going to suggest that you skip that item. If there are questions about your letter we can raise them either now or at the full committee meeting.

Is that okay?

MR. NORDQUIST: I'm that adaptable, yes.

(Laughter.)

QUALITY ASSURANCE AND QUALITY CONTROL PROGRAMS

MR. NORDQUIST: Good afternoon. My name is Don Nordquist. I am the NUSCO manager of quality assurance.

(Slide.)

Today I will describe the quality assurance programs in effect for both the construction and operation phases of Millstone Unit 3.

The NU QA program is described in the Northeast Utilities quality assurance topical report. This topical report is responsive to 10 CFR 50, Appendix B, 10 CFR Part 71 for the shipment of radwaste materials, and portions of this program are responsive to fire protection rules as stated in Branch Technical Position 9.5-1.

(Slide.)

Northeast Utilities is responsible for the quality assurance during the construction of Millstone Unit 3. To implement this program we have delegated authority to one subcontractor, Stone and Webster Engineering Corporation. Stone and Webster has organized their quality function in five divisions, as shown on the chart.

(Slide.)

There are several reasons for the strength of the quality program during the construction of Millstone Unit 3. One key reason is in fact that there is only one subcontractor during the construction phase onsite of Millstone Unit 3. This greatly simplifies interface problems.

There is total management support for a strong quality effort both from Northeast Utilities and Stone and Webster. Both companies are extremely experienced in the business of constructing nuclear power plants.

There is an ethic at Northeast Utilities that I think you've heard before, and I'll say it again, and that is — the ethic is that we do things right the first time, A, and, B, when problems are noted root cause analysis is performed to prevent reoccurrence of problems.

(Slide.)

Relative to the three items that appeared on the latest agenda, the first item that I was requested to speak to was QC problems or items during the construction phase. Our conclusion is that we have had no significant quality problems in the construction of Millstone Unit 3. Problems we noted are aggressively investigated and resolved. I base that on two pieces of information:

One is the low number of stop-work orders that have been in evidence since the construction on unit 3 started. We have had only a total of six stop-work orders.

The second item is an item that the Nuclear Regulatory Commission spoke to earlier, which happened to be my item, and that is there have been only 40 items of noncompliance issued during this job. None of them have noted any generic or system problems with quality assurance.

The second question is how do we assure the design of Millstone Unit 3. We have been asked to reply to the Commission in a letter we received August 13th. So that is an item of ongoing discussion.

Well, we have looked at the programs that we have in place to assure the design, adequate design. One is the design process itself. The procedures, the training and the procedures have been actively reviewed by both Stone and Webster and Northeast Utilities.

Stone and Webster's engineering assurance division performs both technical and quality audits of the implementation of the design process, including field design changes. As we have previously stated, Northeast Utilities maintains a design review of ongoing design. Another item will be the start-up testing phase, which will in fact prove the operability of the program.

In addition, the total NU quality assurance effort provides an umbrella of review of the quality program. Based on these inputs we do not perceive a need for an independent review of the design adequacy of Millstone Unit 3.

I won't speak too much on the third item because you asked me not to, except I wanted to give us a little pat on the back on the strengths that were noted.

In addition to areas of non-compliance, unresolved, open items or weaknesses, there were five strengths noted during this CTI inspection, three of which directly related to the quality program. Two of them had to do with Stone and Webster Engineering Corporation, the document control and inspection certification of inspection personnel. A third one was the Northeast Utilities quality assurance trending program.

(Slide.)

DR. OKRENT: Excuse me. Getting back to the design adequacy, let me ask Staff first are they doing some kind of independent design assessment for Millstone 3?

MS. DOOLITTLE: The Staff has recently sent a letter to Northeast Utilities asking them about this information. I think we have asked for a response within sixty days.

MR. NORDQUIST: That's correct.

MS. DOOLITTLE: At this point we're waiting to hear from them.

DR. OKRENT: But you have not done one of your own thus far?

MS. DOOLITTLE: No.

DR. OKRENT: Now I am thinking back to a recent operating license review in another state where it seemed that the Staff felt that the quality of construction had been rather well handled but where the Staff did do a partial independent design review of a slice of the reactor. They, at the time of the subcommittee, reported that they did find some deficiencies. They had not concluded at that time whether these deficiencies were sufficiently important that further design review was needed or not.

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I'm trying to understand how the Staff decides whether any design review by some third party is relevant. In fact, I must confess I don't know how they decided based on the last one where they didn't come out perfectly clean, how they decided, you know, whether more was needed; they never told me. And I forgot to ask the next time I saw them.

DR. KERR: So your question is?

(Laughter.)

DR. OKRENT: My question is:

How does the Staff decide whether they will do some kind of independent design review or the utility should have something done or no one should do anything or it should all be done or what?

MS. DOOLITTLE: The Office of Inspection and Enforcement --

DR. KERR: Could you get a little closer to the mike, Ms. Doolittle?

MS. DOOLITTLE: The Office of Inspection and Enforcement are the ones that are involved in making the decision whether they're going to conduct some type of independent audit.

MR. YOUNGBLOOD: That is basically over at INE at this time. With the ongoing inspection programs, the IDVPs, the independent construction and design programs and the

Staff's own IDI, there will probably either be an IDI or an IDVP, one of the two if not both at most all of the future utilities. The IDI is the spouse design inspection program. The IDVP, of course, is the third party type of review.

DR. OKRENT: Is this one of most, or what? I'm trying — Where does this fit in?

MR. YOUNGBLOOD: I think that this plant is early enough on that certain it is going to get one of those programs.

DR. OKRENT: And you just haven't decided which?

MR. YOUNGBLOOD: That's right. We have a letter to the Applicant now asking for his response, and we're in the process of going through that as soon as he gives us his response as to what type of programs are going to be required of Millstone 3.

DR. OKRENT: Okay. While I remember —

MR. YOUNGBLOOD: And if you want me — I can't divine you how the Staff comes up with all of this at this point, but I'm sure I can give you — get them to provide you with the criterion that they're using at this time.

DR. OKRENT: That would be very nice. And while I remember, have them give me the criteria by which they decide whether or not what they find is sufficient to trigger more or that they're satisfied.

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MR. YOUNGBLOOD: Did you want this on the agenda for the full committee, or do you want this as a separate report or something?

DR. OKRENT: Yes, because at River Bend I asked and I couldn't get an answer, I must confess. They said they hadn't evaluated it yet. So I'm interested in knowing generically. They can slip in the answer at whatever it was, River Bend, at the same time and it wouldn't hurt my feelings.

MR. YOUNGBLOOD: Okay.

DR. KERR: Other questions? Dr. Remick.

DR. REMICK: Have you undergone an INPO construction performance evaluation for Millstone 3?

MR. NORDQUIST: Yes, we have.

DR. REMICK: You have.

MR. NORDQUIST: Yes.

DR. REMICK: What were basically the results of that, if you recall? Were they favorable or...?

MR. NORDQUIST: I believe they were favorable.

I could hand off to the head table to get specific answers.

DR. KERR: Do you understand the question?

MR. COUNSIL: I understand the question.

Bill Counsil, Northeast Utilities.

As in any inspection report, when one is inspecting to excellence of the programs, we did have some deficiencies, although not marked deficiencies in that inspection program.

We have given INPO our six month update on their recommendations and received from INPO accolades for having the most complete update of any utility in the industry and follow-up and corrective action on achieving those benchmarks of excellence.

I do not believe we will have another INPO full construction inspection because we are approximately 90 percent along. The next visit should be a near-term operating license assist type visit as opposed to a construction visit.

DR. OKRENT: Thank you.

DR. KERR: Other questions?

(No response.)

DR. KERR: Please continue, Mr. Nordquist.

MR. NORDQUIST: The operational QA program at Northeast Utilities is an established and mature program. The program is presently being implemented at three operating nuclear power plants, Connecticut Yankee and Millstone Units 1 and 2. The addition of Millstone Unit 3 to the coverage of the NU QA program will place Millstone 3 under the cognizance of our proven operational quality assurance program.

(Slide.)

This shot depicts the organization for the three quality assurance-quality control functions that will be in place for the operational phase of Millstone Unit 3. On the left is the corporate quality assurance function managed by myself. In the middle is the onsite Millstone quality assurance-quality control function supervised by Gary Closius. And on the right is the construction quality control function managed by Bob Michaud, which I will describe later.

You will notice that all three quality functions have direct advisory communications with the senior vice president.

(Slide.)

Again talking about strengths, there are a number of reasons why this organization works at Northeast Utilities. First of all, again a point you have heard before and you will hear again, and that is that at Northeast Utilities the line management is responsible for implementing the quality assurance program. Therefore the placement of the quality functions in line management is extremely appropriate, while maintaining an independence from costs and scheduling, which is both procedurally required and in practice works.

An additional point is that there is a strong team-work approach between quality functions and line functions at Northeast Utilities.

(Slide.)

DR. KERR: Mr. Nordquist, there have been some earlier statements made by Northeast Utilities staff that the best way of getting quality is to build it in; and I can't disagree with that.

Does it follow that if one does that one does not need a QA organization? And if one does need a QA organization, what does it do? And I'm not being frivolous; I'm trying to understand how this works.

MR. NORDQUIST: Let me address that by talking about quality assurance separately from quality control.

Quality assurance is the total administrative system that defines how we will work at Northeast Utilities. Quality assurance, for example, defines a design process, defines a procurement process, defines a maintenance process. These processes are followed by line personnel.

Really the minor portion of the quality function is the overview function, which is typically your quality control function, and in a programmatic viewpoint the quality assurance function.

Yes, it is a benefit to have an overview function. But the overview function in many cases is only an audit function and not a 100 percent function. The audit function will tend to give you a representative slice of how your program is working. The audit results tend to tell us, as the Commission's inspections have tended to tell us, that the program is in fact working.

Did I get your answer?

DR. KERR: Just one further question. If you were building a coal-fired plant would you have a similar organization?

MR. NORDQUIST: Most utilities that I'm familiar with that are building new fossil plants have quality programs in place. They are not quite as rigorous as our program, but they do involve items such as specification reviews, procurement reviews, installation inspection overview, yes.

DR. KERR: Thank you.

DR. OKRENT: Are there many very high strength bolts used in Millstone 3 for various purposes where bolts are used?

MR. NORDQUIST: We have some high strength bolt use, yes.

DR. OKRENT: Are there any special quality measures taken with regard to these, or are these the conventional industry practice?

MR. NORDQUIST: Typically my experience with high strength bolts is that they are specified by a pretty standard materials specification which is not significantly different than a non-high strength bolt material specification.

DR. OKRENT: And just using the regular ASTM testing?

MR. NORDQUIST: That is correct.

DR. OKRENT: Which is what failed badly at Palo Verde, I believe.

MR. NORDQUIST: I'm aware of that.

DR. OKRENT: If you're aware of it what are you doing differently so that you don't fall into the same difficulty? I'm a little bit unclear.

MR. NORDQUIST: We're familiar with the Palo Verde problem. We noted our use of high strength bolts, we noted where we procured them from.

I think one of the statements that came out of the Palo Verde question was is the sample size, as noted in the ASTM spec -- which I believe was 354 -- is the sample size adequate to predict quality of the lot. That sample size is typical of sample sizes for various material specifications which -- I believe the numbers are with a lot size of 800 you will sample one item. Typical of a continuous process mass-produced process, that same size is valid. I think in that case it did not predict the problems that happened.

I'm not too sure whether the problems were the result of an inadequate sample size or whether the problems were a result of a vendor problem. We did investigate the vendors that contributed to the bolt supplied to that station, and we have not procured high strength bolts from any of those vendors.

DR. OKRENT: I must say it's not at all clear to me that that's a satisfactory answer.

I would interpret the Palo Verde occurrence, from what little I know about it, as, first, an inadequacy on the part of the vendor and, secondly, an inadequacy on the part of the standard because the standard for something this important should anticipate that the vendor is not always perfect. And the numbers that slipped through were astonishingly large; I mean it just wasn't a little bit over.

MR. NORDQUIST: I believe that their lot was 20 or 30 percent defective; you're right.

DR. OKRENT: Indeed. So I'm a little surprised at your answer.

MR. NORDQUIST: Well, I can probably remember four or five ASTM standards, 193 bolting material which we buy every day for three operating plants, which has exactly the same sample size. So it's a typical sample size for

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that type of process.

MR. KUPINSKI: Dr. Okrent, my name is Matt Kupinski and I'm a manager of the piping systems engineering group.

First of all, what I'd like to indicate to you is that Northeast Utilities has actively participated with the AIF and MPC task group on the bolting problem resolution. In addition, we have participated with EPRI on research programs directed towards the resolution of the concern that you brought up at this point in time.

I'd like to indicate to you that internally the engineering organization has evaluated bolts and primary component supports. We are looking at the bolts in the reactor coolant system and we are also looking at the primary pressure boundary bolting. Okay?

We do have some bolts which — quote, unquote — could be considered high strength bolts. However what we are doing right now is we are performing evaluations to determine how the current problem can be resolved in a technically acceptable manner.

DR. KERR: Would it be accurate if I interpreted that to say that you don't know at this point what the solution to the problem is, but you are looking for one?

MR. KUPINSKI: No, that's not true, sir. We have looked at bolting failures, okay? We have followed the

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industry development. To date, as far as we are concerned — and I think it's the regulatory position also — the bolting issue is not considered to be a safety issue. Okay? As far as we are concerned, we have looked at bolting failures and bolting materials that are susceptible to certain types of failures.

If you look at the potential for stress corrosion cracking in high strength bolting, there are several things that one can do. Okay? One of them is to control the pre-load. The other one is to change the environment. And the third one is to change out to improved materials.

DR. KERR: I guess we're trying to find out what you have done and whether you think you have solved the problem. And maybe I've missed something, but I haven't heard anything to convince me —

MR. KUPINSKI: Okay. What I'm trying to say is that we are actively participating with the industry on the bolting program. In-house evaluations have been completed in regards to bolting material selection and the possibility or susceptibility to certain bolting failures, and that corrective measures will be implemented as required.

DR. OKRENT: Well, let me first say I'm somewhat mystified by the statement that bolting is not a safety issue. If the Regulatory Staff says this I would like to hear them repeat it and tell me why. And if you say it I'd like to — because if bolting is not a safety issue presumably you don't need the bolts there. In other words, the plant could run without them if it could run with them failed.

I'm just mystified when I — I frequently see that statement made. You know, we were running the plant and we lost all offsite power and one diesel didn't start, but there was no safety problem, meaning the other diesel started. I don't go along quite with that wording, if you understand what I mean.

So I hope nobody uses that term when I'm in the room again. But I got into this question on bolting because we were talking about quality assurance and you were telling me you were doing a good job, and I was trying to see if you had changed of your own volition that particular requirement on high strength bolting, if you were using it, instead of letting yourself get into a position where now you were evaluating to see what you had and what you needed to do and did you have to reduce some stresses and so forth. That's all. And I think indeed we had better hear about it whenever you meet with the full committee.

DR. KERR: And what is it you wanted to hear about?

DR. OKRENT: The bolting, high strength bolting and how it's being resolved.

DR. KERR: Okay.

DR. OKRENT: What is the nature of the problem, if any, and how is it being resolved.

MR. EBERSOLE: May I ask, are any of these bolts used to close the manways on the primary loop?

DR. KERR: Do you understand the question?

MR. NORDQUIST: Our investigation of high strength bolting as it relates to the same bolts that were used at Palo Verde is the only application on Millstone 3 was for chillers in one specific location.

DR. KERR: Those are the only high strength bolts that you have or the only high strength bolts like the ones at Palo Verde?

MR. NORDQUIST: Like the ones at Palo Verde.

DR. KERR: But you do have other high strength bolts?

MR. NORDQUIST: That's possible. I can't answer that.

We investigated, would we have the same problem that Palo Verde had relative to ASTM 354 grade BD bolts. We found one location with the same type of bolt, but we found that we did not procure those bolts from any of the vendors that Palo Verde procured them from.

DR. KERR: Thank you.

Other questions?

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DR. KERR: Okay.

DR. OKRENT: What is the nature of the problem, if any, and how is it being resolved.

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DR. KERR: Thank you.

Other questions?

(No response.)

DR. KERR: Please continue.

MR. NORDQUIST: The Millstone Station quality assurance-quality control staff is supervised by Gary Closius. It is responsible for the operational quality assurance and quality control for the Millstone Units 1, 2 and 3. It is comprised of 27 personnel and it is fully staffed.

The construction quality control staff, supervised by Bob Michaud, is comprised of 24 personnel.

(Slide.)

Their mission is to provide quality control coverage on major modifications to operating power plants. This could be viewed as a significant strength of our program in that we use in-house personnel for modification activities in the quality control area.

(Slide.)

The corporate quality assurance function, managed by myself, is comprised of 43 personnel. It is responsible for both the definition of the NU QA program and for verifying implementation of that program.

In summary, the operational QA program for Millstone Unit 3 will be a continuation of the existing operational QA program which has proven to be effective for Connecticut Yankee and Millstone Units 1 and 2.

If there are no further questions, I would like to introduce Mr. Fackelmann.

DR. KERR: I see none.

Mr. Fackelmann.

STEAM GENERATORS (6:00 p.m.)

MR. FACKELMANN: I'm Joe Fackelmann. I'm the Supervisor of the Nuclear Materials and Chemistry section at Northeast Utilities. And my topic today is going to be the steam generators at Millstone 3.

(Slide.)

Now the things that really control steam generator tube integrity are the steam generator design, the design of the secondary plant, and the secondary system chemistry.

I'll be discussing these things and the way that they're applied at Millstone 3 to control steam generator tube integrity. I'll also talk about Northeast Utilities' contingency plans in the unexpected situation when a primary- to-secondary tube leak should develop.

(Slide.)

Now, in the steam generator design itself, I've listed a few of the more important characteristics of the Millstone 3 design in this particular slide.

Some of these things repeat what Bill Counsil has already mentioned earlier. But I'll just run through the list here:

There is thermally treated Inconel 600. For the tubing, there's type 405 stainless steel tube support plates, the quatrafoil tube support plate tube hole, full tube to tube sheet expansion, feedwater ring with J tubes, flow distribution baffle, access ports and hand holes. The latter item including some extras.

I won't go through what each one of these things does. I'll pick out one specific example of the type 405 stainless steel support plate material. This particular alloy has got a greatly reduced tendency to form non-protective magnatite. And this characteristic makes it highly unlikely for tube denting to take place. And in this manner it greatly reduces the susceptibility of the tubing to stress corrosion cracking that would be a result of denting.

Now problems that have been experienced in the past, namely stress corrosion cracking, intergranular attack, wastage, fretting and wear, all these problems have been very effectively addressed by these characteristics which are in use in the Model F steam generators at Millstone 3.

Now in discussing the design characteristics of the Model F steam generator at Millstone 3, we really have to mention again -- Bill mentioned it earlier -- that the original plant design called for Model D steam generators. In fact, all four steam generators had been essentially completed when the corporate decision was made to change to the Model F's in the timeframe of 1977.

Now that major design change is an example of Northeast Utilities' policy in which potential benefits associated with this Model F were foreseen and were acted upon in the timeframe of the 1970's.

MR. MICHELSON: Before you leave that slide, if that's the case now: part of the problem with the Model D generator, as I recall, was tube vibration problems. It wasn't just crud buildup and whatever. Now, you've apparently made some modifications — of course Westinghouse did also — to correct those vibration problems. I'm not acquainted with some of the other modifications you made here, but how do you know now that you haven't introduced new vibrational problems?

MR. FACKELMANN: Well, the basic thermal hydraulic characteristics of this Model F steam generator is based on the feedwater ring J-tube water distribution, which is a thermal hydraulic design that has been used for years, since the 1960's. They're the type of vibration problems —

MR. MICHELSON: I was worried about flow distribution baffles and things of this sort, which I don't know what you've done. I'm just asking a question. How do you know, now, that you haven't introduced new potential for tube vibration?

MR. FACKELMANN: Well, there are two reasons. One is that from field experience with this basic type of design.

MR. MICHELSON: Have you ever used-- Is this F in use somewhere already?

MR. FACKELMANN: Yes. The F is in use. It's been in use since 1983.

MR. MICHELSON: Which plant?

MR. FACKELMANN: This is Korai in Korea. Not only that, but there is --

MR. MICHELSON: Really, have you done anything that they did not do? In other words, is your Model F the same as their Model F that they have been using?

MR. FACKELMANN: It's pretty close to it. I believe that that's a two-loop plant and we have a four-loop plant. But the service loads on the two loops are actually a little more stringent than they would be on any one loop in our plant.

MR. MICHELSON: You see, I thought this was something you had worked out just for Millstone, and you're saying no, it's really been worked out already for another plant and you're using it?

MR. FACKELMANN: Well, basically what I'm saying is that the vibration problems in the D, in the Model D, is really associated -- it's tied in with the thermohydraulics that's associated with an integral pre-heater type of feedwater introduction. And we don't have that --

It's a totally different design here.

MR. MICHELSON: Well, I'll leave it. If you tell me that this generator is already in use and has had no problem, that's a good answer.

MR. FACKELMANN: It's been in use and it has been tested in the laboratory also.

MR. MICHELSON: Well, there's nothing quite like field tests.

MR. BENDER: From 1983 to 1984 is not a long time, but is there any test information on that?

MR. FACKELMANN: That's true: but I have to say that the Korai unit is instrumented and the instruments are not showing any unusual types of vibration.

MR. BENDER: Okay. I think that's a better piece of information. You have the data and it shows the vibration is not there that was there in the Model D. Is that what you're telling us?

MR. FACKELMANN: What I'm saying is that there is no indication of a vibration problem in the field in the Korai units.

MR. MICHELSON: I'm not sure I understand that answer, but I'll think about it some.

Thank you.

(Slide.)

MR. FACKELMANN: Now, since the secondary plant can affect secondary chemistry, it can also affect tube integrity. Now some key secondary plant design features are shown in this slide in the order in which the engineering decision was made to make this — to implement this feature or change.

To take one example, the titanium condensor tubes provide a high level of protection against leakage of the seawater coolant into the secondary system, which, in turn, reduces the chances for corrosion.

The change to titanium was made in 1977 from the original copper alloy.

Now, each of the features that I've listed -- I won't go through the precise benefits associated with each one, but each of those features improved some important aspect of secondary chemistry. And the timeframe that's associated with the feature going from the mid-1970's to the present time, once again, illustrates Northeast Utilities' action-oriented policies with respect to recognizing and using new developments or knowledge to benefit its plants.

DR. KERR: Excuse me. What is meant in the second bullet by "copper alloys intended"?

MR. FACKELMANN: What that means is that the general industry practice was to use copper alloys.

DR. KERR: If that's what it means that's okay. I didn't understand the term. That's enough, if that's what it means.

MR. EBERSOLE: May I ask a question? Would you explain to me very briefly what the term grooved tube sheet means? I understand it's kind of a purge flow?

MR. FACKELMANN: Jim will explain that.

MR. CROCKETT: The grooved tube sheet design on Millstone 3 actually includes a grooved tube sheet and a double tube sheet design. Now what that means is that the double tube sheet design provides for the injection of condensate water into the area so that the pressure on the tube sheet is higher than seawater pressure. So we would not see that leakage from the --

MR. EBERSOLE: I understand.

MR. CROCKETT: The second part: each of the tube -- actually now two tube sheets -- has an integral groove milled in the tube sheet, so that when you expand the tube you get a double roll effect into that groove, so you get a much tighter seal.

MR. EBERSOLE: Is this different from the other two units?

MR. CROCKETT: Yes.

MR. EBERSOLE: Thank you.

MR. BENDER: Can I go back to the steam generator matter for just a minute?

Do you plan to instrument this steam generator so that you know the problems that have been experienced previously have disappeared?

MR. FACKELMANN: No, we don't have plans like that. As I mentioned, the lead unit is instrumented, and, in addition to that, there has been some extensive laboratory testing including the 10 megawatt model in Tampa, Florida. So there really is a lot of data that addresses things like vibration as well as corrosion. By the time Millstone starts operating we will really have a good deal of operating experience on this Korai unit as well as some of the modified series 51 units, like Turkey Point and Surry, which have got upwards of four years' operating experience already.

MR. BENDER: Who's monitoring that? Is Westinghouse monitoring it or are you monitoring it?

MR. FACKELMANN: Westinghouse is, but we interface with Westinghouse and get feedback on this type of information from them. That's a valuable resource.

MR. BENDER: Thank you.

MR. FACKELMANN: Plus we also get feedback in owners' groups from the utilities.

(Slide.)

Now the secondary chemistry controls at Millstone 3 are based on Westinghouse and steam generator owners' group guidelines. The action response to deviations from these guidelines have been summarized here in this slide for the three different action levels, action level 1, 2, and 3. Action level 1 refers to a small deviation. The action here consists of defining and correcting the problem.

Now the process for defining and correcting the problem is greatly expedited, or will be greatly expedited at Millstone 3 without sacrificing accuracy by use of a computerized data management program.

For greater chemistry deviations we get into action level 2, and if the deviation is still greater we get into action level 3.

At action level 3, a power reduction -- well at action level 2 a power reduction is called for, and at action level 3 a plant shutdown in 8 hours is called for.

(Slide.)

Now the contingency actions that are tied in with tube leaks and flaws are summarized in this particular slide.

We don't really expect to get tube leaks because of all these advanced features and design characteristics and controls that I've been talking about. But if a leak should develop because of a condition that we don't foresee right now, the leak would be detected by activity monitors,and then, if or when that leakage became significant, the plant would be shut down. And the leaking or defective tube would be repaired or removed from service by plugging. The tube would be located by a combination of hydrostatic tests or eddy current testing.

Over and above this we would make evaluations to figure out what had actually caused the problem, and we would be taking corrective actions to make sure that a continuation of the problem did not — that the problem did not continue, if that was appropriate.

Now, if a tube flaw existed that did not penetrate through the wall of the tube, that condition would be detected by non-destructive examination testing techniquas, primarily eddy current testing. This would be done both during the pre-service inspection and during inservice inspections. In this case the progression of the flaw would be monitored at subsequent outages and if the flaw size ever became significant, then that tube would either be repaired or removed from service by plugging.

Again it goes without saying that we would also be evaluating the cause of the problem and taking corrective actions to make sure that the problem did not continue, if that was appropriate.

DR. KERR: Mr. Fackelmann, according to my watch your time is up.

MR. EBERSOLE: Don't let him go yet.

DR. KERR: I didn't say your time is up, just his.

MR. FACKELMANN: I'm getting ready to summarize right now.

DR. KERR: Okay.

MR. FACKELMANN: So in summary, steam generator tube integrity at Millstone 3 is assured to a high level of confidence by advanced steam generator design features, by advanced secondary plant design features, and by an effective program of chemistry control. If a tube flaw develops in spite of these features and controls, the tube would be repaired or removed from service before a potential for significant release would exist. In any case, safe and efficient operation of the Millstone 3 steam generators is assured to a high level of confidence.

DR. KERR: Mr. Ebersole?

MR. EBERSOLE: You concentrated on steam generators, Mr. Fackelmann. I would like to ask you about the waste heat removal systems that you have at the plant, and I suspect you played a large part in the design choices that you made. A good many years ago I tried to get Westinghouse to live with the idea that they didn't need component cooling to get rid of post-accident heat. And that was with just plain river water. And they told me, in essence, I was crazy if that's what you do.

In the matter of getting rid of waste heat at this plant, I see an interesting array of the presence of both direct cooling on the secondary side using seawater, and then a number of interposed cooling loops, by which, in turn, you have a tertiary path. You eventually get to seawater but you do so through a treated water loop.

What is the fundamental process by which you determine whether you use a treated water loop or not, and how did you manage to, for instance, take post-accident waste heat out directly through the tube walls to seawater? And how do you cool the diesels? Is it cooled by seawater in the engine jackets or do you have component cooling for it? And what's the rationale?

DR. KERR: Is someone going to cover that in another presentation?

MR. COUNSIL: We just covered several systems.

MR. EBERSOLE: It was a set of systems.

MR. COUNSIL: Yes, it was. Can we take them backwards and then you just fill in the blanks on which other ones? Let's take the diesel first.

MR. EBERSOLE: Right. That'll be fine.

MR. COUNSIL: You asked is it a closed cooling water system? Yes, it is a closed cooling water system. There's a jacket cooling water system and it is cooled by seawater and that is in fact rejected. As we discussed, I think, in our tour today the generator itself is cooled by the building air.

MR. EBERSOLE: I'm talking about the engine.

MR. COUNSIL: The engine is cooled by closed cooling water systems that are within the diesel system itself. Those systems are then cooled by the service water system and rejected to Long Island Sound.

MR. EBERSOLE: So you have electric pumps; or are they mechanical pumps driving the closed cooling water loop and then electric pumps driving the saltwater?

MR. COUNSIL: There are shaft-driven pumps on the internal systems of the diesel itself, and the service water system is electric driven pumps.

MR. EBERSOLE: What about the post-accident waste heat removal. How is that designed? The RHR heat exchangers, are they normally filled, stored --

MR. CROCKETT: The RHR heat exchangers are cooled by the intermediate reactor plant component cooling water loop which is in turn cooled by the service water system.

MR. EBERSOLE: So that means you have an interposed cooling loop of treated water--

MR. COUNSIL: That's correct.

MR. EBERSOLE: --between the primary coolant and the seawater?

MR. COUNSIL: That's correct.

MR. EBERSOLE: I see. Well, then I got some erroneous information today.

MR. COUNSIL: I think you were referring to the recirculation spray system.

MR. EBERSOLE: Oh, that's a different system?

MR. COUNSIL: That system is a long-term heat rejection system for the design basis accident.

MR. EBERSOLE: That's from primary coolant direct to seawater?

MR. COUNSIL: That's correct. Containment sump inventory pump back to the spray headers and also for long-term rejection.

MR. EBERSOLE: Is there a materials compatibility problem there between the primary coolant and the seawater and a single material between the two? What kind of tube material did you use for that function?

MR. COUNSIL: I don't have an answer for that.

DR. KERR: If you don't have an answer now, you can get it. Does someone have the answer?

MR. EBERSOLE: My understanding was that was a difficult combinational arrangement.

DR. KERR: There seems to be someone who's either getting up to go out or to coming to answer the question.

(Laughter.)

MR. VIVIANO: I'm Assistant Project Engineer working for NUSCO. The tube material in the research spray heat exchangers is copper-nickel.

MR. EBERSOLE: That's interfaced with the primary coolant?

MR. VIVIANO: That's interfaced with the primary coolant; that's correct.

MR. EBERSOLE: And that's compatible with the borated water?

MR. VIVIANO: It's compatible with both borated water on the shell side and on the tube side it's also compatible with the service water.

MR. EBERSOLE: If it can be used, since it's much simpler, since theres no interposed loop in that mode, why isn't it used elsewhere?

MR. VIVIANO: Would you repeat that one more time?

MR. EBERSOLE: If you could use that direct exchange in this mode, why were you required to use an interposed loop in other modes — in other designs?

MR. VIVIANO: The loop is a dry heat exchanger. During testing when you run service water through the heat exchanger, after testing it is drained and flushed with demineralized water.

MR. EBERSOLE: Oh, the reason is this is not normally wet?

MR. VIVIANO: It's not normally filled with service water.

MR. EBERSOLE: You keep it dry?

MR. VIVIANO: That's correct.

MR. EBERSOLE: Are there any other direct saltwater cooling functions without the benefit of a tertiary loop that you can think of? Any bearing cooling?

MR. VIVIANO: No, the component cooling water cools the bearings and there are sealed coolers on the air return pumps.

MR. EBERSOLE: I see, that's fine. Thank you. I'm finished.

DR. KERR: Thank you, Mr. Fackelmann.

MR. MICHELSON: I'd like to get a clarification on the answer to be sure I understand. You pointed out in the case of the RHR, the component cooling water served the RHR heat exchanger and the bearing coolers. In looking at the PRA, in the analysis of component cooling water it says the component cooling water really doesn't serve any essential heat removal function. So I speculate that you didn't think the heat removal aspect of RHR was essential but only the injection capability as a low pressure injection pump. Is that correct?

MR. COUNSIL: Mr. Michelson, primary cooling is the RHR normal shutdown heat rejection.

MR. MICHELSON: So, then, really, component cooling water is a safety-related system when it's serving as a RHR heat exchanger; is that correct?

MR. CROCKETT: Yes, it is.

MR. MICHELSON: Thank you. When we discuss the PRA later on, we'll go into a little more detail.

DR. KERR: You're on, Mr. DeBarba.

REACTOR PRESSURE VESSEL THERMAL SHOCK ISSUES

(Slide.)

MR. DE BARBA: Good afternoon, my name is Eric DeBarba and I am System Manager, Generation Mechanical Engineering. I'll be talking very briefly about reactor vessel integrity.

(Slide.)

As long fracture resistance of the vessel material is relatively high, overcooling events are not expected to cause vessel material.

As can be seen, our initial fracture resistance vessel are, number one, both characterized by testing and, number two, indicative of relatively tough material from weldments, that is, initial RTNDT at minus-50 degrees, in a prelimiting plate, 60 degrees.

Predicting the rate of embroilment has received much attention over the past several years. Copper and nickel are principle contributors to the expected shift in transition temperature.

For Millstone 3, copper content, as can be seen, is clearly lost. Consequently the predicted end-of-life shift is only 78 degrees derived using the latest Guthrie techniques on predicting shift.

In summary, we conclude that there really are no pressurized thermal shock concerns for Millstone 3 and that the end-of-life RTNDT is 138 degrees, which is significantly removed from the NRC screening limit of 270 degrees F.

DR. KERR: What about the NUS screening limit, NUS or Northeast Utilities as well?

Now I mean you, yourself, are concerned about this, is that your concern? Is the end-of-life number satisfactory as far as you're concerned?

MR. DE BARBA: Yes, it is.

DR. KERR: Thank you.

Are there questions?

Mr. Bender?

MR. BENDER: What about the stainless steel cladding, what do you know about it? Is it susceptible to cracking and does it have a radiation damage contribution?

MR. DE BARBA: Not nearly that of the vessel substrate itself, but we really take no credit for the cladding itself in overall protection.

MR. BENDER: Well there's some views that say the cladding can be a cracking contributor. Have you looked into the matter?

MR. DE BARBA: We did consider the thermal stresses associated with cladding in looking at our overall generation of K-1.

MR. BENDER: What does that mean?

MR. DE BARBA: What means is that there are some deleterious effects associated with cladding and the fact that they had different coefficients c thermal expansion, for instance. So that there are things that are considered from the cladding in terms of potential flaws.

MR. BENDER: If a crack initiated at the face of the cladding, could it penetrate through to the vessel?

MR. DE BARBA: Could it penetrate through the vessel from Millstone 3?

The answer to that is it's an extremely low probability.

MR. BENDER: Okay. Thank you.

DR. KERR: What is "extremely low?"

MR. DE BARBA: Mr. Bickel will discuss that.

(Laughter.)

DR. KERR: I have discussed it with Mr. Bickel in the past, that's the reason I asked you.

(Laughter.)

Are you just using the term in a qualitative sense or are you talking about --

MR. DE BARBA: No, actually we followed the resolution in NUREG 0737, Item II.K213 over the past several years that the owners' groups formed, and the 270 degree screening limit -- essentially if you are in fact right at that number somewhere in your lifetime I believe the probability of vessel failure comes out to be 10-to-the-minus-5 or 10-to-the-minus-6.

DR. KERR: 10-to-the-minus-5, 10-to-the-minus-6 per....

MR. DE BARBA: Per reactor operating unit? John?

MR. BICKEL: It's very low.

DR. KERR: And you're happy with the vessel failure probability of 10-to-the-minus-5 per year.

MR. BICKEL: At end of life our RTNDT is 138 degrees. Therefore we are significantly lower than that.

DR. KERR: Okay. I have some better feel for what "extremely low" means to you.

Any other questions? None?

(No response.)

DR. KERR: Next man.

MR. DE BARBA: The next speaker is Mr. Robert Smart.

SEISMIC DESIGN OF PLANT EQUIPMENT

(Slide.)

MR. SMART: Good afternoon. I want to talk to you today about the seismic design basis of Millstone 3.

(Slide.)

The important points I want to cover are the design basis that was established at the time the construction permit was issued, the studies of the New Brunswick sequence that were done, seismic hazard studes that we have performed and the marginal studies. There is a lot of information to cover here in a short period.

I think there is a lot of interest in the margins work that we have done so I'm going to try and reserve about half of the block of time that we have to discuss those margin studies.

People that were very active in helping with this work I have here with me on a panel and I'd like to introduce them:

Mr. Briggs, first, from my staff.

Next to him is Dr. Kennedy, with Structural Mechanics Associates.

Dr. Robert McGuire of Dames and Moore who has done the work on seismic hazard studies.

And to the extreme right of our panel table, Dr. Holt of Weston Geophysical who headed up the studies of the New Brunswick sequence.

(Slide.)

MR. SMART: Shown here is the location map of the site and I'd like to bring your attention to the site being located right in this area (indicating) and it's in the area that's generally called the Southeastern New England Platform.

And I would like to differentiate that from this general area (indicating), which is the White Mountain Plutonic Series.

(Slide.)

Shown here is the epicentral location map and you'll note the area of Millstone a very seismically-quiet area.

Also shown on this slide is the important seismicity that was considered in establishing the design basis of the plant.

In central Connecticut there is the Moodus, 1791 Moodus event, an intensity 5 to 6 event, its magnitude was less than 5, and that's located approximately 20 miles from the site.

In the New York City area there were two earthquakes, 1737 and 1884 events, both intensity 7 events, magnitude less than or equal to 5 and that's located greater than 100 miles from the site.

Just south of that is the Asbury Park event in 1927, intensity 7 again and its magnitude was less than 5.

Far to the north is the 1940 Ossipee, New Hampshire earthquake, intensity 7 again, its magnitude was estimated as 5.4.

And off to the southeast of that location is the 1755 Cape Ann event, an intensity 8 event, magnitude 6, located 140 miles from the site.

(Slide.)

Consideration of that seismicity led then to the

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seismic design basis to take a Modified Mercalli Intensity VII and locat it 10 kilometers from the site, 10 kilometers being in accordance with the tectonic province map that were submitted at the time of the application for a construction permit.

A Murphy and O'Brien conversion was used that calculated the ground motion at the site of 0.1 g horizontal. Based on that, the designed safe shutdown earthquake was chosen as 0.17 g horizontal using a modified Newmark spectra.

I would also point out that the structural analysis of the plant was done using 5 percent damping, which is somewhat less than the current reg guides permit, which is as high as 7 percent structural damping.

(Slide.)

DR. OKRENT: Remind me, are you on rock or soils?

MR. SMART: I'm sorry, I forgot to point that out. It's a rock site for almost all important structures.

DR. OKRENT: And you still think that the damping is too low?

MR. SMART: Our 5 percent damping is a conservative value but 7 percent can be justified as structural damping.

Shown here on this map is the epicenter map. The epicenter map, again with the addition of the 1982 New

Brunswick event, a magnitude 5.75 event, and the accelerations at the epicenter were greater than the SSE accelerations at the Millstone site. So that led to the question of could that type of an earthquake occur at the site.

(Slide.)

We took an intensive study to address that question and I'll try and summarize the result of that investigation very briefly.

First of all, we discovered that the Miramichi area in central New Brunswick is a very seismically active area. And our study further indicated that it probably has been, but there is not a good data base to prove that.

The second point that we found is that that seismicity is reasonably correlated to a tectonic structure. Three important pieces of information to define that structure: seismically it's much more active than the surrounding area, it's approximately an order of magnitude more active than the immediate surroundings; the second major piece of data is that the structure we defined has a distinct geology: careful examination of the aeromagnetic and gravity data shows that the structure we defined has been rotated approximately 90 degrees counterclockwise compared to the fabric of the surroundings.

The structure we defined is bounded on the

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south, west and most of the north with faults and on the east side by a steep gravity gradient.

And the last piece of data that supports the definition — the last major piece of data that supports the definition of the structure is the gravity anomaly across the structure as compared to the surroundings.

In the context of Appendix A, we believe the convergence of data reasonably correlates to the seismicity that has occurred there to the structure we defined.

DR. MARK: Could you say what the dimensions of that thing you call the structure are roughly?

MR. SMART: It's approximately 30 miles in diameter.

The corollary part to this study that has to be answered also is could there be a similar structure in the vicinity of the Millstone site so that study — that was undertaken also.

By contrast seismically Millstone is a seismically-quiet area. It's got a very long history dating back to 1600. There is a good record of there being very little seismicity in the area; in fact there has been no important seismicity within 25 kilometers of the site in all of that record dating back to the 1600's.

And by comparison to the structure we've defined in central New Brunswick — it is approximately two orders of magnitude, nearly two orders of magnitude less seismically-active at Millstone than at Brunswick.

DR. OKRENT: How much off-shore information do we have in the Millstone area, and by that I mean not just a few miles from Millstone?

MR. SMART: Dr. Holt, could I ask for you help in addressing that issue, please?

DR. HOLT: My name is Richard Holt, Weston Geophysical, consultant for Northeast Utilities.

My recollection is quite a bit, Dr. Okrent. There is aeromagnetic data existing off-shore. And in pursuing sites for New England Power some time ago, we had a substantial amount of seismic reflection data off-shore to investigate a fault called the New Shoreham Fault.

DR. OKRENT: Well I mean is it anything like the kind of off-shore information that one develops off the coast of California or is it a rather localized kind of information? I'm trying to understand.

MR. SMART: One thing I might point out is the long record of seismic history is a very good --

DR. OKRENT: I'm aware of that. I would just like to know whether there is enough off-shore seismic profile and things of this sort to know that there are not some old -- let me postulate for the moment -- faults within what I'll call striking distance, whatever that means.

DR. HOLT: There is not detailed seismic information off-shore of Millstone.

In New England we have one advantage and that is that the aeromagnetic data basically reveals much of the lithologies of the faults associated with it and there is a reasonable extrapolation of the geology on-shore to off-shore.

DR. OKRENT: Well I don't know quite how much to buy that. Another point to be made was that the size of the structure was, what, the order of 30 miles there in a dimension maybe.

If you think a structure like this is suspect, does that mean everywhere in the U.S. where there is such a structure we have to be — or a structure approximately of this sort we have to raise a question whether or not it happens to be seismically-active at the moment?

MR. SMART: Our data — as I mentioned it's a convergence of the data from the data base.

DR. OKRENT: I'd like the specific question addressed for the moment, not the putting the things together.

MR. SMART: Our argument was not based on the geology of that structure alone, it was all of the data we used to define that structure, seismic as well as geophysics and geology. We thought it had to take all three pieces.

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MS. DOOLITTLE: Dr. Okrent, the Staff would like to make a comment.

MR. KIMBALL: I'm Jeff Kimball, seismologist for the NRC Staff.

There is quite a bit of extensive reflection profiling off-shore in New England, particularly in Long Island Sound. The USGS has done quite a bit of this, particularly off Connecticut and Rhode Island toward Block Island; in particular, as was stated, to look at the New Shoreham Fault.

In the process of this review, in addition to what was done for the reactor site, the reviewer went up to Woods Hole and sat with the USGS and went over the reflection profiling off-shore.

I would say it is comparable to many areas off of California except that oil prospecting doesn't quite come in this line. But it is hundreds of miles of reflection lines.

DR. OKRENT: And it shows no signs of any off-shore faults?

MR. KIMBALL: There are some off-shore faults in the area. Gaining from what can be seen, particularly the New Shoreham Fault since that was the most significant one, the profiling shows that nothing in the last two million appears to be offset. Datable material out there is very

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difficult to come by. But I believe from what they can tell us of Pleistocene materials which is the last two million, it's not offset.

DR. OKRENT: There's no new garbage that has been offset.

MR. KIMBALL: Right.

MR. SMART: The conclusion to the investigations that we had done regarding the New Brunswick sequence of earthquakes was that based on the geological, geophysical and seismological studies the Millstone area is indeed markedly different than the New Brunswick area.

Our studies showed the design basis of the plant is conservative and justified in light of studies that we have done of the New Brunswick sequence.

DR. POMEROY: Mr. Chairman?

DR. KERR: Yes, sir.

DR. POMEROY: While we have Dr. Kimball from the Staff here, in the SER — and I'll paraphrase it -- there is a statement that although the Staff doesn't agree -- doesn't disagree with the design basis, Staff does have differences with the Applicant with regard to the tectonic province of the New Brunswick earthquake and the assignment of the New Brunswick earthquake to a specific tectonic structure.

I think I understand from the SER the differences with regard to the third element, that is, the association to the tectonic structures, but I wonder if Dr. Kimball could elaborate on the differences between the Staff and the Applicant with regard to the tectonic province and the New Brunswick earthquake.

DR. KERR: Let me say, Mr. Smart, have you finished your presentation?

MR. SMART: Regarding the New Brunswick sequence, yes.

DR. KERR: Okay.

Mr. Kimball, are you willing to elaborate?

MR. KIMBALL: Sure.

DR. KERR: An elaboration does not have to be lengthy.

(Laughter.)

MR. KIMBALL: I am intimately familiar with quickness and the ACRS.

DR. KERR: That's what I was afraid of.

MR. KIMBALL: Basically based on the geologic and tectonic characteristics the Staff could not find enough uniqueness to the New Brunswick area to say that it was different — Let me start over.

The differences which we saw in the geology and tectonic characteristics — and there are differences between the New Brunswick and the central region and the

Millstone site region -- cannot be well-correlated with causative mechanisms of earthquakes.

Given that, we also requested a lot of seismicity comparisons. It was our judgment that the specific structure, which is a relatively small area, was basically too small and did not have enough history of seismicity to it other than to qualitatively say that, yes, in the last five to seven years it looks like there is a significant amount of activity prior to the 1982 earthquake. So we used that qualitatively.

Basically the Staff continues to support the large New England piedmont province, tectonic province. We did see seismicity differences between the New Brunswick region, a large area in New Brunswick, and the site region. However, there was some overlap in those comparisons and it was that that we requested a confirmatory program using available information in the probabilistic safety study which I believe Mr. Smart is about to tell you about to basically eliminate the uncertainty -- the higher degree of uncertainty I guess in this case -- with the fact that we do support the existing design basis mainly on the fact that the seismicity comparisons show a lower potential for moderate earthquakes in the Millstone site area.

DR. POMEROY: So it really comes down to a difference in the level of seismicity between the two areas.

in your estimation?

MR. KIMBALL: Level of seismicity, yes, that would be mainly it, the level of the likelihood of a moderate-sized earthquake coupled with the fact that in the geologic review the basic conclusion was that there are no known causative structures of seismicity in the Millstone site. There are no red flags in the geology.

MR. POMEROY: Thank you.

Mr. Smart, I wonder if you would comment then. If we took away your second bullet under the New Brunswick event, that is, that the seismicity is reasonably correlated to the tectonic structure, you would still make the same kind of statement that Dr. Kimball has made?

MR. SMART: I think you'll see from the remainder of our study, the additional work we did to confirm the adequacy of the SSE in the first place gives us a lot of support in that regard.

Our position is that all of the data is real. We looked at it and we believe that as part of our overall study that the hazard margin study is a very strong part of the argument and I'll get into that as well.

MR. POMEROY: One other question:

I understand that recently there has been some extensive trenching work done by Weston Geophysical on New Brunswick. Is there a report available on that trenching effort.

MR. SMART: In the reports that we have submitted to the questions that Mr. Kimball referred, we have considerable information on the trenching. I believe there is some further work ongoing which is being monitored by several organizations.

MR. POMEROY: That's correct. The Canadians are doing trenching up there. I understood, however, that Weston Geophysical had done some specific trenching.

MR. SMART: I think you're suggesting you would like a very brief description of the trenching that we have been part of?

MR. POMEROY: If I could have a very brief one.

MR. SMART: Dr. Holt please?

DR. HOLT: There was an area in the epicentral region that was basically rock with some one to two feet of overburden that wa scraped off by the Canadians as a zone that is perhaps, oh, a thousand feet long by perhaps 200 feet wide. In addition to that area that they exposed to look at the bedrock, there was a trench that was excavated over electrical anomaly of BLFEM that was striking north 40 degrees west and in the tectonic structure that Bob Smart mentioned most of the fabric of the rock that we see in the aeromagnetic is indeed north 40 west.

We made that trench. There is indeed a major tectonic fault with several different offsets over a long period of time, perhaps as much as 200 million years. There is disturbed Pleistocene material over the fault itself. There are some features in it that would indicate that -- in general, most of the disturbance we see in the Pleistocene material which is perhaps 12- to 13,000 years old is glacially induced, fragetic flow due to water flowing and a lot of shear action due to the glacier itself.

In addition, there are several other features: Glacial till embedded into the fault gouge some one to two meters deep. That's not entirely explanable, at least to me at the present time, by glacial action. And so I think that we would consider the question at the present time somewhat moot as to whether or not the fault moved in Pleistocene times. I think there's a possibility that it did.

The trench, incidentially, was about two meters deep. It was basically east-west and it was about 200, 250 feet long.

DR. POMEROY: Could you comment briefly on the pop-up features observed on the Canadian trenches?

MR. HOLT: There is considerable stress relief going on at the present time in the epicentral area. The rock that I mentioned was exposed has cracked continuously starting about April of this year. The cracks are some two inches wide. There are some slight offsets of a few millimeters. They are as much as I would say five to six meters long, and they are extensive. There are several dozen of them.

DR. POMEROY: Would you care to comment on the acceptance of the Canadians, for example, with regard to your correlation of the tectonic structure?

MR. HOLT: Well, there are several agencies involved.

DR. POMEROY: Let's confine it to the Earth Physics Branch because they are the principal and, as far as I'm concerned, about the only seismological group that we're concerned with here.

MR. HOLT: With that warning, I'm still going to go back and say there are several agencies involved.

One is the New Brunswick Geological Survey that was principally involved with respect to the geology and the geophysics that was done at the site. In addition, the Earth Physics Branch, which consults directly to the Atomic Energy Commission of Canada.

I don't think at the present time, outside of the fact of exploring and trenching for rock offsets in the epicentral area, that the Earth Physics Branch has made the conclusion with respect to the earthquake and its particular correlation to a tectonic structure. They have at least indicated to me privately that they will follow up with respect to the interpretation of the tillages in the fault and they will be making conclusions. To the best of my knowledge they have not at the present time.

With respect to the New Brunswick, at least the geological survey in New Brunswick is represented by two people, Dr. Lester Fife and James Chandra. I think they would support the fact that that earthquake can be related to a tectonic structure, perhaps somewhat bigger than we would define it, but still relate it to a tectonic structure.

DR. POMEROY: Thank you.

MR. SMART: What I would like to get on with now is a brief description of a hazards study, and then go into a bit more detail into the margin —

DR. KERR: Mr. Smart, this strikes me as a good time for a ten-minute break, and I'm going to declare one.

MR. SMART: I'm game. Thank you.

(Recess.)

DR. KERR: May we assemble and give respectful attention to Mr. Smart?

(Slide.)

MR. SMART: In this next section I'll try to describe the work we did and then get on into the margin work. And I'll try to answer your questions along the way.

DR. KERR: We always defer our questions as much as possible.

(Slide.)

MR. SMART: The hazard study we did used multiple hypotheses of zonation. Eleven different zones were included in the study. We had various recurrence frequency models within those zones and four different attenuation models were used. So it was quite a detailed study.

The first product of it, of course, was in the family of hazard analyses, and then secondly for the margin study.

The PSS I will refer to a couple of times along the way, the probabilistic safety study. I'll be pleased if you defer almost all questions on that because that's going to be described in great detail tomorrow. We just had to use it a little bit to get started here.

In addition to producing the hazard one of the important findings of our study was that our SSE has a frequency of excedence of an order of ten-to-the-minus-four per year. A second important finding was that the hazard at the site is dominated by earthquakes in the range of 5.9.

(Slide.)

The margin study we undertook was developed in response to an SER issue. The results of these studies are just being completed. They were presented to the Staff at a meeting on August 22nd.

Our program was to determine the capability of the Millstone 3 plant to withstand seismic excitation above the SSE level.

(Slide.)

The approach we used was based upon an extraction from the SMA fragilities report, and therefore this is a probabilistic margin statement.

The first step we undertook was to identify the dominant contributors to severe core damage by looking at the PSS fault trees.

The objectives of the report were, first, to demonstrate the high confidence low frequency of failure accelerations are considerably larger than the SSE for the critical structures and components that we have identified in the first step.

We further wanted to demonstrate that for the dominant plant gamme states they also have very high confidence low frequency accelerations larger than the SSE.

Thirdly, we wanted to demonstrate that the frequencies of occurrence of the significant damage states from seismic events is very low; and, lastly, demonstrate that the contributions to frequencies of occurrence of significant plant damage from earthquakes in the range of 0.2 to 0.3g is small.

DR. OKRENT: If I can make a small point, I wish when you do a study, instead of knowing what answers you're looking for and trying to demonstrate it, that you started out trying to evaluate the situation. There is a difference.

MR. SMART: Perhaps I stated it wrong.

(Slide.)

The dominant plant state demonstrates that we identify our Vs for and they cover approximately 95 percent of the total seismic risk. This was done as a result of examining ESS results. The two that I bring your attention to are V3, which is LOCA with containment bypass -- and that's a very important damage state regarding consequences -- and damage state TE, which is an important damage state regarding core damage.

(Slide.)

There's a lot of information in this slide and I'll try and take you through it. The center curve you see here is the median fragility curve that was developed as part of the PSS study, and the median capacity show, this is for the emergency generator enclosure building. I'm using it as an example of how we developed the margins capacities, the median capacity. That which is our best estimate of the capacity of this structure is 0.88g, and the range of our confidence, the 90 percent confidence range, and our estimate of the median capacity is from this 95 percent probability curve to the five percent probability curve. And the range of our estimates of median capacity is from 0.41g to 1.88g.

Now in that same median curve, if we wanted to have a 95 percent probability that we estimated correctly, we track down to the five percent level, and you see that we're 95 percent sure we've got the right capacity, 0.6g, again on the median capacity curve.

Now for our margin study we wanted a high confidence of a low frequency of failure capacity. And for that we used a 95 percent probability curve and the five percent frequency of failure curve and showed this value, which is 0.3g. It's a number -- We're very confident we do have that capacity in the EGG. And you'll note that that number is roughly twice our safe shutdown earthquake. That's the approach we used in developing the margin capacities in this statement.

MR. EBERSOLE: May I ask you to consider another model, not quite maybe so rugged.

Take the DC batteries which have brittle, probably plastic covers bonded together by copper and strapped up on some sort of a combination. What will I find for them?

MR. SMART: Dr. Kennedy, will you help me respond to that question?

DR. KENNEDY: I think you know DC batteries better than I do, Don.

MR. WESLEY: I'm Don Wesley. I'm from SME.

We looked at a number of components. The example that Bob Smart showed is actually a lower capacity. DC batteries, if I can trace it across, actually we found they have a median capacity in the range of 1.7g, actually approximately twice what you see here. The variabilities

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are somewhat higher.

MR. EBERSOLE: How do they fail?

MR. WESLEY: These were structural failures: the casing, as I remember.

MR. EBERSOLE: Thank you.

DR. KENNEDY: In general, I think that's the case. If you looked at earthquake damage from past earthquakes, as long as these batteries are supported in racks that have decent battons or side supports on the batteries and as long as the rack has a structural system to it, both of which exist at Millstone, you do not find examples of DC batteries themselves failing in earthquakes.

The example put up here on the board on the slide of the emergency generator building, this is the, in our judgment, this is the structural failure mode which most dominates the core melt frequencies. And so this is the fragility that most dominates the VRA estimated core melt frequencies.

MR. EBERSOLE: One reason I asked that is I've heard a good many cases of spontaneous cracking in these cells without any stress, and this is a progressive -- In other words, the aging effect. How do you rationalize that?

DR. KENNEDY: I think that DC batteries certainly show an aging effect, with or without an earthquake. The experiences in earthquakes are that DC batteries have not been a particularly fragile piece of equipment as long as they are properly supported. Clearly DC batteries have failed in earthquakes where the battery racks were inadequate, as battery racks were prior to the SEB. But in recent plants we don't have that problem.

MR. BENDER: It seems to me the most prevalent problem in earthquakes we've seen have been with hold-down modes. What kind of comment could you make about hold-down modes?

MR. KENNEDY: With hold-down modes, if you look at the most prevalent cause of damage in past earthquakes on most electromechanical equipment in past earthquakes most of the damage has been because of failure of the anchorage of the equipment, inadequate anchorage.

Now the anchorage of equipment in standard industrial practice is simply nowhere near as rugged as anchorage of equipment in modern nuclear power plants, and so I don't see the same problem on a power plant of Millstone 3 vintage with anchor bolts as you see in the data base of equipment damage.

MR. BENDER: Let me go back to Dr. Okrent's questions on high strength bolts. They are always suspect. Do we know they're being used properly?

MR. KENNEDY: Most equipment anchorage is not with high strength bolts. Most of this mechanical equipment anchorage is not using high strength bolts. I guess I do share your concern on high strength bolts used for seismic anchorage because of the potential problem of high stress bolts.

MR. BENDER: I don't know which critical equipment has it and which equipment doesn't. If we were going to look through the seismic fragility, that's one of the considerations I would put into the investigation.

DR. KERR: Some steam generators have been anchored with high strength bolts.

MR. BENDER: Among other things. I'm only making it as a point because I don't think it necessarily changes your conclusion. But if you're going to study these fragility questions I think you have to look at how earthquake-sensitive it is.

MR. KENNEDY: When we generate fragility curves, if we are asked to generate a fragility curve on a piece of equipment that is anchored by high strength bolts we assign essentially no ductility to those bolts for exactly the same concern that you have expressed. So that in actual fact the seismic safety of a piece of equipment with high strength bolts is likely to be no higher and possibly less than the seismic safety of a piece of equipment anchored with the same diameter low strength bolts. But that is incorporated into these fragility curves.

MR. EBERSOLE: We recently heard of a plant that employed cast iron to resist saltwater, and over the years — I think they called it the graphite component or whatever — in essence it leached — or the structural strength of those boundaries was essentially barely able to hold a normal working pressure and not able at all to carry any sort of superimposed seismic event. This is a plant that's cooled by saltwater and it's carried around through the plant in a variety of pipes.

When you do these analyses do you consider the ultimate corrosion-erosion degradation of those plants and whether or not, if they are tested to confirm, they have the original margin of strength for seismic?

MR. KENNEDY: When we generate fragility curves we certainly try to take into account end-of-life corrosion problems.

Fragilities associated with cast iron components are generally rather — well, fragilities are high, capacities are low. Cast iron components certainly perform poorer in earthquakes in many cases than do ductile steel components.

MR. EBERSOLE: Not if they are thick and heavy enough, they don't.

MR. KENNEDY: Well, if they're thick and heavy enough, I agree with that. But they do tend to be embrittled. They do tend to have problems associated with connections when they have shown damage in past earthquakes.

(Slide.)

MR. SMART: If I can continue with the table, it shows the results of a similar type analysis.

DR. KERR: Don't you think our restraint has been remarkable over the past few minutes?

(Laughter.)

MR. SMART: Shown here is a table that has some of the components that we identified as representative of the range of the dominant components, and in the column entitled A-half are the median estimated capacities. And in the far-right column is the high confidence-low frequency of failure capacities. And you can see that for these various components the range is from the 0.3g that we talked about in the example graph on up to 0.62g for the containment crane wall.

(Slide.)

That information was used in the size risk program by SMA in conjunction with the fault trees of the PSS studies, and arrived at the column entitled A-half for a plant damage stage. This is the base case, we call it. capacity ranging from the best estimate, 0.6g, on up to greater than 2g.

Another important thing to note is when we're on our best estimate of what the capacity is the 90 percent confidence bounds range from 0.39g to 0.84g for damage state TE, and the range for B3 is from 1.16g up to 3.45g. That's our best estimate of the capacities of those two different damage states, all four damage states.

The last column shows then our high confidence, low frequency and failure estimates ranging from 0.26g to — for the damage state TE — and TE again, as I mentioned, is the damage state that's important relating to core damage — on up to a high confidence low frequency capacity for damage state V3 of 0.6g. And that's the damage state that is important to consequences.

MR. MICHELSON: These various numbers are dealing with structural damage to the component, these fragilities?

MR. SMART: Correct.

MR. MICHELSON: What do you do about the susceptibility of components to seismic disturbances wherein it creates unwanted operation as opposed to physical damage? How do you approach that?

MR. SMART: In the PSS study that has been directly addressed, and I think it probably will be pretty thoroughly covered tomorrow.

MR. MICHELSON: Okay. If it's going to be covered tomorrow, fine.

DR. OKRENT: I would not be too optimistic, but we'll wait to see.

Could I ask a different question? When I look at the work that is being done on what some people call the source term I find a large number of investigators trying to examine the question. I find industry acting as a peer group on what the NSD does, and the NRC goes out and gets the American Physical Society as a peer group. I sort of have the impression that all of this is condensed into Bob Kennedy with regard to fragility estimates. I am probably overstating it, but I don't think by very much. How do we get --

DR. KERR: You mean who is Bob Kennedy's peer? Is that the question?

DR. OKRENT: How does one build up a much broader base of information? I suppose if it's all going to be subjective or mostly subjective, that will remain a problem. But at the moment I sort of have a feeling that there is one report back there and everyone tends to use it with perhaps with some specific modifications for the plant in hand if there is a structural question.

MR. SMART: I think there is nobody better qualified to respond to that comment than Bob Kennedy.

DR. OKRENT: I was hoping he would come up with a suggestion.

MR. KENNEDY: Well, all of this fragility work on

Millstone, plus on most of the other areas, tends to be reviewed by at least some independent reviewer. There are always questions and comments in the review. There is a tendency to try to reach a consensus at the end of the review.

Now it is true, most of these PRAs have also been reviewed by a single person, Jack R. Benjamin Associates and John Reed. There is more and more of an effort to collect historical earthquake performance data to better validate these seismic PRA fragilities.

You're aware that the NRC, of course, has an effort to try to plan experimental programs to better validate the seismic PRAs. Right now about all that you have, all you have in the way of peer review on the fragilities of the seismic PRAs are the independent review of some consultant to the NRC Staff that reviews the fragilities that are being generated.

DR. OKRENT: Yes, but who needs a PRA for seismic fragilities? Do you know what I mean?

MR. KENNEDY: They are QA. It's very clear you need a larger consensus group ultimate in the seismic PRA area. That's very clear.

MR. SMART: I might add for the purposes of our margin study, one of the reasons I went through the graph that showed the capacities in a bit of detail is that we are way down in the very, very high confidence area; that is comparable to a design analysis type result. It's a number that Bob is very, very confident with.

DR. OKRENT: Well, isn't it presented in this short discussion? What I don't recall finding either in the longer PRA is a thoughtful list of things that might be shortcomings with regard to the seismic area just because you can't do everything with a limited amount of time and money. I think it's about time we started making a beginning along those lines.

DR. MARK: Could I ask a simple but amateur question? There must be some g level at which it is reasonable to suppose a power line sort of action. There are some levels where you would expect it to survive. Where roughly is that?

MR. SMART: In each of these damage states that we talked of I think the offsite power is lost. About 0.2g capacity we're quite certain that there is a loss of offsite power.

DR. MARK: Thank you.

(Slide.)

MR. SMART: This is an impossible set of curves to read. These are input to the seismic margin study. There are ten curves in this family and they represent a wide range of seismic hazard. These then were used in conjunction with the plant damage state capacities that you saw in the previous slide to perform the risk analyses.

(Slide.)

The results of that combination of data is presented in this slide. I bring you attention to damage state V3, the one that is important to the consequences. The annual frequency, the median annual frequency for that estimate is two-times-ten-to-the-minus-nine. For the high confidence bounds there is again an extremely low risk.

Then if we look down then at damage state TE, which is the one that is relative to core melt, again very low risk. The median annual frequency is two-times-ten-to-the-minus-six and the 95 percent confidence bound is two-times-ten-to-the-minus-five. This clearly shows that there is very low risk related to seismicity.

MR. MICHELSON: I think what you're saying is there is very low risk of physical damage related to seismicity, isn't that right?

MR. SMART: Physical damage and then --

MR. MICHELSON: That's the only thing you're really covering here.

MR. SMART: The damage state V3 is consequence.

MR. MICHELSON: Yes, but consequence is based on physical damage, probabilities only.

DR. OKRENT: You have to say according to the study.

MR. MICHELSON: Yes.

MR. SMART: Another way of looking at the results of our study we present in this pair of graphs here. The first one pertains to damage state TE, and you can show whether you're looking at the median frequency acceleration range or the 95 percent confidence bends. For accelerations in the range of 0.2 to 0.3g there is extremely small risk by either the median or the 95 percent measure.

(Slide.)

If we look at damage state V3 there is no risk associated with earthquakes in the range of 0.3g, whether measured by the median frequency or the 95 percent frequency. It is not until a much higher earthquake that there is any substantial risk.

We believe the margin study is a major step further showing the adequacy of the SSE.

(Slide.)

Our overall conclusion of the results of the New Brunswick studies, the hazard studies and the margin studies show that the design basis is adequate to assure a safe plant to resist seismic excitation.

DR. MUELLER: Has the story you presented in the PRA changed any from the August '83 version? I'm getting a nodding yes.

MR. SMART: Yes. And the question I have is whether we address it now. I think that will be addressed in the discussion tomorrow.

MR. BICKEL: John Bickel, Northeast Utilities.

The answer is yes.

DR. MUELLER: The reason I bring it up is because Lawrence Livermore has come out with a report that says that the hazard is underestimated by a factor of ten. Now presumably the assumptions that Lawrence Livermore drew with respect to that study would also impact this study. Can you--

MR. SMART: We were aware of their study, of course, and we have commented, first of all, on their draft report itself. And we believe it is a draft and it is not appropriate to use as a licensing basis. There are a number of conservatisms in that report which we believe are not appropriate for a best estimate study. And so we commented to the staff that these might be considered before the report is finalized.

More to your point, however, is that in the margin study itself we did several sensitivity studies, and that was one of the particular subjects that we addressed, and what is the sensitivity then to our margin conclusions if we assume that?

If I may ask Dr. Kennedy to give us a quick overview of what that sensitivity was.

Could we turn off that back-lighted screen? And we will have to use the foreground screen here.

MR. KENNEDY: The numbers that were presented are numbers based upon the--

DR. KERR: Is there any way you can have a microphone?

(Pause.)

(Slide.)

MR. KENNEDY: I will work from over here.

The numbers that were presented are numbers that were based upon--

DR. OKRENT: Excuse me. Better somebody focus the....

(Pause.)

DR. OKRENT: I take that back.

(Laughter.)

MR. KENNEDY: The numbers that were presented were numbers that were based upon the Dames and Moore or Robin McGuire hazard model. And for instance for TE, the damaged state that primarily contributed to core melt, the numbers from that were for median, 2 times 10 to the minus 6, (indicating), and for mean, 6 times 10 to the minus 6. (Indicating.)

Now if you substitute the Livermore hazard model for the base model or the Dames and Moore/Robin McGuire model, the median results for TE increased by a factor of approximately 15 (indicating), and the mean results increased by a factor of more nearly 30 to 35 (indicating).

Now these higher risk numbers using the Livermore hazard model come about because of certain assumptions in the Livermore hazard model, and so sensitivity studies were performed to find out how sensitive the results were to certain assumptions in the two different models.

One of the primary causes of differences is in the Livermore hazard model they are talking ground accelerations from various earthquake levels but a lower-bound magnitude on the earthquakes is magnitude 3.75.

Now we have not observed anywhere in the world, to the best of my knowledge, damage to any engineered structure anywhere in the world from earthquakes of magnitudes less than about 5, and so it seems to me that to be talking about ground motion for magnitude 3.75 as a significant contributor to risk is in violation of our earthquake engineering experience.

As a result, one of the revisions that was made was to simply raise the lower bound magnitude from 3.75 to 4.5, and also to 5.0, and it was found that this made a significant difference in the Livermore hazard results, simply changing the lower bound magnitude that was included in the data set.

There were other modifications made in attenuation relationships, but Robin McGuire can go into the details. And there were changes made to truncate upper bound effective acceleration. And again Robin McGuire would be the one to go into the details of those.

But with those changes to the Livermore hazard model, and just those changes, the risk results that result from using the Livermore hazard model, or I guess at this stage you would call it a revised or modified Livermore hazard model, are no longer very dissimilar from the results of using Robin McGuire's or Dames and Moore's hazard models.

Again for median, essentially the same median for the TE, which is the state that primarily -- the damage state that primarily contributes to core melt, and for the mean, (indicating), similarly not a very large change in means, (indicating), a factor of three difference in mean.

So the question really boils down to looking at some of the very fine-tuned details of the two different hazard models. But a lot of it boils down to the use of the lower bound magnitude, truncation on accelerations, and some differences in attenuation model.

DR. OKRENT: There is something peculiar in what you are saying. My recollection of what I read was that in your estimates using their subjective opinions from experts, they were getting a return frequency like five times larger than you're saying, and if you are somehow getting rid of that by whatever it is you are doing here, I have a problem.

If in fact you have a return frequency that is five times larger if you keep everything else the same, then it would go up by a factor of five, I believe.

They also had problems, if I recall correctly, with how you translated from the -- not "you" but "you" as a group -- how you translated from the non-seismic sequences to the seismic sequences.

They also had some problems, if I remember correctly, about the treatment of things like correlation and so on. I didn't find a really definitive, quantitative summation in what I read, but they did have problems in several areas.

And for you to come back and tell me gee, you can take some part of it and truncate it here and truncate it there and come out with the same somehow gives me a very different impression of what I read. And hadn't we better wait until Mr. Garcia and -- whatever it is -- Livermore is here to talk about it I guess?

MR. KENNEDY: I think you are talking about Livermore's comments on the August '83 seismic PRA. There are basically two Livermore studies, and maybe that is the source of confusion. There are Livermore comments on the

August '83 seimic PRA study. The current seismic PRA results have nothing to do with the August '83 seismic PRA studies that Livermore comments on.

I am in nearly complete agreement with Livermore's comments on the August '83 study. I think what I was answering is Livermore also has generated hazard curves in a separate Livermore study. Livermore has generated hazard curves from ten East Coast sites, Millstone being one of the ten.

The Livermore hazard curves for Millstone are somewhat different than those from Dames and Moore. My comments were referring to the differences between Livermore hazard curves and Dames and Moore hazard curves.

If you are referring to the comments -- Livermore's comments on the '83 seismic PRA for Millstone, I am in almost perfect agreement with those comments.

DR. OKRENT: I don't know what-all Livermore has written. They have written something dated May 30, 1984, which is the most recent draft that I've received. And I have also seen some kind of a book in which they have a more recent review of eastern sites, I guess, and that's referred to I think in what the Staff sets forth, the results of that, if I recall correctly.

MS. DOOLITTLE: Dr. Kerr?

DR. KERR: Yes, Ma'am.

MS. DOOLITTLE: If I might make a comment, the Staff would like to respond to some of your comments. However, those particular people are not yet here. Mr. Kimball would like to make a comment on the applicant's program that they are now performing.

MR. KIMBALL: Basically I wanted to explain why the confirmatory program was requested the way it was.

I think Dr. Okrent made a comment that it is not good to know what the answer is before you work out the problem.

The PRA was completed-- The work by Structural Mechanics Associates was completed for the PRA well before the confirmatory program was established. Specifically the confirmatory program is to assist the Staff basically with the New Brunswick earthquake specifically in mind, to reduce the uncertainty that exists basically with the way you reviewed the seismic design of this plant, the way you come up with the ground motion utilizing the information that is available in the PSS.

All of that information was already available. The median capacities, the uncertainties that were attached to that were all available. It was only in the last two months, basically in the writing of the Safety Evaluation Report, that any specific g value was developed with the New Brunswick earthquake in mind.

Basically what we requested — required of them was to go ahead and review, utilize available information in the PSS with acceleration of about .25 g in mind. In other words go into the PSS, get into the details in terms of both the individual structures and component capacities there and get into the details in terms of the system.

And we have also requested to look at some of the other consequences such as fatalities. Are they sensitive to accelerations that one would associate at least with an earthquake like the New Brunswick? The details in terms of the core melt numbers, in terms of the hazard curves are really a result of the PSS, separate from having the New Brunswick earthquake in mind.

So the confirmatory program is basically an add-on from the SER review utilizing that available information.

I just wanted to clarify that because--

DR. KERR: Does that clarify things?

MR. SMART: If there are no further questions, I think I have used my alloted time slot already and then some.

DR. OKRENT: I have a question.

MR. SMART: I was afraid you might.

(Laughter.)

DR. OKRENT: When we are talking about the PRA some time tomorrow -- and I suspect the time currently allotted for it will shrink as Mr. Kerr finds himself squeezed -- is it expected that we will get into the seismic part of it at this time, or is that for some future meeting? It is not something you can do in five or ten minutes.

MR. SMART: We don't plan any detailed discussion of the seismic part of the PRA tomorrow.

DR. OKRENT: I think it is the plan to have a Subcommittee meeting where we can look in more detail at the PSS and we would include the seismic part and try to have all the people who would look at it in detail present at the same time.

MS. DOOLITTLE: The Staff would be available for comments tomorrow.

DR. OKRENT: Well, we would like to get your salient comments tomorrow by all means, to see what you agree with, what you don't agree with, where you think the questions are particularly open, and so forth. We would like to benefit that way tomorrow.

As I think I said before, I found this an interesting review to read. In fact, while I learned certain things, I didn't find it quite as complete as the Sandia review of Zion.

MR. SMART: I think our bottom line is there's extremely little risk of excitations in the range of 0.2 to 0.3g.

MR. OKRENT: Let me make a comment to that. I have to assume that what Mr. Kimball was referring to is as follows, and correct me if I'm wrong: If the staff had to go back to Appendix A and postulate that the New Brunswick earthquake might occur at Pilgrim — I'm sorry: wrong reactor: Millstone. --it could have been Pilgrim.-- Millstone is in this province and has to be designed for .25g. You'd like to see whether the reactor can withstand .25g. If we're taking a different perspective and trying to find out is siesmic one of the important contributors to risk, nd it's not important but significant, then .25g is not a magic number.

MR. KIMBALL: You know, if we get into it tomorrow, the difference in hazard curves, there's a little more seismic characterization program that although you get large absolute differences, it turns out, when you look at the contribution to core melt, what we've seen from the preliminary results, it depended basically on the slope of the hazard curves. And from what we've seen in the Livermore hazard curves here that the contribution to core melt, or accelerations down in this area .25g, or around there, is ab-ut the same, relatively the same no matter which of the two hazard curves.

The absolute numbers will be quite different, may be, but the actual contribution to core melt from accelerations of .25g comes out about the same for the two studies.

MR. OKRENT: I don't understand what you're saying, unless the answer is zero for future events but I don't want to try to understand it tonight.

DR. KERR: That concludes the presentation?

MR. SMART: Yes, it does.

DR. KERR: Any further questions?

(No response.)

DR. KERR: Thank you, Mr. Smart.

We have time for 10 minutes of ATWS.

MR. SMART: I would like to introduce George Pitman.

(Slide.)

ATWS MITIGATION

MR. PITMAN: My name is George Pitman. And I'm Manager of Generation Electrical Engineering. I'd like to say that Mr. Ebersole's question on sharing of diesel generators on a common site will be addressed by Mr. Roby rather than myself. He has come prepared to talk about station blackouts, but I'm here today to talk about anticipated transients without scram, what is commonly referred to as ATWS, and will cover Section A on the agenda related to compliance with the rule. Mr. Jim Crockett, Plant Superintendent, will talk about the Salem event-related portions.

(Slide.)

An ATWS event is defined as an expected operational transient such as a loss of off-site power or a loss of main feedwater flow, which is then accompanied by a failure of the reactor trip system to shut down or scram the reactor. Without timely operator intervention, severe core damage can result with the potential for a release of radioactivity to the environment.

Several years of activity within the nuclear industry and the NRC have finally resulted in the publication of an ATWS Rule. That rule came out in the Federal Register on June 26, 1984. And on the basis of value impact studies the rule selects specific fixes for the various reactor types. In the case of Westinghouse plants, a scheme referred to as AMSAC is specified.

DR. KERR: Let's assume that we are reasonably familiar with the general solution being proposed and see what you --

MR. PITMAN: Regarding the plans?

DR. KERR: What are you going to do about ATWS?

MR. PITMAN: What we will do per the rule requirements is install an AMSAC system in Millstone 3.

The details of it are presently being worked out at the Westinghouse Owners's Group. We will be submitting a proposed implementation schedule within 180 days of receipt of the NRC QA guidance document that is to be forthcoming.

Basically our plan is to comply with the Rule as presently written.

DR. KERR: In effect you're going to comply with the Rule?

MR. PITMAN: That's correct.

MR. OKRENT: You noted that reliability assurance programs are encouraged?

MR. PITMAN: That's correct.

MR. OKRENT: Do you have in mind first what is meant in this case by reliability assurance programs, and second, whether you will pursue some sort of thing like this?

MR. PITMAN: The preamble to the Rule is quite explicit in explaining what the NRC means by reliability response program. And we generally agree with that definition.

Our plan relative to developing a program lies with the Atomic Industrial Forum effort that's presently being geared up to get under way. Northeast Utilities will actively participate in that effort.

But it relates back to things like

performance goals for the system. The detailed review to reveal common cause failures, that sort of thing.

MR. OKRENT: Is it something that will be restricted to things that could impact ATWS or is it a broader program?

MR. PITMAN: The AIF program will be limited to try to come up with a program that meets that which was urged by the NRC. It will be limited to the reactor trip system components from sensor to removal of power from the rods.

DR. KERR: It's possible however that you will become so excited about reliability to assurance that you will extend it to the rest of the plant?

MR. COUNSIL: In many cases we already have. Last week we had the NRC staff talking about preventive maintenance, corrective maintenance and so forth at Northeast Utilities. We toured them through the plant. We showed them what we knew from every refueling outage. For instance let me give you a few of things that we do during a refueling outage. We basically do oversisght testing of our steam lines. We measure wall thicknesses, thinning in the main steam pipe, things of this nature. Eddy current tests, all the changes in the plant, not just steam generators, and we do corrective flooding. In addition to that, we eddy current test, obviously, the main condensors. When we find degradation, we replace equipment. For instance, two years ago we replaced two of the water pipes in Connecticutt Yankee with stainless steel. The other two were in fact degrading. They were replaced in this refueling outage. We also replaced many of the feedwater heaters. We overhauled almost all of the air operated valves in the stationl.

That is by no means the entire program. We spent some 10 hours discussing this with the NRC.

I know for a fact that other utilities have adopted a similar program.

DR. KERR: I would hope that utilities could develop this because I think only utilities can do it.

If it is to be done, it'll have to be done by the people who are responsible for the plants.

MR. COUNSIL: Dr. Kerr, I'm in complete agreement with you.

Such programs though, you must recognize-- We've tried to make them apply by rule. It is very, very difficult because of the site specific nature of the balance of plant, particularly for a seawater plant.

DR. KERR: I'm in agreement with you. Before we starting agreeing with each other too much, does that conclude your presentation on ATWS?

MR. PITMAN: It does.

DR. KERR: Are there questions?

(No response.)

DR. KERR: I propose to end this meeting on schedule. There are two items that we're scheduled to cover this evening that we will not be able to. I would propose to try to cover those tomorrow morning with questions from the Subcommittee rather than asking for presentations. And we probably will ask for brief presentations on both of those presentations at the full committee meeting. So with perhaps five or ten minutes of questions we can then get fairly well on schedule tomorrow morning.

Thank you for your patience and perseverance and I'll see you at 8:00 in the morning.

(Whereupon, at 8:00 p.m., the hearing was adjourned, to reconvene at 8:00 a.m., Wednesday, August 29, 1984.)

CERTIFICATE OF OFFICIAL REPORTER

This is to certify that the attached proceedings before the UNITED STATES NUCLEAR REGULATORY COMMISSION in the matter of:

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

COMBINED MILLSTONE NUCLEAR POWER STATION
UNIT3/RELIABILITY AND PROBABILISTIC
ASSESSMENT SUBCOMMITTEE MEETING

DOCKET NO.:

PLACE: Windsor Locks, Connecticut

DATE: Tuesday, August 28, 1984

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission.

William R. Bloom /sg

William R. Bloom

Official Reporter

ACE-FEDERAL REPORTERS, INC.
Reporter's Affiliation

CERTIFICATE OF OFFICIAL REPORTER

This is to certify that the attached proceedings before the UNITED STATES NUCLEAR REGULATORY COMMISSION in the matter of:

NAME OF PROCEEDING:

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

COMBINED MILLSTONE NUCLEAR POWER STATION
UNIT 3/RELIABILITY AND PROBABILISTIC
ASSESSMENT SUBCOMMITTEE MEETING

DOCKET NO.:

PLACE: Windsor Locks, Connecticut

DATE: Tuesday, August 28, 1984

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Anne G. Bloom /sg

Anne G. Bloom

Official Reporter

ACE-FEDERAL REPORTERS, INC.
Reporter's Affiliation

NORTHEAST UTILITIES SERVICE COMPANY

MR. W.G. COUNSIL
SENIOR VICE PRESIDENT

NUCLEAR ENGINEERING
AND OPERATIONS GROUP

NU

CORPORATE MISSION STATEMENT

EXCERPT

"NORTHEAST UTILITIES IS DEDICATED TO PROVIDING SAFE, DEPENDABLE AND REASONABLY PRICED ENERGY AND RELATED SERVICES . . ."

NU

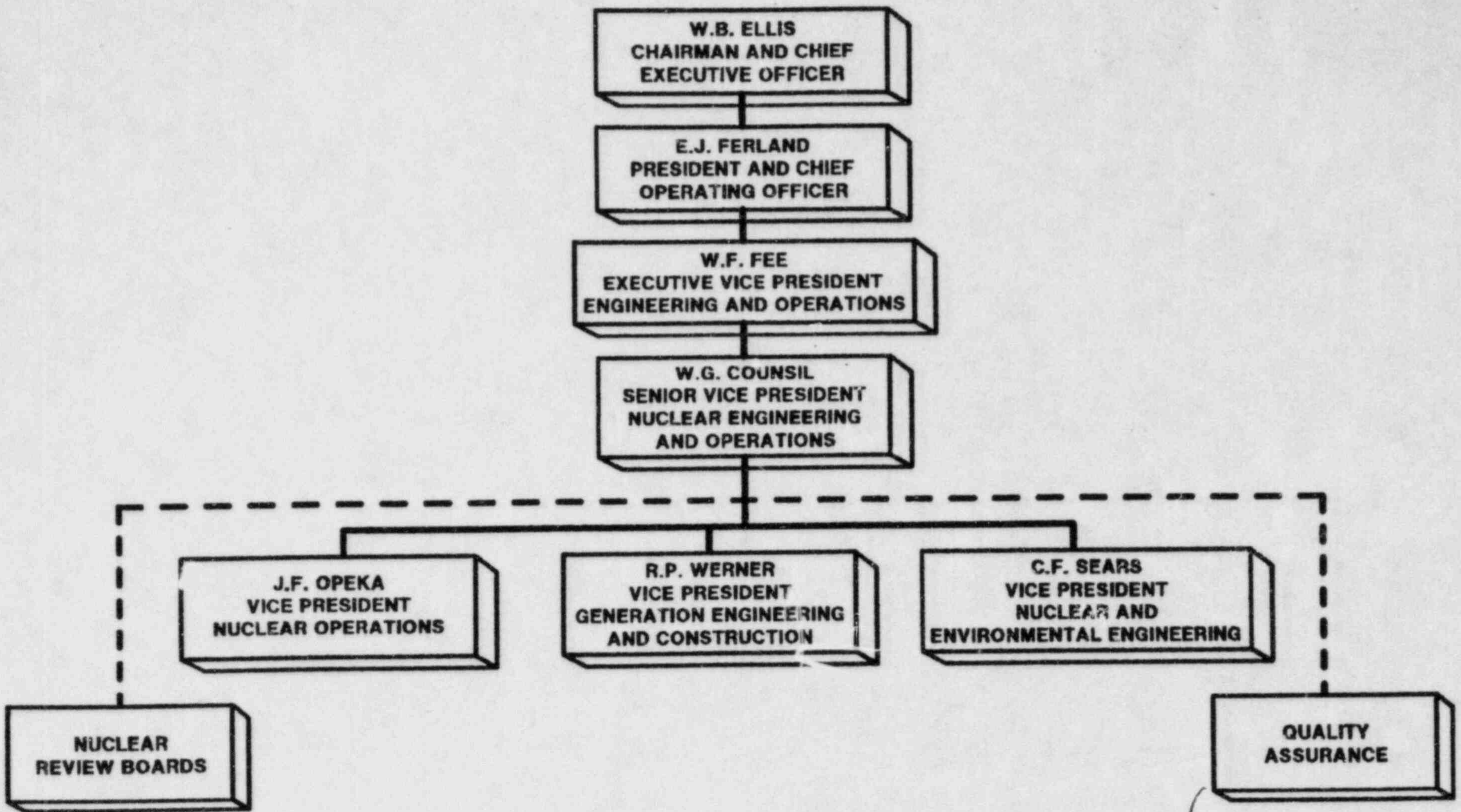
NUCLEAR ENGINEERING AND OPERATIONS GROUP

NUCLEAR POLICY

EXCERPT

"... NORTHEAST UTILITIES FULLY RECOGNIZES ITS RESPONSIBILITIES AND ACCOUNTABILITIES TO OPERATE ITS NUCLEAR PLANTS SAFELY, EFFECTIVELY AND WITH A MINIMUM IMPACT ON THE ENVIRONMENT, THE PUBLIC HEALTH AND SAFETY, AND THE HEALTH AND SAFETY OF COMPANY PERSONNEL."

NU


W.B. ELLIS
CHAIRMAN AND CHIEF
EXECUTIVE OFFICER
E.J. FERLAND
PRESIDENT AND CHIEF
OPERATING OFFICER
W.F. FEE
EXECUTIVE VICE PRESIDENT
ENGINEERING AND OPERATIONS
W.G. COUNSIL
SENIOR VICE PRESIDENT
NUCLEAR ENGINEERING
AND OPERATIONS
J.F. OPEKA
VICE PRESIDENT
NUCLEAR OPERATIONS
R.P. WERNER
VICE PRESIDENT
GENERATION ENGINEERING
AND CONSTRUCTION
C.F. SEARS
VICE PRESIDENT
NUCLEAR AND
ENVIRONMENTAL ENGINEERING
NUCLEAR
REVIEW BOARDS
QUALITY
ASSURANCE

NU

NUCLEAR ENGINEERING AND OPERATIONS GROUP

APPROXIMATE NUMBER OF PERSONNEL:	2,020
APPROXIMATE NUMBER WITH COLLEGE DEGREES:	948
APPROXIMATE YEARS OF NUCLEAR EXPERIENCE:	14,000

NU

NUCLEAR ENGINEERING AND OPERATIONS GROUP

TOTAL STAFF		2020
MANAGEMENT	276	
PROFESSIONAL	615	
TECHNICAL	681	
OPERATORS	216	
CRAFT	50	
ADMINISTRATIVE	182	
DEGREE DISTRIBUTION		
ASSOCIATE	232	
BACHELOR OF ARTS	42	
BACHELOR OF SCIENCE	537	
MASTERS	218	
PHD	22	
TOTAL YEARS OF NUCLEAR EXPERIENCE		14,064
MILITARY	3780	
ENGINEERING	7533	
PLANT OPERATION	2751	

NU

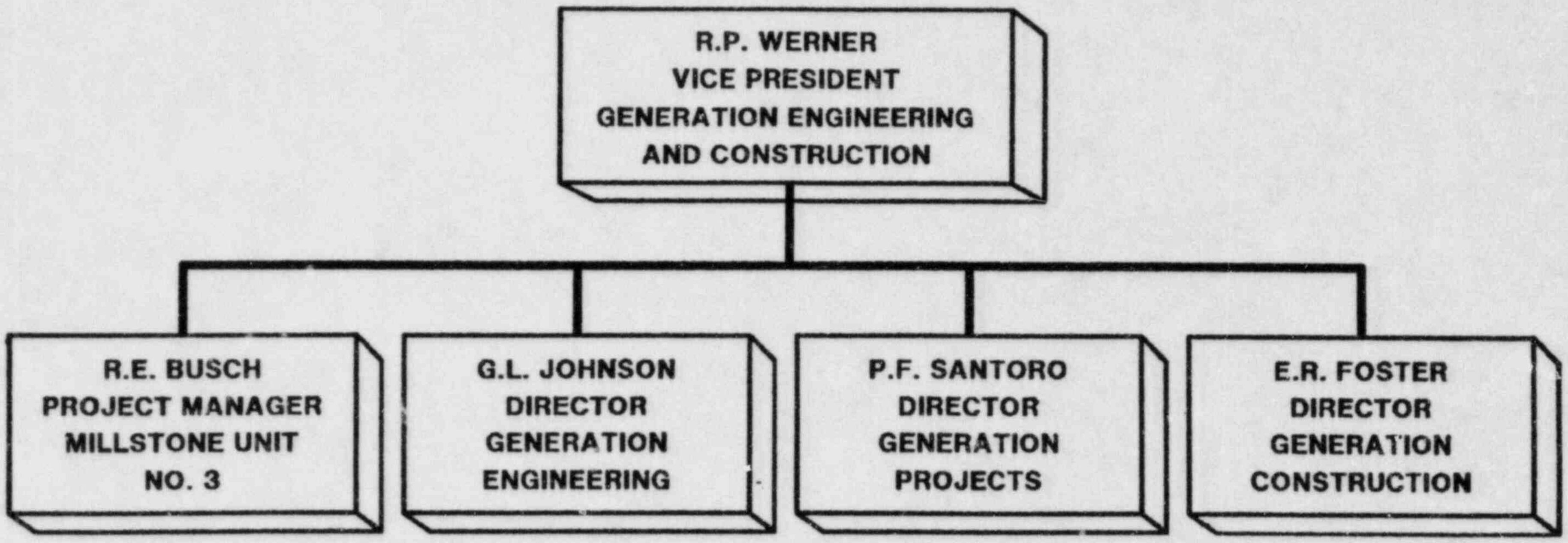
NORTHEAST UTILITIES SERVICE COMPANY

R.P. WERNER
VICE PRESIDENT

GENERATION ENGINEERING
AND CONSTRUCTION

NU

GENERATION ENGINEERING AND CONSTRUCTION DIVISION



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GENERATION ENGINEERING AND CONSTRUCTION FUNCTIONS

- PROVIDE PROJECT ENGINEERING AND TECHNICAL SUPPORT FOR THE DESIGN, SPECIFICATION, AND PROCUREMENT OF PLANT SYSTEMS AND MATERIALS
- PROVIDE PROJECT MANAGEMENT FOR ALL GENERATION BACKFIT AND BETTERMENT PROJECTS
- PROVIDE ENGINEERING DESIGN AND DRAFTING SERVICES
- PROVIDE SITE CONSTRUCTION MANAGEMENT

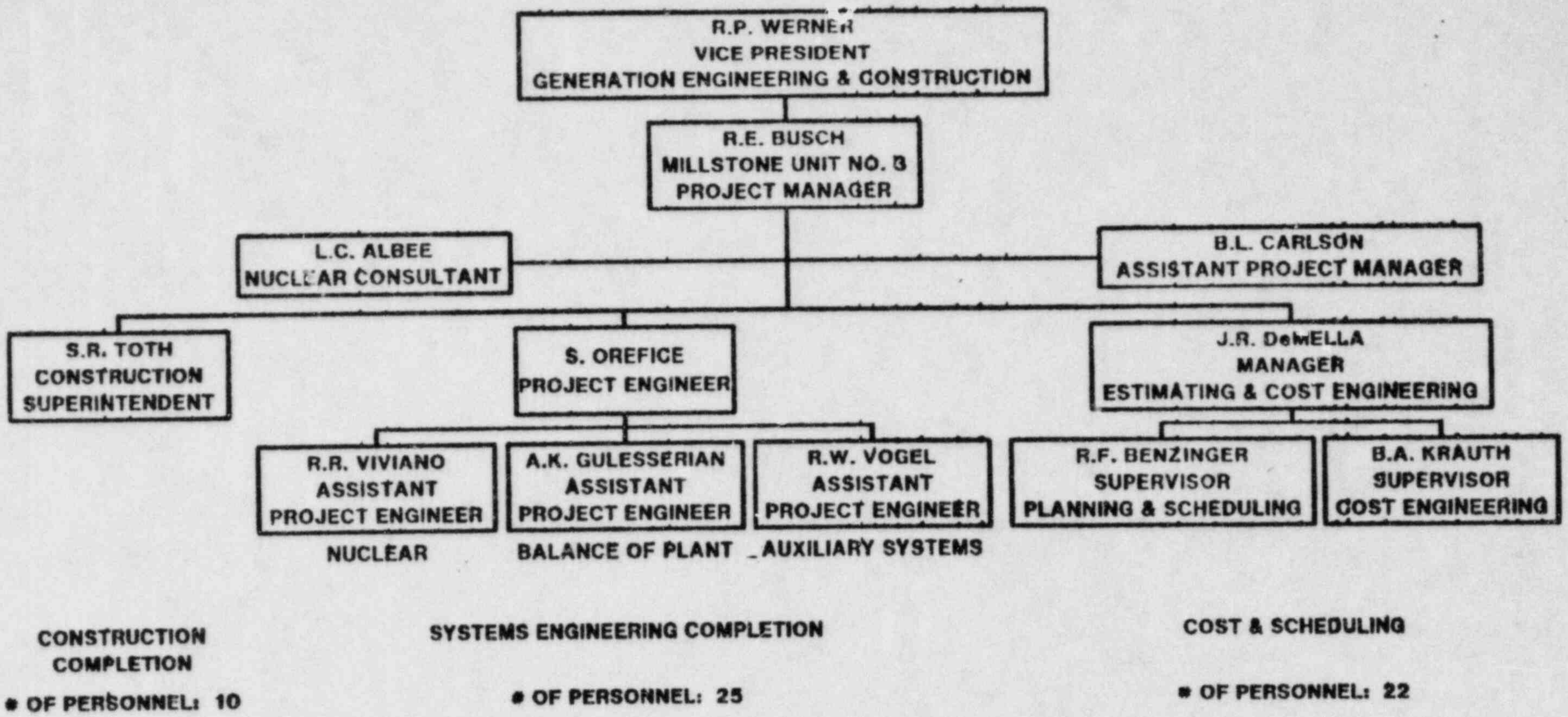
NU

GENERATION ENGINEERING AND CONSTRUCTION

TOTAL STAFF		505
MANAGEMENT	86	
PROFESSIONAL	218	
TECHNICAL	110	
CRAFT	50	
ADMINISTRATIVE	41	
DEGREE DISTRIBUTION		
ASSOCIATE	58	
BACHELOR OF ARTS	3	
BACHELOR OF SCIENCE	177	
MASTERS	71	
PHD	3	
TOTAL YEARS OF NUCLEAR EXPERIENCE		3255
MILITARY	240	
ENGINEERING	2864	
PLANT OPERATION	151	

NU

MILLSTONE UNIT NO. 3
PROJECT ORGANIZATION



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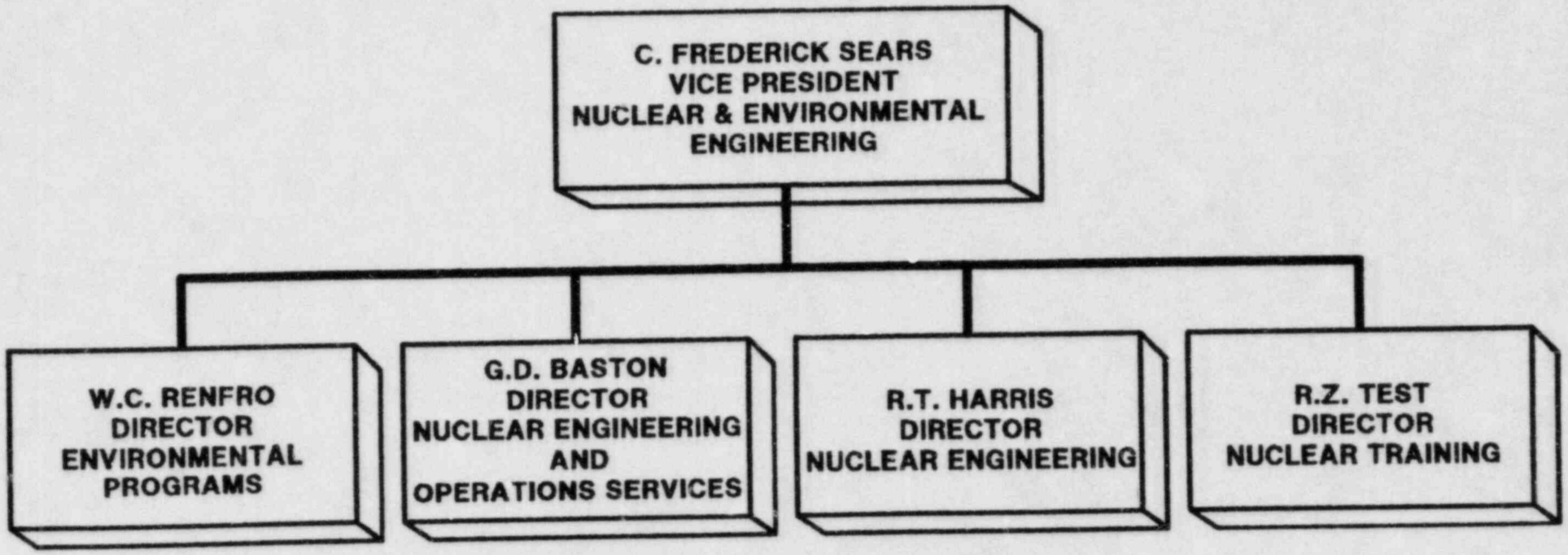
NORTHEAST UTILITIES SERVICE COMPANY

DR. C.F. SEARS
VICE PRESIDENT

NUCLEAR AND
ENVIRONMENTAL ENGINEERING

NU

NUCLEAR & ENVIRONMENTAL ENGINEERING DIVISION



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NUCLEAR AND ENVIRONMENTAL ENGINEERING FUNCTIONS

PROVIDE SUPPORT SERVICES TO THE NUCLEAR ENGINEERING AND OPERATIONS GROUP IN THE AREAS OF:

- ENVIRONMENTAL PROGRAMS
- LICENSING
- FUEL MANAGEMENT
- GENERATION RECORDS MANAGEMENT
- RADIOLOGICAL ASSESSMENT
- MATERIALS AND CHEMISTRY
- SAFETY ENGINEERING
- QUALITY ASSURANCE
- RELIABILITY ENGINEERING
- REACTOR ENGINEERING
- TRAINING

NU

NUCLEAR AND ENVIRONMENTAL ENGINEERING DIVISION

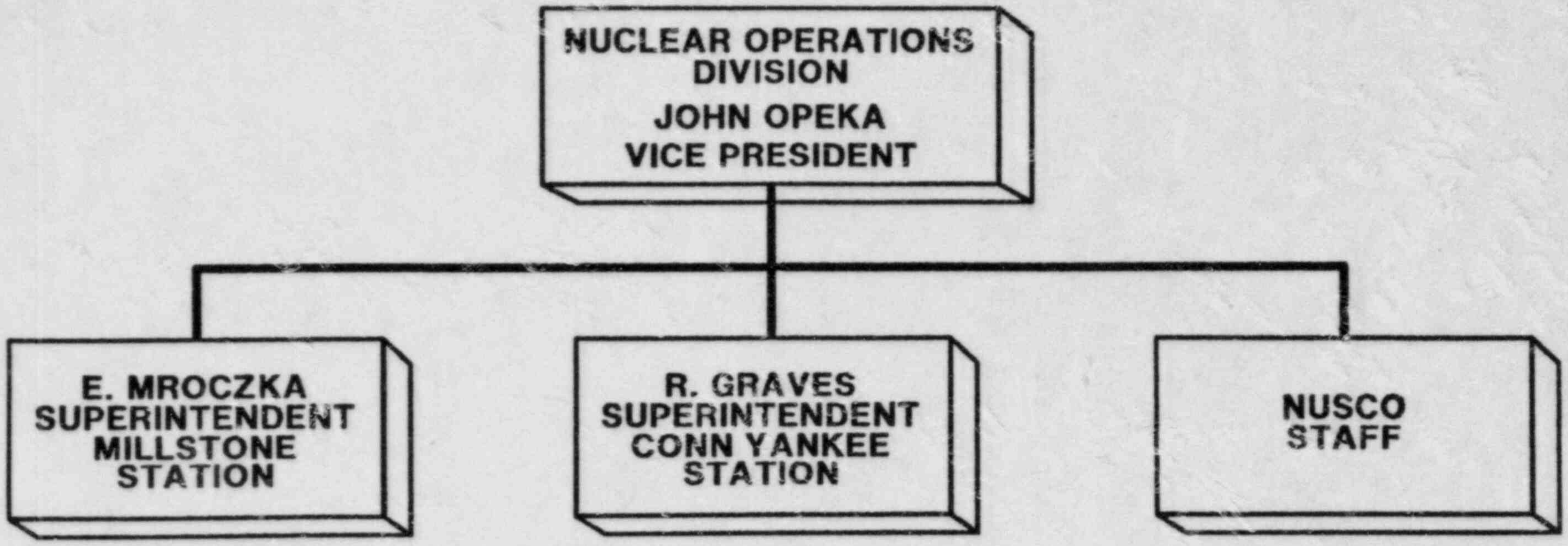
TOTAL STAFF		422
MANAGEMENT	57	
PROFESSIONAL	230	
TECHNICAL	86	
ADMINISTRATIVE	49	
DEGREE DISTRIBUTION		
ASSOCIATE	53	
BACHELOR OF ARTS	15	
BACHELOR OF SCIENCE	155	
MASTERS	98	
PHD	18	
TOTAL YEARS OF NUCLEAR EXPERIENCE		3000
MILITARY	580	
ENGINEERING	2100	
PLANT OPERATION	320	

NU

NORTHEAST UTILITIES SERVICE COMPANY

J.F. OPEKA
VICE PRESIDENT

NUCLEAR OPERATIONS



STAFF (3 PLANTS) = 814

STAFF (MP-3) = 303

STAFF (1 PLANT) = 275

STAFF = 19

NU

NUCLEAR OPERATIONS FUNCTIONS

NUCLEAR PLANT

- OPERATE AND MAINTAIN THE NUCLEAR STATIONS IN ACCORDANCE WITH REGULATORY AND COMPANY POLICIES

NUSCO SUPPORT

- NUCLEAR PLANT PERFORMANCE MONITORING
- NUCLEAR PLANT ADMINISTRATIVE REPORTING
- NUCLEAR PLANT RELIABILITY DATA SYSTEM (NPRDS) REPORTING
- NUCLEAR PLANT CONTRACTOR SECURITY SCREENING
- NUCLEAR PLANT OPERATIONAL SUPPORT

NU

NUCLEAR OPERATIONS

TOTAL STAFF		1051
MANAGEMENT	125	
PROFESSIONAL	142	
TECHNICAL	483	
OPERATORS	216	
ADMINISTRATIVE	85	
DEGREE DISTRIBUTION		
ASSOCIATE	119	
BACHELOR OF ARTS	22	
BACHELOR OF SCIENCE	189	
MASTERS	42	
PHD	0	
TOTAL YEARS OF NUCLEAR EXPERIENCE		7393
MILITARY	2806	
ENGINEERING	2463	
PLANT OPERATION	2124	

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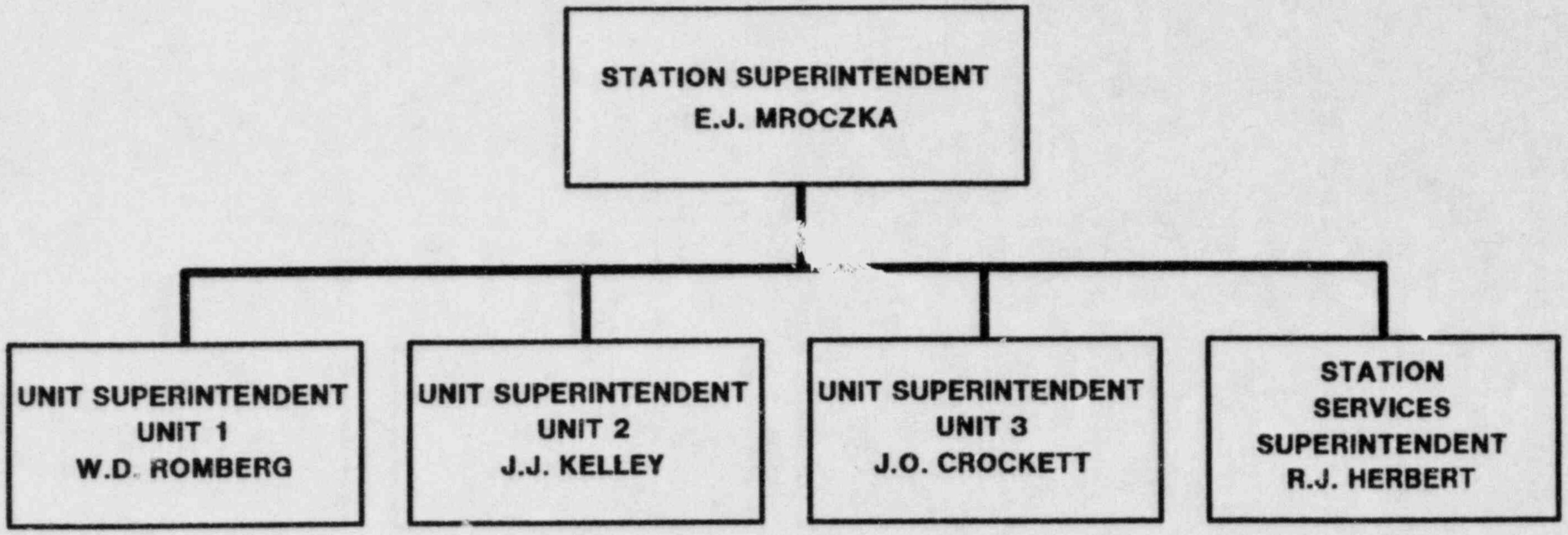
NORTHEAST NUCLEAR ENERGY COMPANY

MR. E.J. MROCZKA
MILLSTONE STATION SUPERINTENDENT

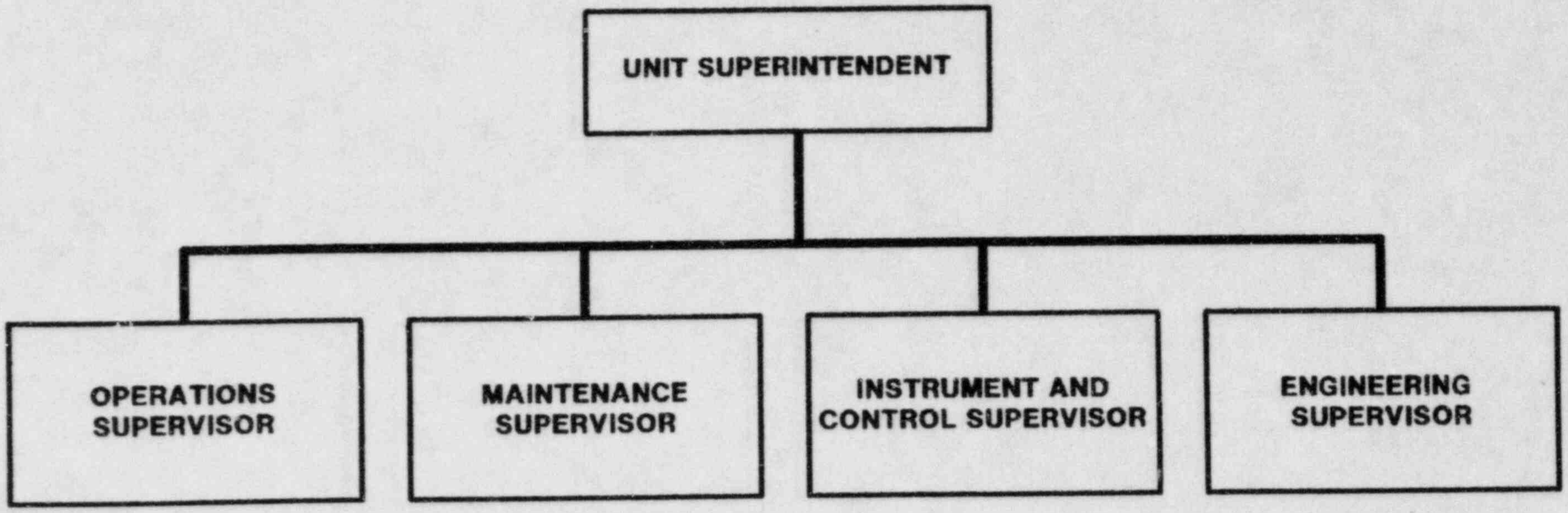
MILLSTONE STATION ORGANIZATION

NU

MILLSTONE NUCLEAR POWER STATION



UNIT ORGANIZATION



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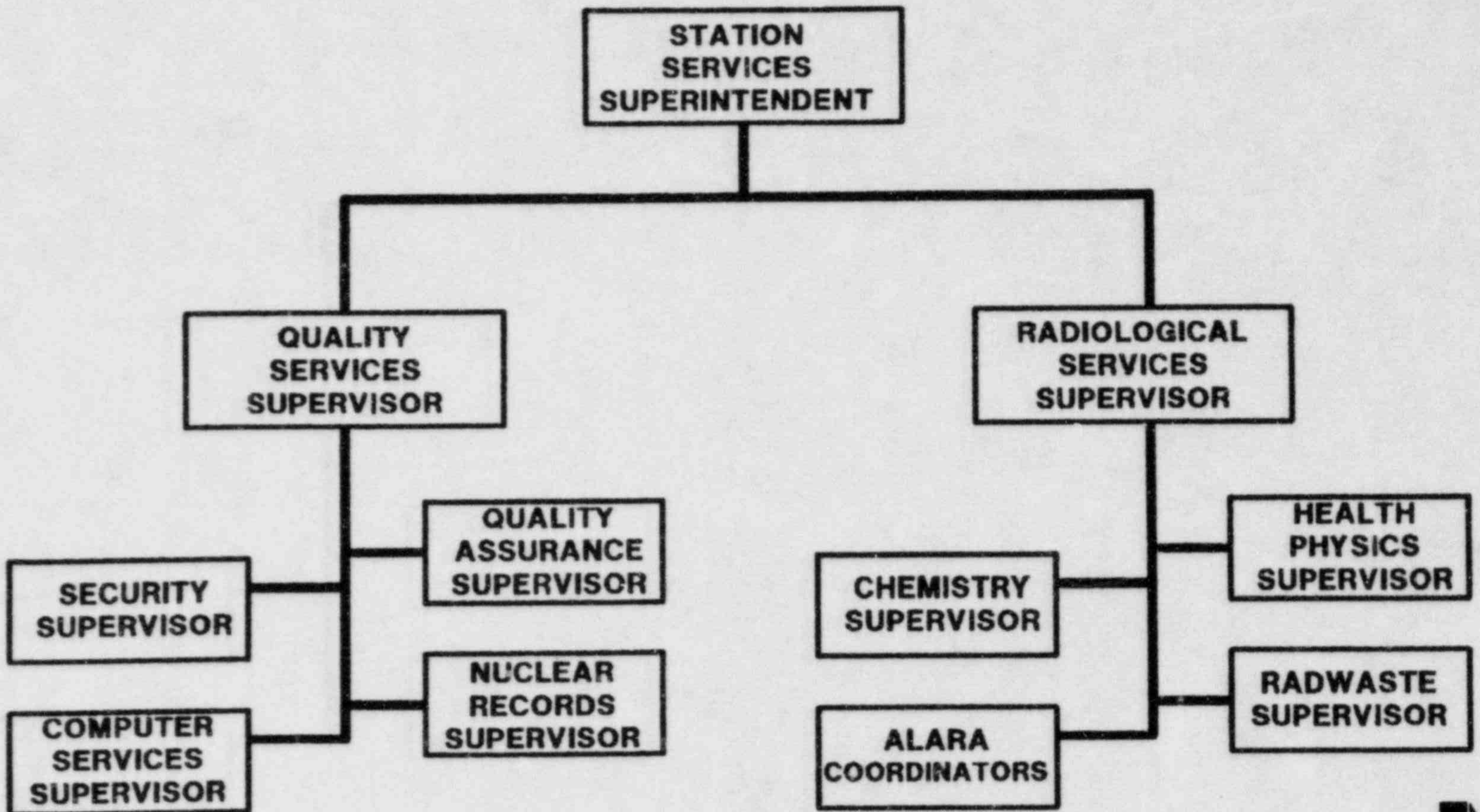
STATION SERVICES ORGANIZATION



NU

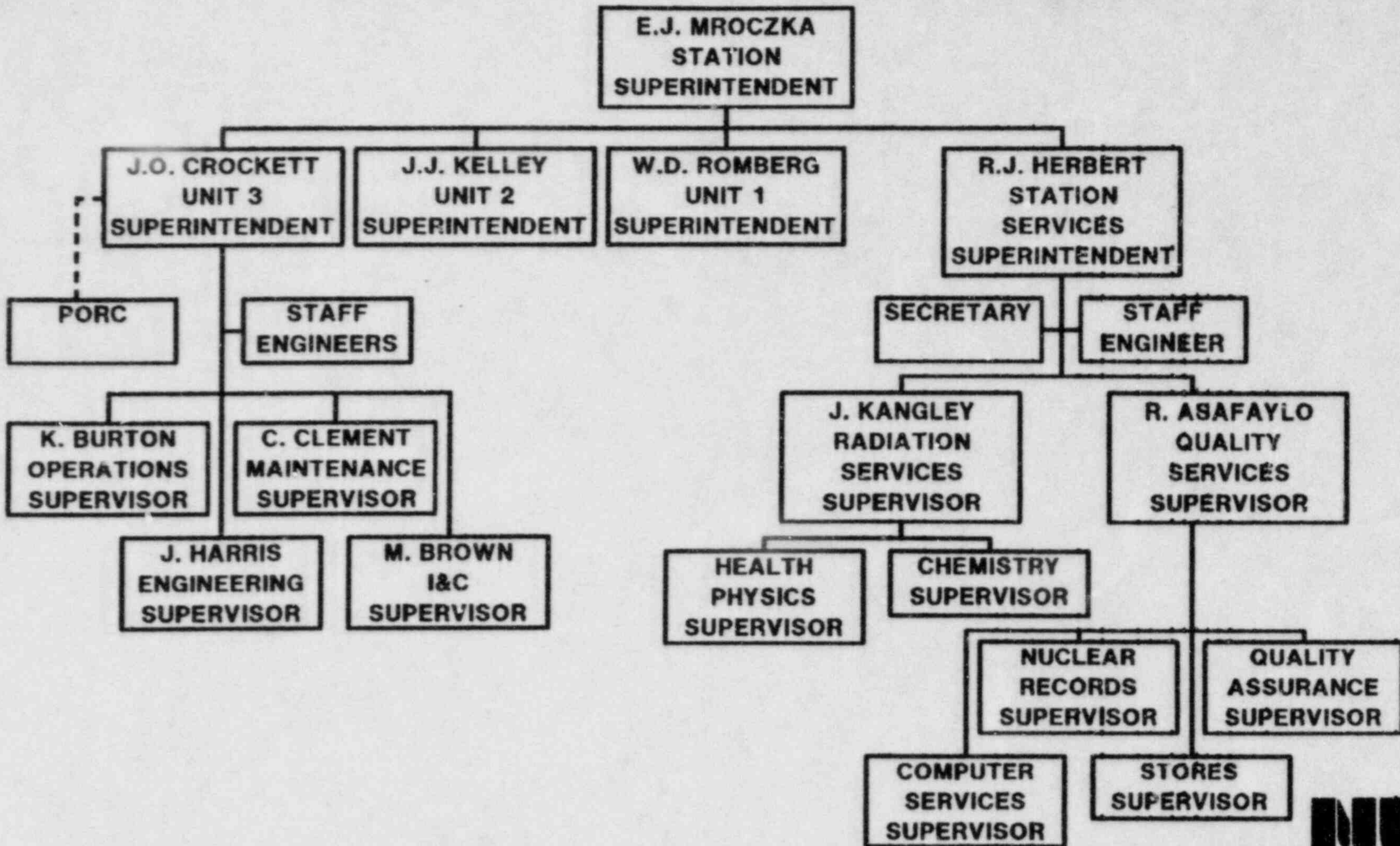
NORTHEAST NUCLEAR ENERGY COMPANY

MR. J.O CROCKETT
MP3 UNIT SUPERINTENDENT

MP3 UNIT ORGANIZATION

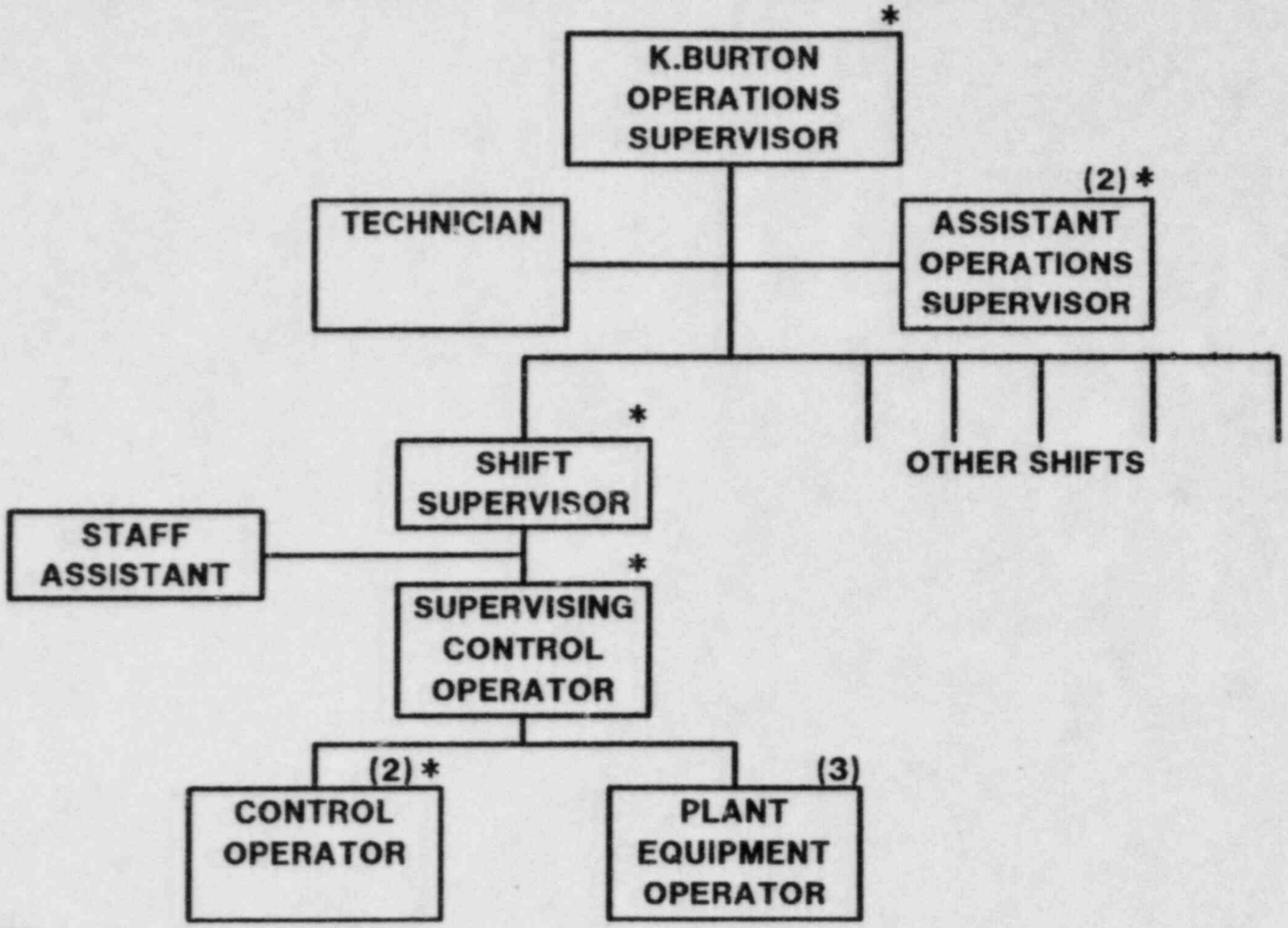
NU

MILLSTONE ORGANIZATION



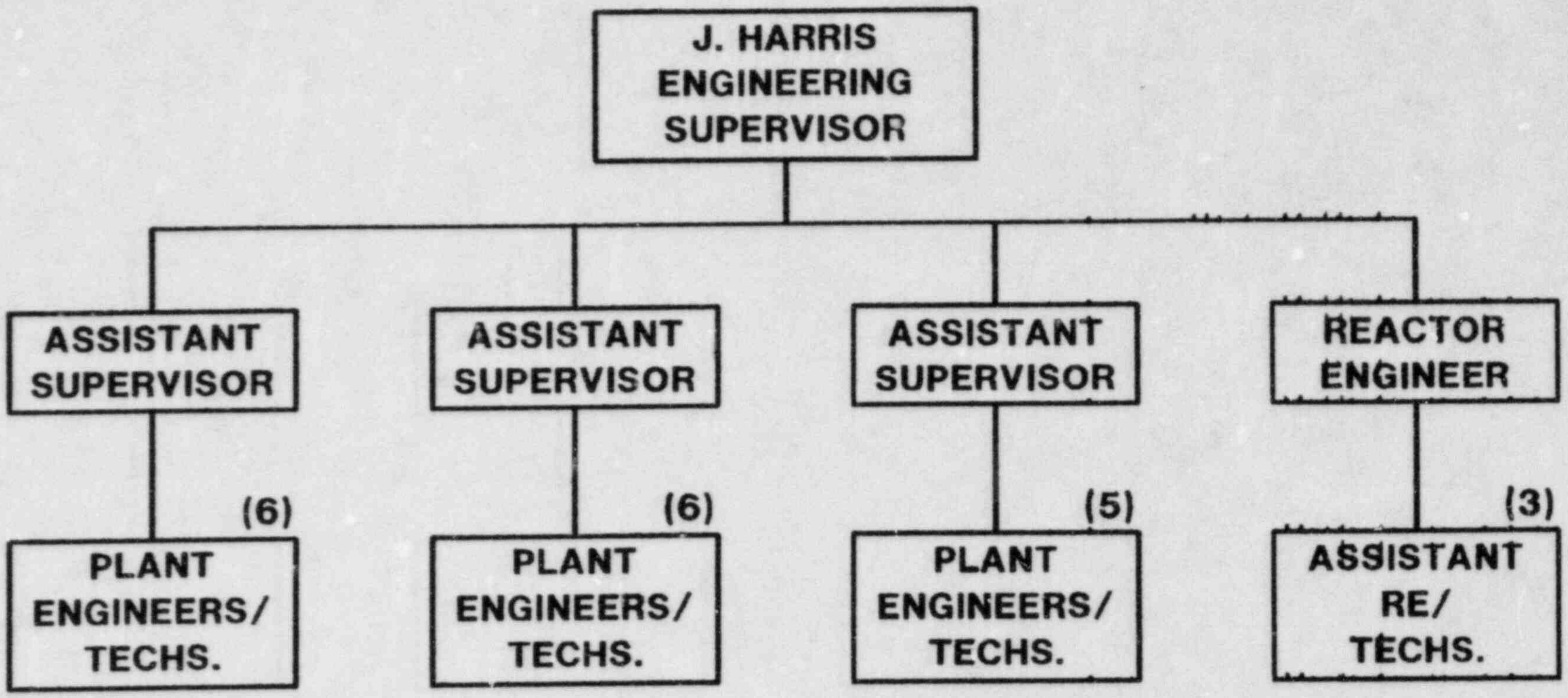
NU

OPERATIONS DEPARTMENT



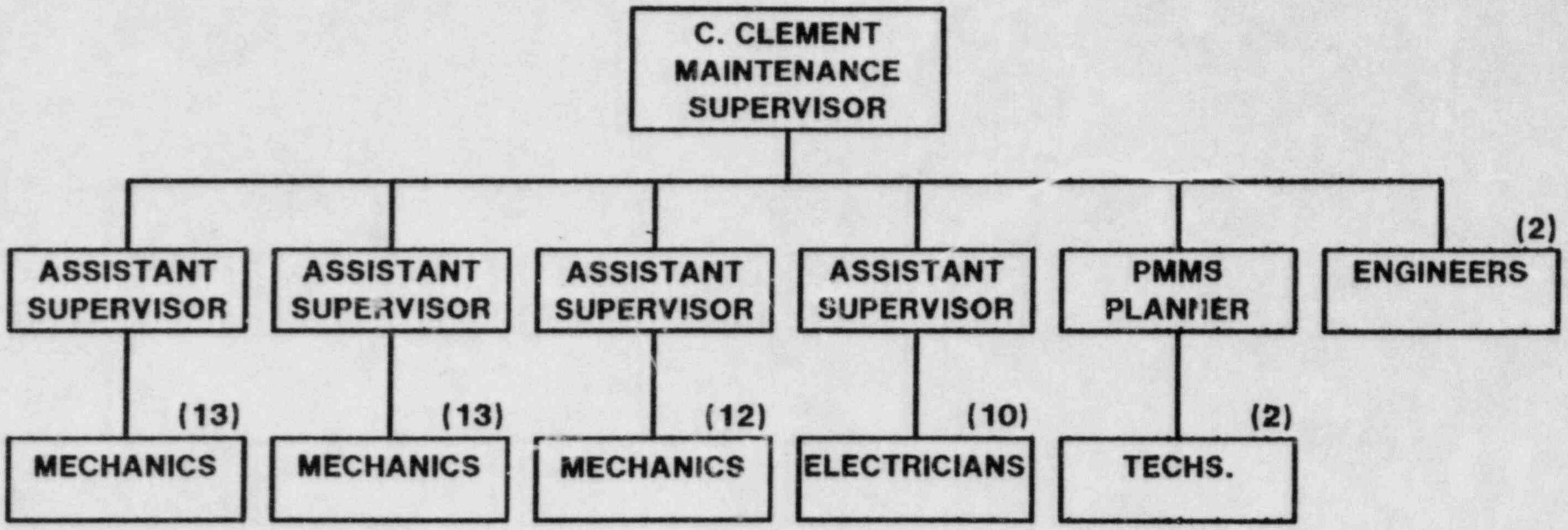
LICENSED - *
TOTAL STAFF = 67

ENGINEERING DEPARTMENT



TOTAL STAFF = 26

MAINTENANCE DEPARTMENT

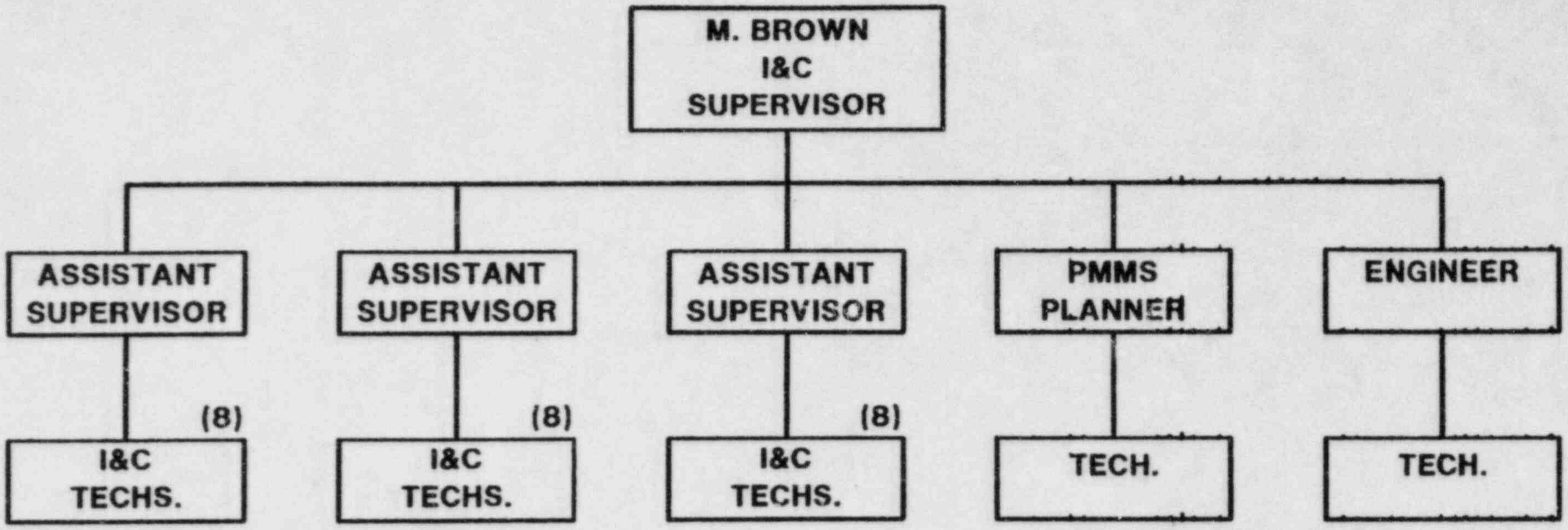


<u>TOTAL STAFF</u> = 59

ASST. SUPV.	15	AVERAGE YEARS EXPERIENCE,	10	AVERAGE YEARS NUCLEAR EXPERIENCE
MECHANICS	11.2	AVERAGE YEARS EXPERIENCE,	2.6	AVERAGE YEARS NUCLEAR EXPERIENCE
ELECTRICIANS	7.3	AVERAGE YEARS EXPERIENCE,	2.4	AVERAGE YEARS NUCLEAR EXPERIENCE

NU

INSTRUMENTATION & CONTROL DEPARTMENT



<u>TOTAL STAFF</u> = 33

ASST. SUPV. 15 AVERAGE YEARS EXPERIENCE, 13.5 AVERAGE YEARS NUCLEAR EXPERIENCE

I&C TECHS 9.50 AVERAGE YEARS EXPERIENCE, 4.82 AVERAGE YEARS NUCLEAR EXPERIENCE

NORTHEAST NUCLEAR ENERGY COMPANY

MR. J.O. CROCKETT
MP3 STATION SUPERINTENDENT

SELECTION AND TRAINING OF OPERATORS

NU

SELECTION AND TRAINING OF OPERATORS

STAFFING OBJECTIVES
- EXPERIENCE TRANSFER
- STA QUALIFICATION
- 6 SHIFT COMMITMENT
- STARTUP SUPPORT
- PROGRESSION

TRAINING PROGRAM
- NUCLEAR FUNDAMENTALS
- CLASSROOM/SIMULATOR SNUPPS COURSE
- 3 MONTH SITE SCHOOL
- 6 ADDITIONAL TRAINING SHIFT WEEKS
- OJT
- SIMULATOR
- FINAL TRAINING/EVALUATION
- STARTUP TESTING

SELECTION PROCESS
- OPERATING UNIT TRANSFER
- LICENSE ELIGIBILITY
- SHIFT SUPERVISORS/SUPERVISING CONTROL OPERATORS
- REACTOR OPERATORS
- PLANT EQUIPMENT OPERATORS

SELECTION AND TRAINING OF OPERATORS

EXPERIENCE LEVELS

- NUCLEAR EXPERIENCE

- LICENSED SS'S, SCO'S, CO'S	292 YEARS
- NON-LICENSED OPERATORS	122 YEARS
- UNIT 3 EXPERIENCE	114 YEARS
- TOTAL	528 YEARS

- MANAGEMENT EXPERIENCE

- SHIFT SUPERVISORS	- NAVY EOOW/ENG QUALIFICATION OR ACTUAL SS EXPERIENCE
- SUPERVISING CONTROL	- ALL PREVIOUSLY NRC LICENSED, 5 WERE PREVIOUS SCO'S, ALL HAVE COMPLETED STA LEVEL 11 QUALIFICATION

- STARTUP EXPERIENCE
  - ALL OPERATING PROCEDURES WRITTEN BY OPERATORS
  - ALL SYSTEM OPERATION FOR TEST PERFORMED BY OPERATORS
  - OVER 3 YEARS OF ONGOING EXPERIENCE
  - OPERATING PROCEDURES USED DURING STARTUP TEST PROGRAM

SELECTION AND TRAINING OF MAINTENANCE STAFF

STAFFING OBJECTIVES

- HIGHLY QUALIFIED ASSISTANT SUPERVISORS
- EXPERIENCE TRANSFER
- BREADTH OF SKILLS
- STARTUP SUPPORT
- PM PROGRAM SUPPORT

SELECTION PROCESS

- OPERATING PLANT TRANSFER
- CRITICAL SKILLS
- INDUSTRIAL EXPERIENCE

TRAINING PROGRAM

- SYSTEMS FAMILIARIZATION
- BASIC DEPARTMENT
- DISCIPLINE
- SPECIALIZED
- OJT
- STARTUP TESTING

EXPERIENCE LEVELS

- 276 YEARS TOTAL NUCLEAR EXPERIENCE
- EXPERIENCE

	AVERAGE	NUCLEAR
- ASSISTANT SUPERVISORS	15	10
- MECHANICS	11.2	2.6
- ELECTRICIANS	7.3	2.4

SELECTION AND TRAINING
I&C STAFF

STAFFING OBJECTIVES

- HIGHLY QUALIFIED ASSISTANT SUPERVISORS
- PROCESS CONTROLS EXPERIENCE
- BREADTH OF SKILLS
- DIVERSITY
- STARTUP SUPPORT
- PM PROGRAM SUPPORT

SELECTION PROCESS

- ANALOG/DIGITAL BACKGROUND
- PROCESS CONTROLS BACKGROUND
- TRAINING

TRAINING PROGRAM

- SYSTEMS FAMILIARIZATION
- BASIC DEPARTMENT
- GENERAL PROCESS CONTROL
- SPECIALIZED TECHNICAL
- OJT
- STARTUP TESTING

EXPERIENCE LEVELS

- 206 YEARS NUCLEAR EXPERIENCE
- EXPERIENCE

EXPERIENCE	AVERAGE	NUCLEAR
– ASSISTANT SUPERVISORS	15	13.5
– TECHNICIANS	9.5	4.8

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NORTHEAST NUCLEAR ENERGY COMPANY

MR. K.L. BURTON
MP3 OPERATIONS SUPERVISOR

EMERGENCY OPERATING PROCEDURES

NU

EMERGENCY OPERATING PROCEDURES

- FUNCTIONAL AND EVENT ORIENTED (MAJORITY - WOG - ERG'S REV. 1 BASED)
- COORDINATED WITH THE CONTROL ROOM DESIGN REVIEW AND SAFETY PARAMETER DISPLAY SYSTEM
- EXTENSIVE REVIEW PRIOR TO ACTUAL USE

NU

COORDINATION

- THE EOP'S WERE TASK ANALYZED FOR THE CRDR
- THE SPDS WILL BE CONSISTENT WITH THE EOP'S - AN AID TO THE FOLLOWING OF PLANT RESPONSE TO EOP ACTIONS AND A DISPLAY FORMAT TO ASSIST EOP'S
- OPERATORS INVOLVED IN THE CONVERSION OF ERG's TO EOP'S

NU

EMERGENCY PLAN IMPLEMENTING PROCEDURES

- ASSESSMENT (SS)
- ACTIVITIES/RESPONSIBILITIES OF MANAGERS
- COMMUNICATIONS
- RADIOLOGICAL ASSESSMENT
- OPERATION OF EQUIPMENT SUPPORTING EMERGENCY FACILITIES
- NON PLANT TYPE ACCIDENTS (SHIPPING ACCIDENTS, SECURITY THREATS, ETC.)

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NORTHEAST NUCLEAR ENERGY COMPANY

MR. J. O. CROCKETT

MP3 STATION SUPERINTENDENT

PLANT COMMUNICATIONS

COMMUNICATIONS DURING NORMAL AS WELL AS EMERGENCY SITUATIONS

INTRAPLANT COMMUNICATIONS

- PLANT SWITCHING NETWORK
- VOICE PAGING
- MAINTENANCE JACK
- FUEL HANDLING
- SOUND POWERED SYSTEM
- UHF REPEATER

INTRASITE AND OFFSITE COMMUNICATIONS

- PLANT SWITCHING NETWORK
- MESSAGE NETWORK
- EVACUATION ALARM SYSTEM
- MICROWAVE SYSTEM
- EMERGENCY NOTIFICATION SYSTEM
- MULTIPLE DEDICATED AUTOMATIC RINGDOWN TELEPHONES
- CONNECTICUT VALLEY ELECTRIC EXCHANGE (CONVEX)
- CONTROL ROOM INTERCOM
- MULTIPLE RADIO SYSTEMS

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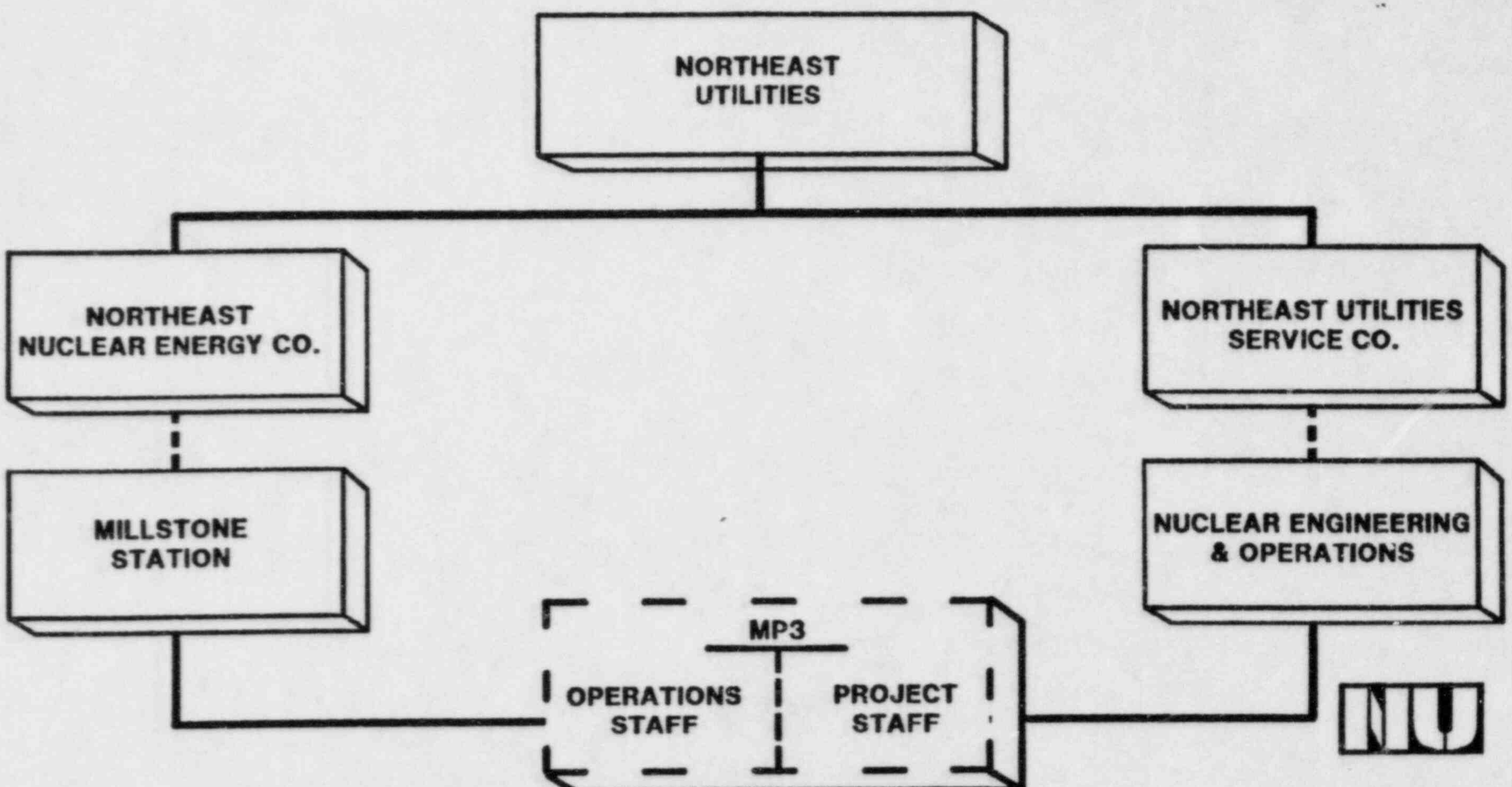
NORTHEAST UTILITIES SERVICE COMPANY

MR. ROBERT E. BUSCH
PROJECT MANAGER MILLSTONE 3

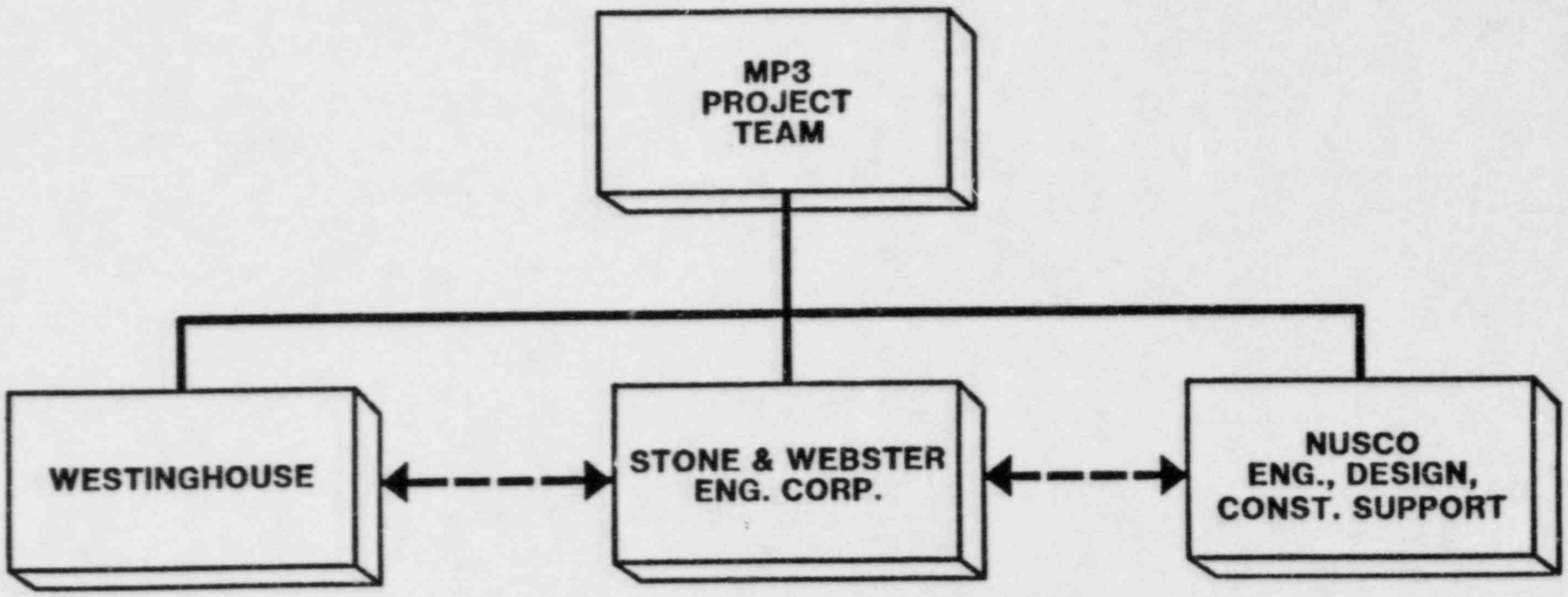
CONSTRUCTION STATUS AND PLANT STARTUP SCHEDULE

NU

MILLSTONE 3 PROJECT STRUCTURE OVERVIEWS



GENERAL PROJECT ORGANIZATION

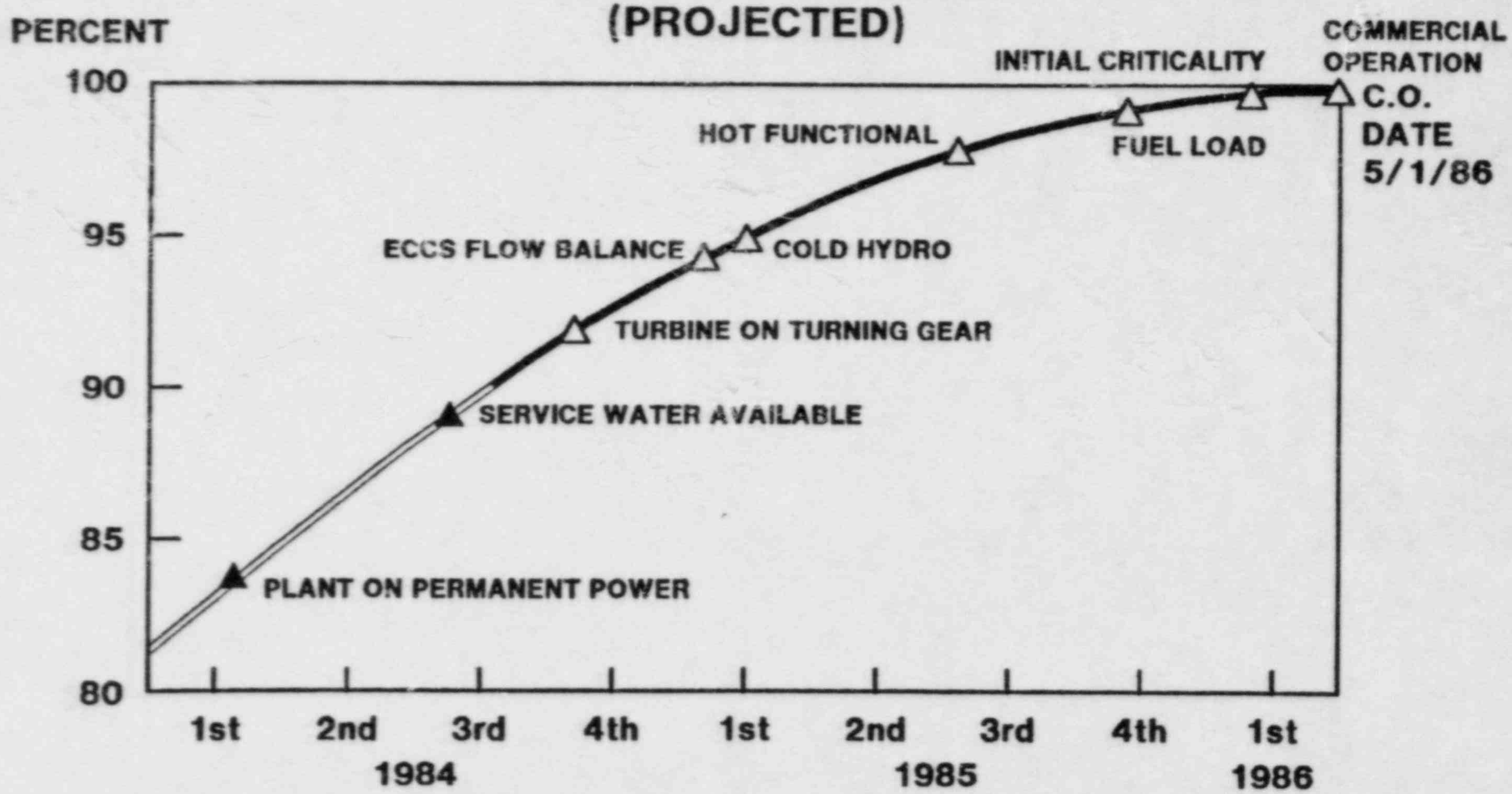


MILLSTONE UNIT NO. 3
PROGRESS OF BULK COMMODITIES
DATA AS OF AUGUST 1, 1984

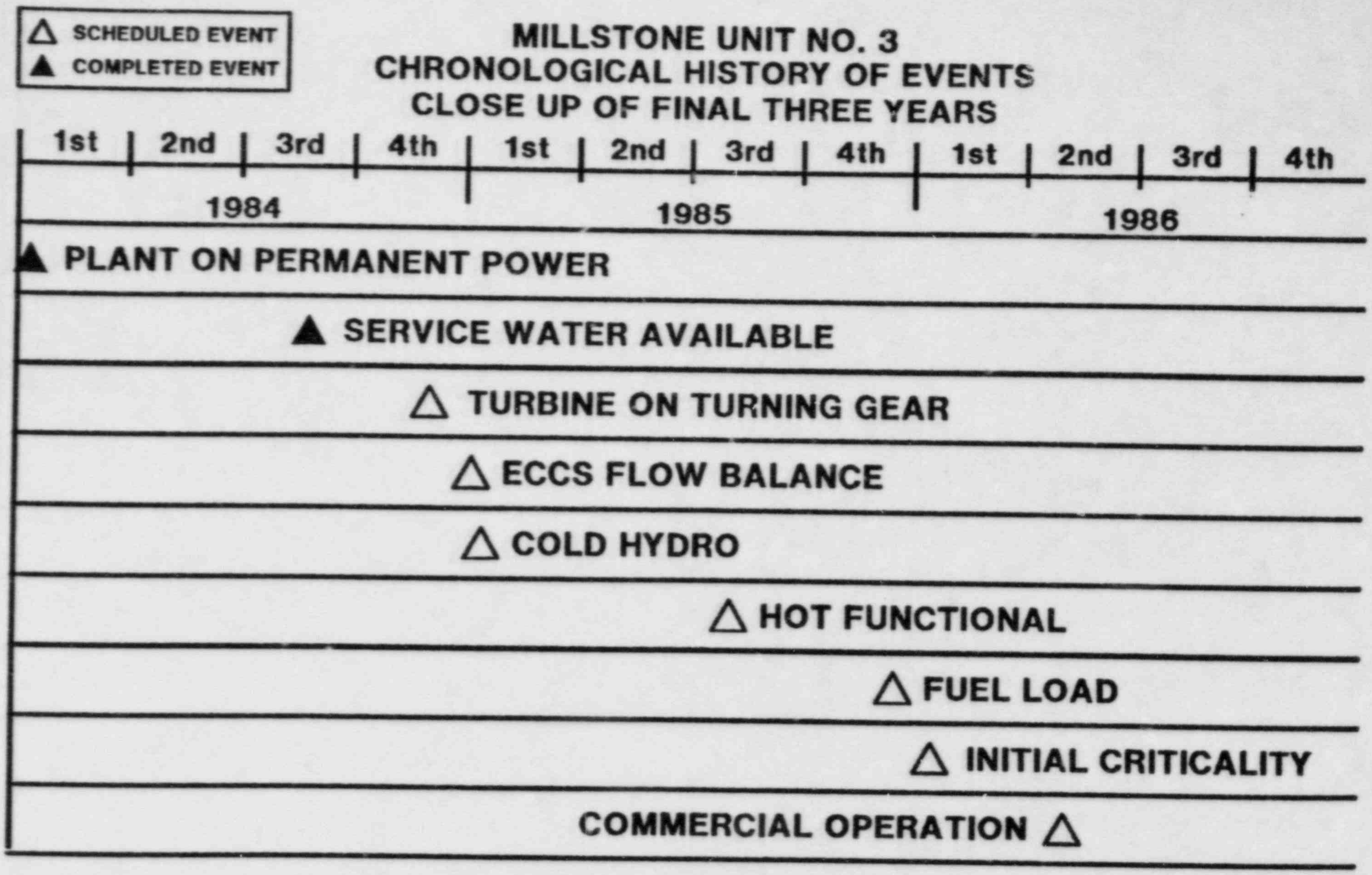
CONCRETE	99%
LARGE PIPE	96
LARGE PIPE HANGERS	90
SMALL PIPE	91
SMALL PIPE HANGERS	88
INSTRUMENT TUBING	67
CABLE TRAY	99
CONDUIT	80
CABLE	72
ELECTRICAL TERMINATIONS	68

NOTE: TOTAL PROJECT 85.5% COMPLETE

MILLSTONE UNIT NO. 3
TOTAL PROJECT
PERCENT COMPLETE
(PROJECTED)



MILLSTONE UNIT NO. 3
CHRONOLOGICAL HISTORY OF EVENTS
CLOSE UP OF FINAL THREE YEARS



NORTHEAST UTILITIES SERVICE COMPANY

MR. SALVATORE OREFICE
PROJECT ENGINEER, MILLSTONE 3

PRINCIPAL DESIGN FEATURES
MILLSTONE 3

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MILLSTONE UNIT NO. 3

PRINCIPAL DESIGN FEATURES

- Westinghouse Nuclear Steam Supply System
- General Electric Turbine/Generator
- Single Pass Surface Condenser
- Subatmospheric Containment
- Containment Enclosure With Supplementary Leak Collection and Release System
- Safety Grade Cold Shutdown Capability
- Two Full Capacity Off Site Power Sources

NORTHEAST NUCLEAR ENERGY COMPANY

MR. J.O. CROCKETT
MP3 STATION SUPERINTENDENT

MAINTENANCE AND INSERVICE INSPECTION

MAINTAINANCE, INSERVICE INSPECTION AND PREOPERATIONAL TESTING

MAINTENANCE PROGRAM

- PREVENTIVE
- PREDICTIVE
- CORRECTIVE

INSERVICE INSPECTION

- BASELINE PRESERVICE INSPECTION
- BASELINE PUMP-MOTOR-VALVE DATA PART OF PREOPERATIONAL TESTING FOR EACH SYSTEM
- PLANT AND CORPORATE SUPPORT STAFF

PREOPERATIONAL TESTING

- OPERATING COMPANY RESPONSIBILITY
- ALL TESTING BY OPERATING STAFF
- OPERATING PROCEDURES BASIS OF TEST PROCEDURES
- COMMON ADMINISTRATIVE SYSTEMS

NORTHEAST UTILITIES SERVICE COMPANY

MR. D.O. NORDQUIST
MANAGER QUALITY ASSURANCE

QUALITY ASSURANCE PROGRAM

NU

NORTHEAST UTILITIES
QUALITY ASSURANCE PROGRAM

- CONSTRUCTION PHASE - MILLSTONE 3
- OPERATIONS PHASE - MILLSTONE 3

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NORTHEAST UTILITIES QUALITY ASSURANCE PROGRAM

- NU QUALITY ASSURANCE TOPICAL REPORT
- TITLE 10 CFR 50, APPENDIX B
- TITLE 10 CFR 71
- QUALITY PROGRAM FIRE PROTECTION

NU

QUALITY ASSURANCE
CONSTRUCTION PHASE - MILLSTONE 3

- NORTHEAST UTILITIES IS RESPONSIBLE
- STONE & WEBSTER IS DELEGATED AUTHORITY TO IMPLEMENT:
  - ENGINEERING ASSURANCE
  - PROCUREMENT QUALITY ASSURANCE
  - FIELD QUALITY CONTROL
  - NONDESTRUCTIVE TEST DIVISION
  - STONE & WEBSTER QUALITY ASSURANCE

NU

SIGNIFICANT STRENGTHS - MP3 CONSTRUCTION QUALITY PROGRAM

- ONE QUALITY PROGRAM ON MP3
- TOTAL MANAGEMENT SUPPORT
- EXPERIENCED STONE & WEBSTER QUALITY PROGRAM
- EXPERIENCED NU QUALITY PROGRAM
- CORRECTIVE ACTION ETHIC

NU

SPECIFIC QUALITY ITEMS

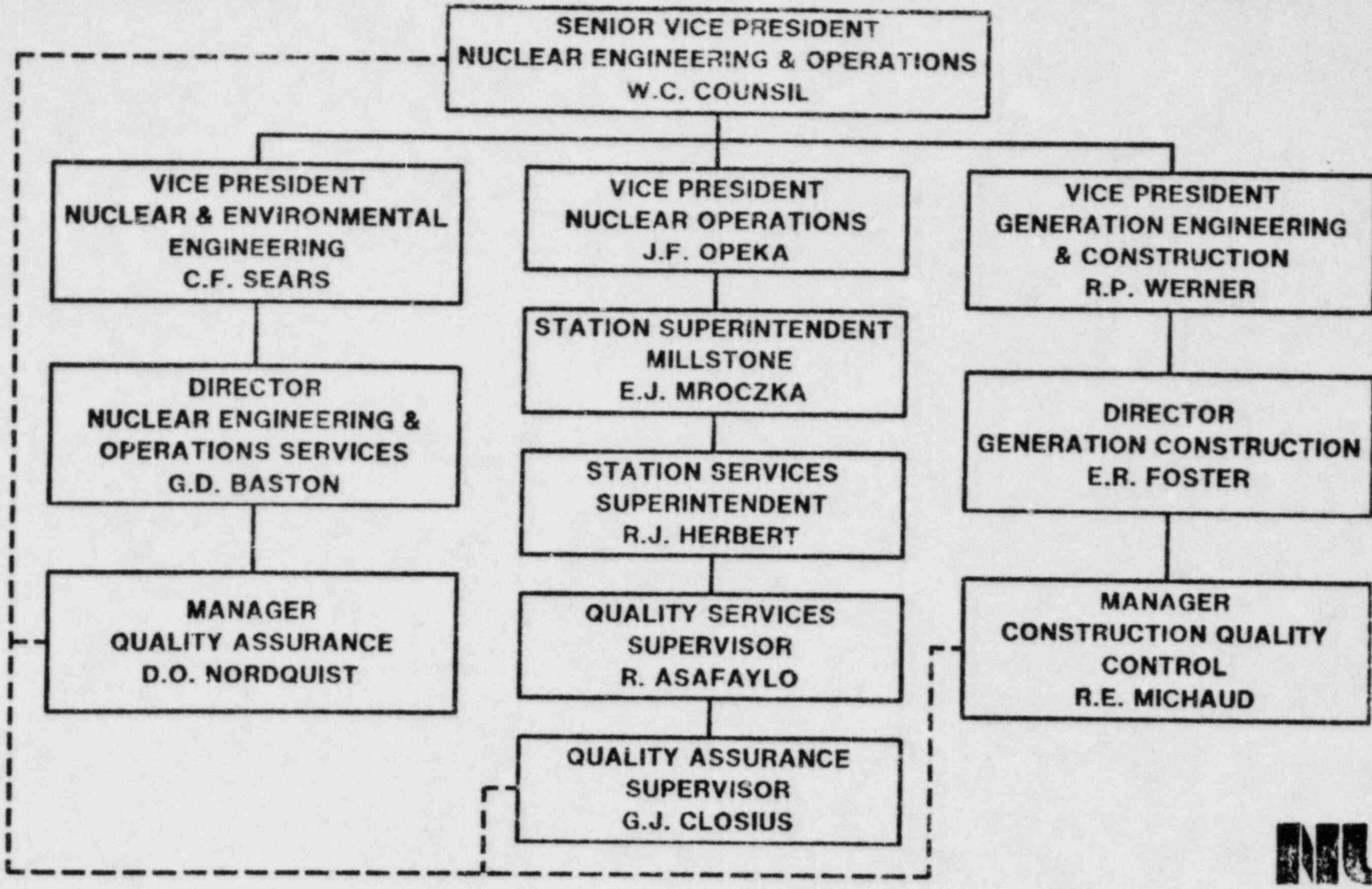
- QC ITEMS - CONSTRUCTION PHASE
- INDEPENDENT AUDIT
- I & E REPORT - JUNE 11, 1984

NU

QUALITY ASSURANCE
OPERATIONS PHASE - MILLSTONE 3

- ESTABLISHED AND MATURE PROGRAM - CY, MP1, AND MP2
- IMPLEMENTATION ON MP3 WILL FOLLOW
- CORPORATE QUALITY ASSURANCE
- MILLSTONE STATION QUALITY ASSURANCE/QUALITY CONTROL
- CONSTRUCTION QUALITY CONTROL - MODIFICATIONS

NU

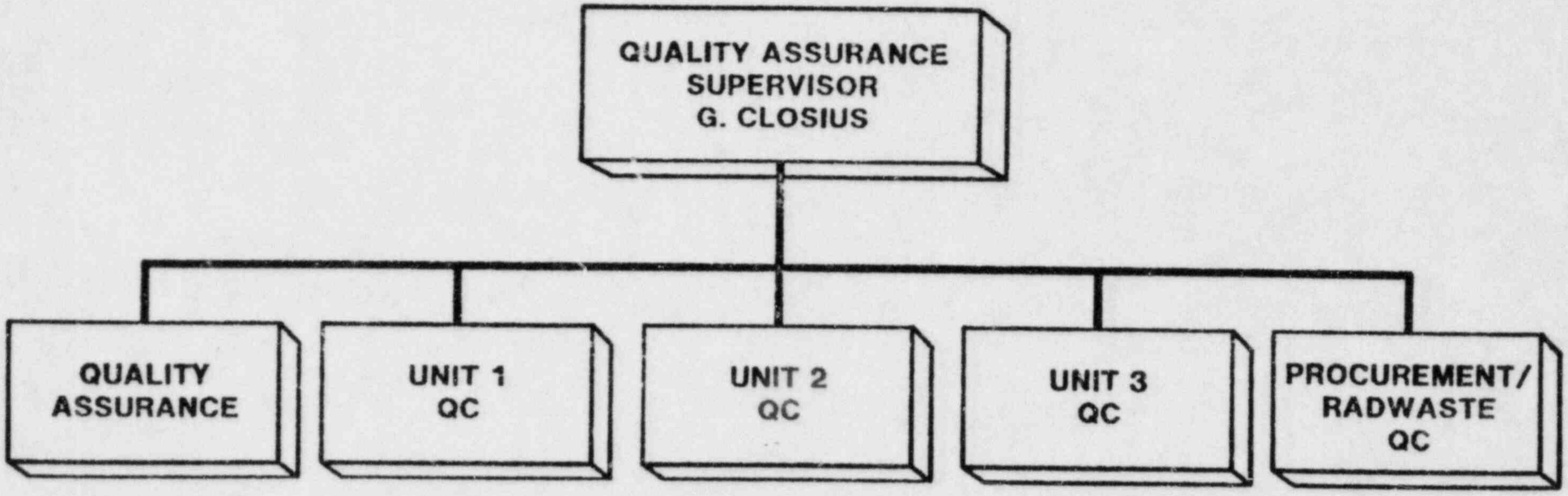

SENIOR VICE PRESIDENT NUCLEAR ENGINEERING & OPERATIONS W.C. COUNSIL
VICE PRESIDENT NUCLEAR & ENVIRONMENTAL ENGINEERING C.F. SEARS
VICE PRESIDENT NUCLEAR OPERATIONS J.F. OPEKA
VICE PRESIDENT GENERATION ENGINEERING & CONSTRUCTION R.P. WERNER
DIRECTOR NUCLEAR ENGINEERING & OPERATIONS SERVICES G.D. BASTON
STATION SUPERINTENDENT MILLSTONE E.J. MROCZKA
DIRECTOR GENERATION CONSTRUCTION E.R. FOSTER
STATION SERVICES SUPERINTENDENT R.J. HERBERT
MANAGER QUALITY ASSURANCE D.O. NORDQUIST
QUALITY SERVICES SUPERVISOR R. ASAFAYLO
MANAGER CONSTRUCTION QUALITY CONTROL R.E. MICHAUD
QUALITY ASSURANCE SUPERVISOR G.J. CLOSIUS

SIGNIFICANT STRENGTHS
QUALITY ORGANIZATION

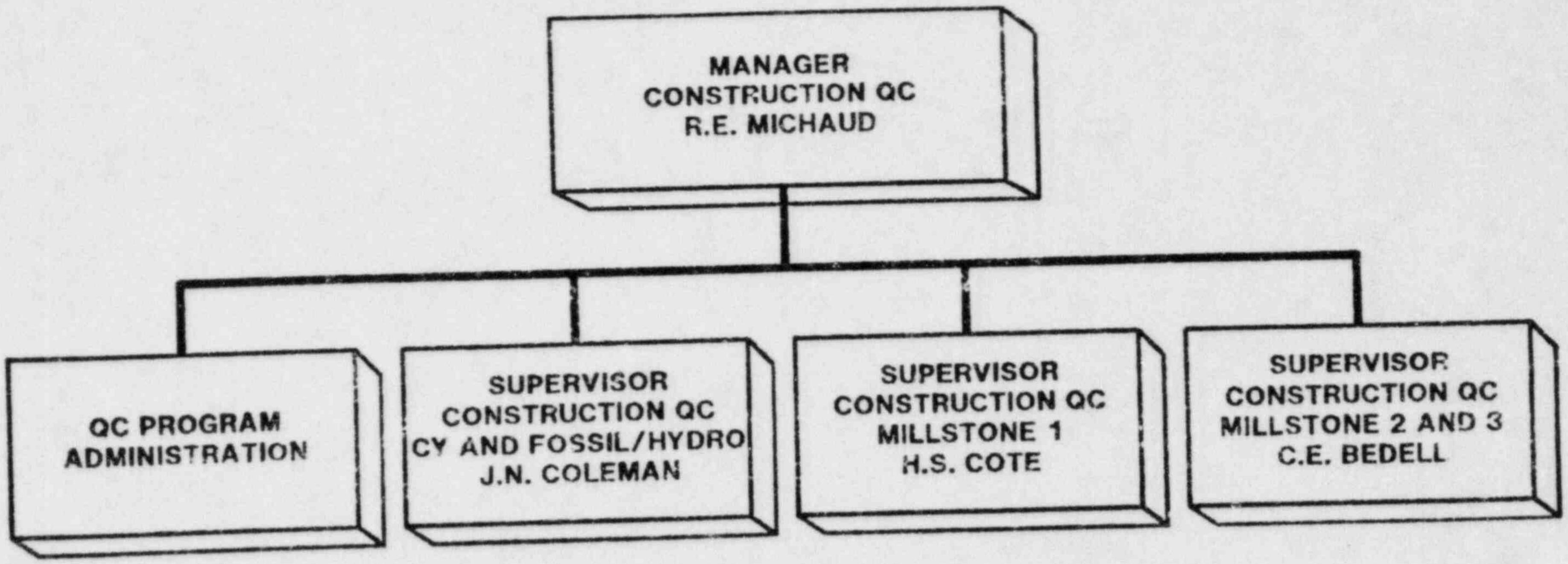
- LINE ORGANIZATION IS RESPONSIBLE
- QUALITY ORGANIZATION IN LINE ORGANIZATION
- QUALITY IS INDEPENDENT OF COST & SCHEDULE
- QUALITY HAS DIRECT ACCESS TO SENIOR VP
- TEAM WORK

NU

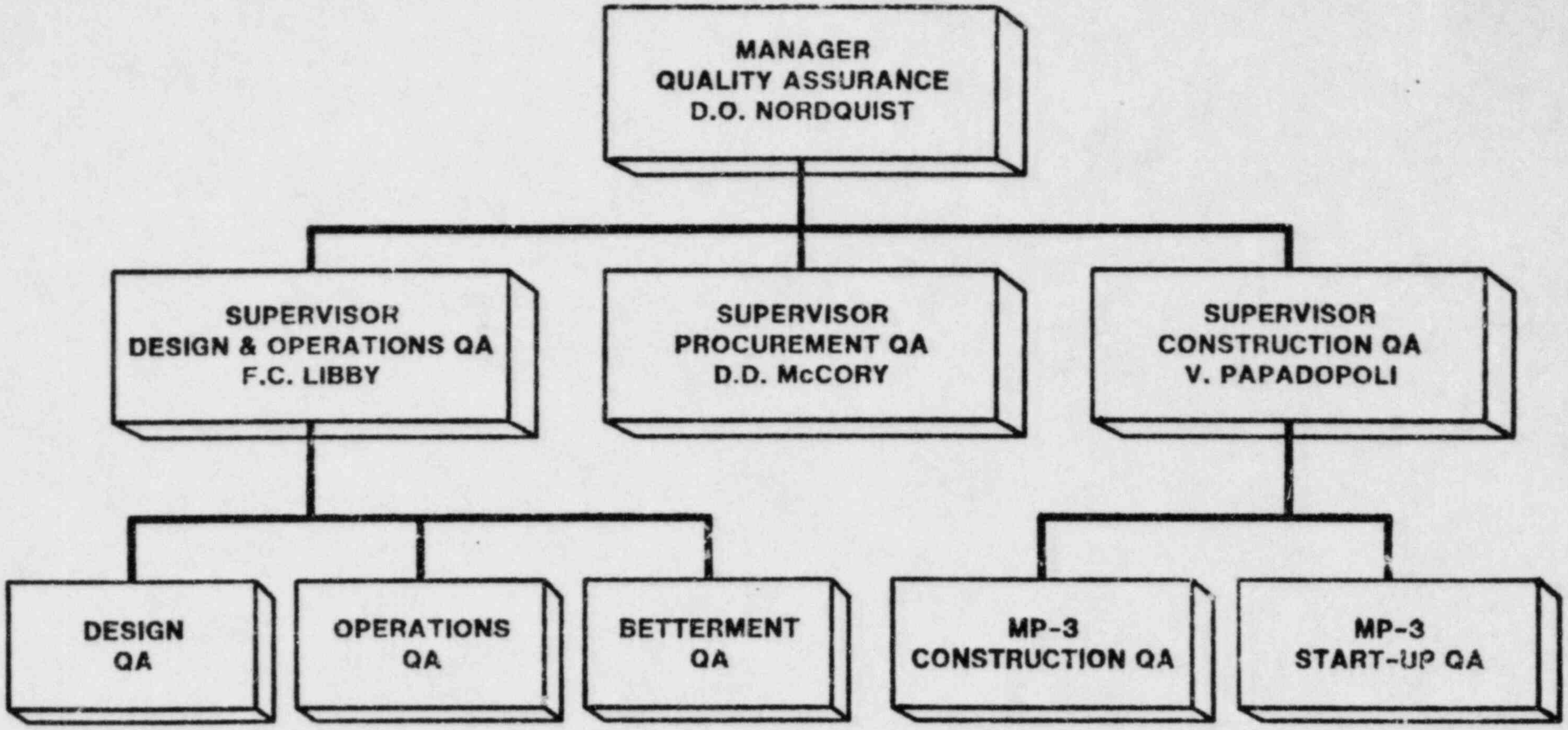
MILLSTONE STATION QA/QC



CONSTRUCTION QUALITY CONTROL



CORPORATE QUALITY ASSURANCE



NORTHEAST UTILITIES SERVICE COMPANY

J. M. FACKELMANN
SUPERVISOR
NUCLEAR MATERIALS
AND CHEMISTRY

STEAM GENERATORS

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MILLSTONE 3 STEAM GENERATORS TUBE INTEGRITY

- STEAM GENERATOR DESIGN
- SECONDARY SYSTEM AND COMPONENT DESIGN
- SECONDARY SYSTEM CHEMISTRY CONTROLS
- CONTINGENCY PLANS

STEAM GENERATOR DESIGN

MODEL F

- THERMALLY TREATED 1600
- TYPE 405 SS TSPL
- QUATREFOIL TSPL DESIGN
- FULL TS EXPANSION
- FEEDWATER RING/J TUBES
- FLOW DISTRIBUTION BAFFLE
- ACCESS PORTS/HANDHOLES

ORIGINALLY MODEL "D"

- RETURNED WESTINGHOUSE 1977
- EARLY NU RECOGNITION OF POTENTIAL BENEFITS

NU

KEY SECONDARY SYSTEM DESIGN FEATURE

- DEEP BED DEMINS (WESTINGHOUSE CHANGED TO AVT-1974)
- FERROUS FW HEATER TRAIN (Cu ALLOYS INTENDED) 1976-1977
- TI TUBED (Cu ALLOY ORIGINALLY) CONDENSER/GROOVED TS 1977-1978
- DEAERATED MAKEUP WATER (WAS AERATED) 1983-1984
- INCREASED BLOWDOWN CAPACITIES (FROM 1 PERCENT TO 4 PERCENT) 1983
- FEEDWATER DRAINS TO CONDENSERS DURING STARTUP

NU

CHEMISTRY CONTROLS

SPECS BASED ON WESTINGHOUSE/SGOG GUIDELINES

ON LINE MONITORS AND SAMPLES

ACTION RESPONSE

- AL1 - DEFINE/CORRECT PROBLEM
- AL2 - REDUCE POWER
- AL3 - SHUTDOWN (EIGHT HOURS)

NU

CONTINGENCY PLANS

Tube Leakage (P/S)

- Detect, Activity Monitors
- Locate, Hydro/ECT
- Plug or Sleeve Defective Tube(s)

Tube Flaw

- Detect, Preservice and Inservice NDE
- Define Problem
- Monitor Progression
- Plug or Sleeve Defective Tube(s)

NORTHEAST UTILITIES SERVICE COMPANY

MR. ERIC A. DeBARBA
SYSTEM MANAGER,
GENERATION MECHANICAL ENGINEERING

PRESSURIZED THERMAL SHOCK

MILLSTONE UNIT NO. 3
REACTOR VESSEL INTEGRITY

- **EXCELLENT INITIAL TOUGHNESS-**
  - LIMITING BASE METAL $RT_{NDT_{I\,MAX}}$ = 60 F°
  - LIMITING WELD METAL $RT_{NDT_{I\,MAX}}$ – 50 F°
- **LOW EMBRITTLEMENT SUSCEPTIBILITY -**

	)	- Cu	=	0.05%
BASE METAL	)	- Ni	=	0.61%
	)	- P	=	0.001%
	)	- Cu	=	0.07%
WELD METAL	)	- Ni	=	0.03%
	)	- P	=	0.011%

- **MAXIMUM PREDICTED END-OF-LIFE SHIFT**
  - LIMITING BASE METAL = 78°F
  - LIMITING WELD METAL = 78° F

- **NO PRESSURIZED THERMAL SHOCK CONCERNS**
  END-OF-LIFE RT_{NDT} = 138° F < 270° F
  (NRC RECOMMENDED SCREENING LIMIT)

NORTHEAST UTILITIES SERVICE COMPANY

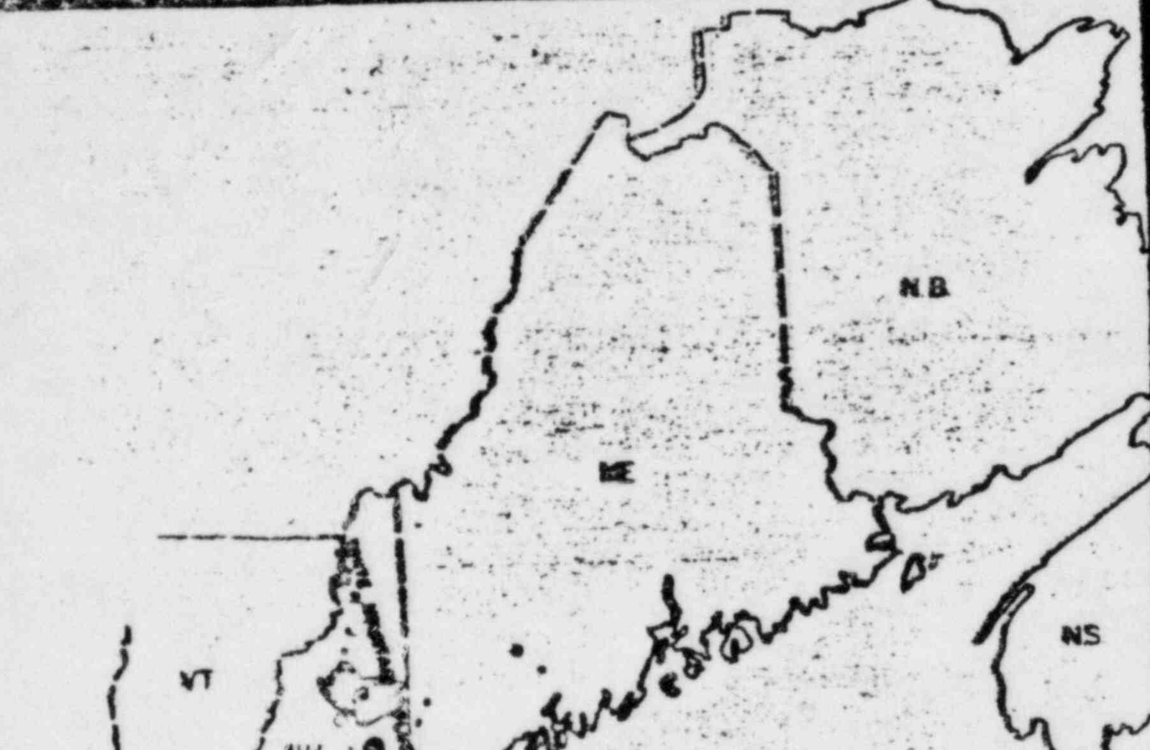
MR. ROBERT N. SMART
MANAGER, GENERATION CIVIL ENGINEERING

SEISMIC DESIGN BASES
MILLSTONE 3

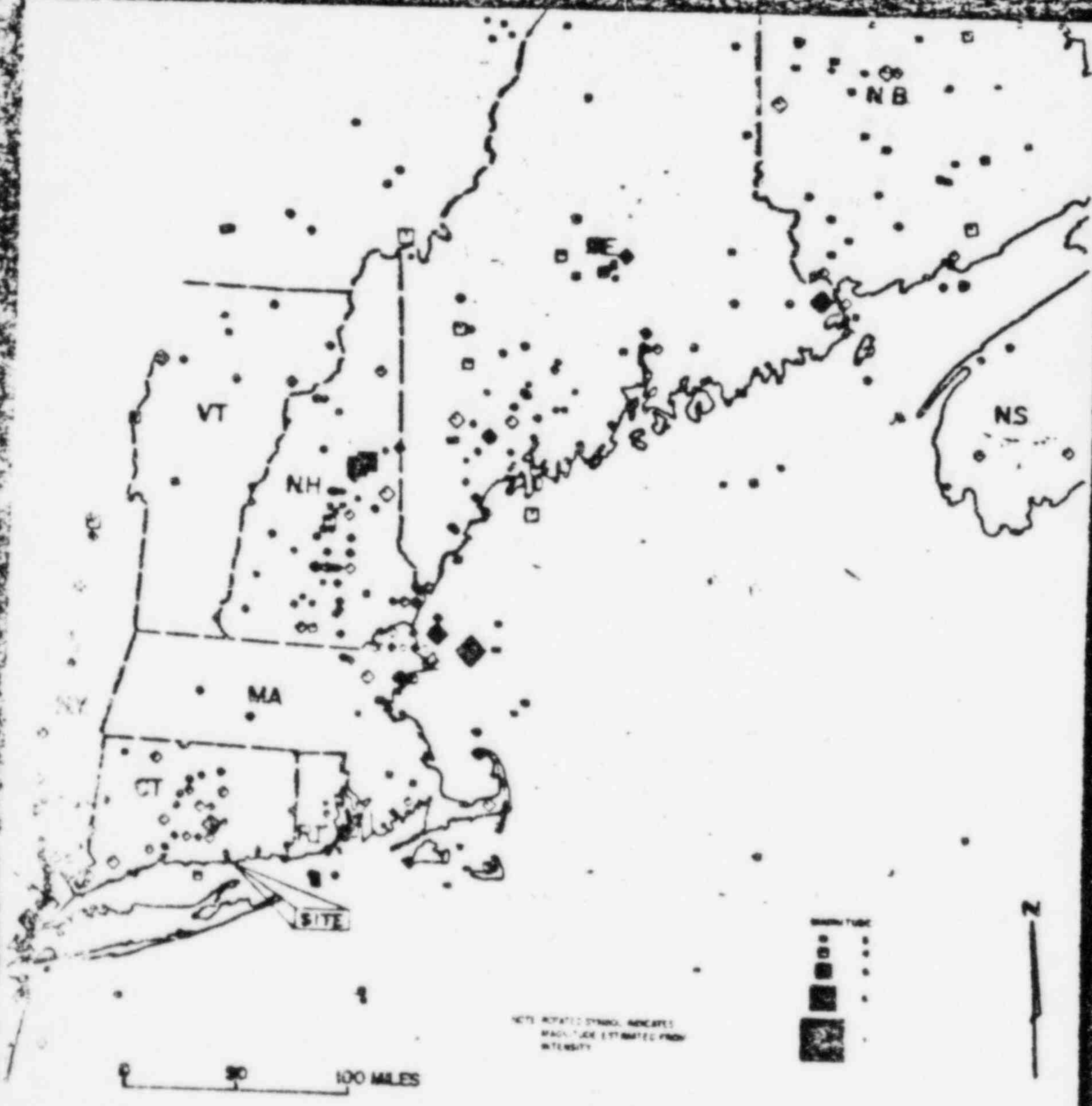
NU

SEISMIC DESIGN BASES

- THE IMPORTANT POINTS REGARDING THE SEISMIC DESIGN BASES
  - DESIGN BASES
  - NEW BRUNSWICK SEQUENCE
  - SEISMIC HAZARD/MARGIN STUDIES



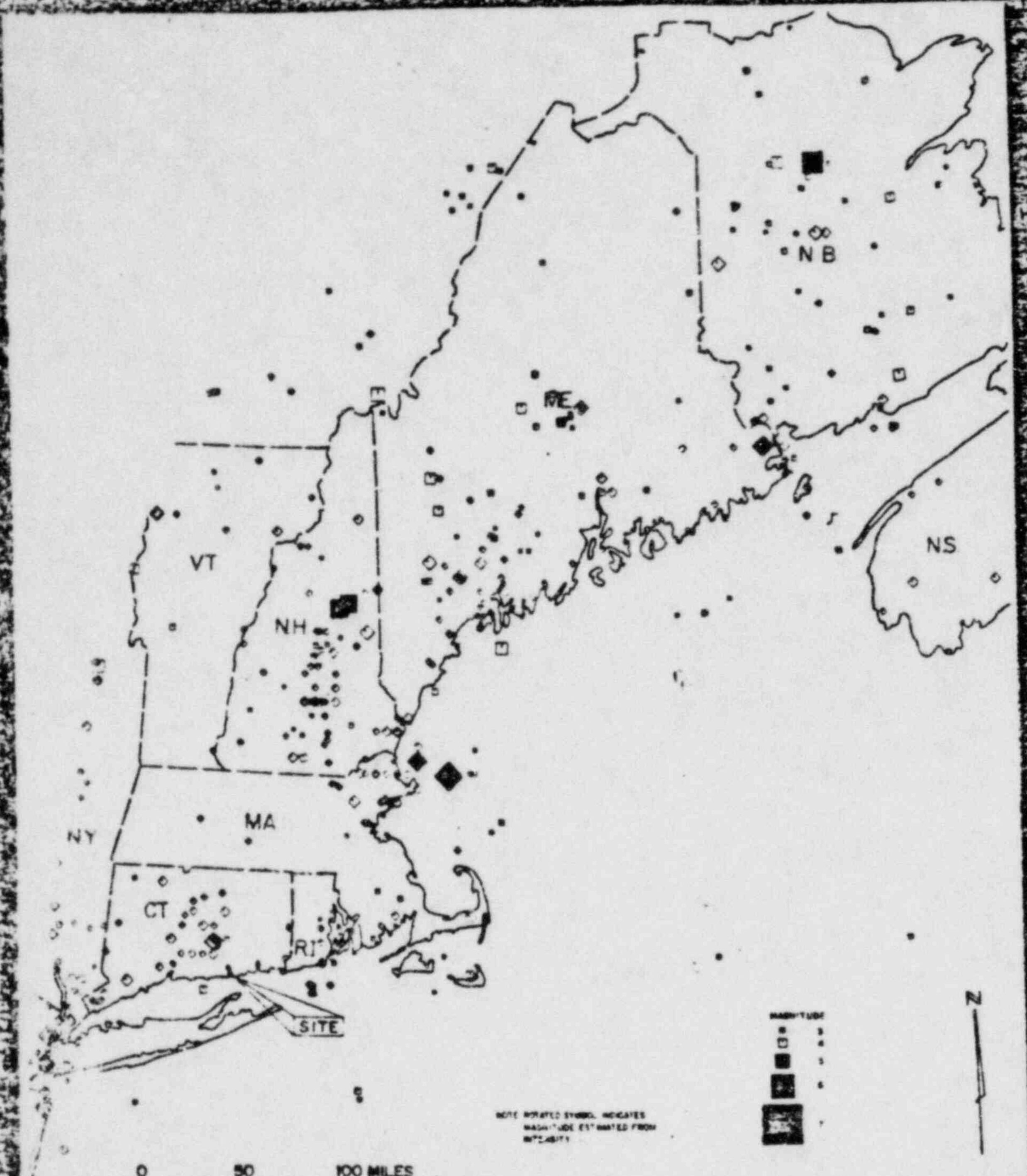
SOUTHEASTERN NEW ENGLAND PLATFORM
AND WHITE MOUNTAIN PLUTONIC SERIES



EPICENTER MAP

DESIGN BASIS

- MM VII AT 10 KM
- MURPHY AND O'BRIEN 0.10 G AT SITE
- DESIGN SSE 0.17 G HORIZONTAL
  MODIFIED NEWMARK SPECTRA
- 5 PERCENT STRUCTURAL DAMPING



EPICENTER MAP

NEW BRUNSWICK SEQUENCE

- EXTENSIVE STUDY FOLLOWING 1982 SEQUENCE
- NEW BRUNSWICK
  - MIRAMICHI SEISMICALLY ACTIVE
  - SEISMICITY REASONABLY CORRELATED TO TECTONIC STRUCTURE
    - SIGNIFICANTLY MORE ACTIVE THAN SURROUNDING AREA
    - DISTINCT GEOLOGY
    - DISTINCT GEOPHYSICS
- MILLSTONE
  - SEISMICALLY QUIET
  - GEOLOGY AND GEOPHYSICS SIMILAR TO SURROUNDING AREA
- CONCLUSION:

  BASED ON GEOLOGICAL, GEOPHYSICAL, AND SEISMOLOGICAL STUDIES, THE MILLSTONE AREA IS <u>MARKEDLY DIFFERENT</u> THAN NEW BRUNSWICK

NU

SEISMIC HAZARD STUDY

- PROBABILISTIC SEISMIC HAZARD STUDY
  - MULTIPLE HYPOTHESES ON ZONATION, RECURRENCE FREQUENCY AND ATTENUATION
  - SSE FREQUENCY OF EXCEEDANCE OF 10^{-4} PER YEAR
  - HAZARD DOMINATED BY MAGNITUDE 5.2 TO 5.9 EARTHQUAKES

- EPRI EASTERN U.S. SEISMICITY STUDY
  - MILLSTONE IS A TEST SITE

NU

A PROGRAM TO DETERMINE THE CAPABILITY OF THE MILLSTONE 3 NUCLEAR POWER PLANT TO WITHSTAND SEISMIC EXCITATION ABOVE THE DESIGN SSE

Submitted by

NORTHEAST UTILITIES SERVICE COMPANY

Prepared by

NORTHEAST UTILITIES SERVICE COMPANY
NTS/STRUCTURAL MECHANICS ASSOCIATES

MILLSTONE UNIT 3

SEISMIC MARGIN STUDY BASED ON

SEISMIC PRA RESULTS

APPROACH

IDENTIFY DOMINANT CONTRIBUTORS TO SEVERE CORE DAMAGE

DEMONSTRATE THAT THE HIGH CONFIDENCE LOW FREQUENCY OF FAILURE ACCELERATIONS ARE CONSIDERABLY LARGER THAN SSE FOR CRITICAL STRUCTURES AND EQUIPMENT

DEMONSTRATE THAT DOMINANT PLANT DAMAGE STATES ALSO HAVE HIGH CONFIDENCE LOW FREQUENCY ACCELERATIONS MUCH LARGER THAN SSE

DEMONSTRATE THAT THE FREQUENCIES OF OCCURRENCE OF SIGNIFICANT PLANT DAMAGE STATES FROM SEISMIC EVENTS ARE VERY LOW

DEMONSTRATE THAT THE CONTRIBUTIONS TO FREQUENCIES OF OCCURRENCE OF SIGNIFICANT PLANT DAMAGE STATES BY EARTHQUAKES IN THE RANGE OF 0.20 G - 0.30 G ARE VERY SMALL.

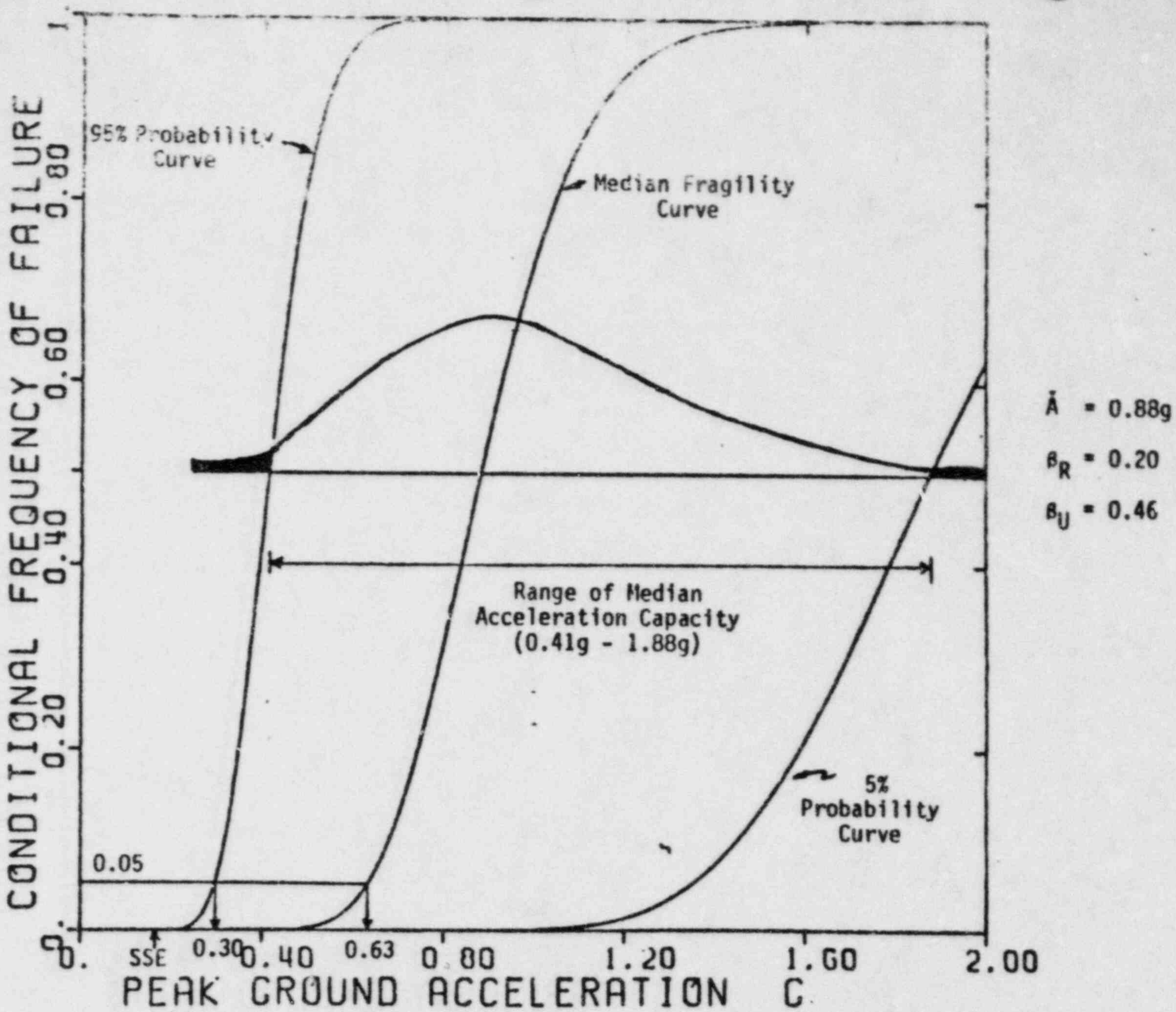
DOMINANT PLANT DAMAGE STATES

V3 - LOCA w/containment bypass

AE - Large LOCA with early core melt (i.e., failure of safety injection)

SE - Small LOCA or Seismic ATWS with early core melt

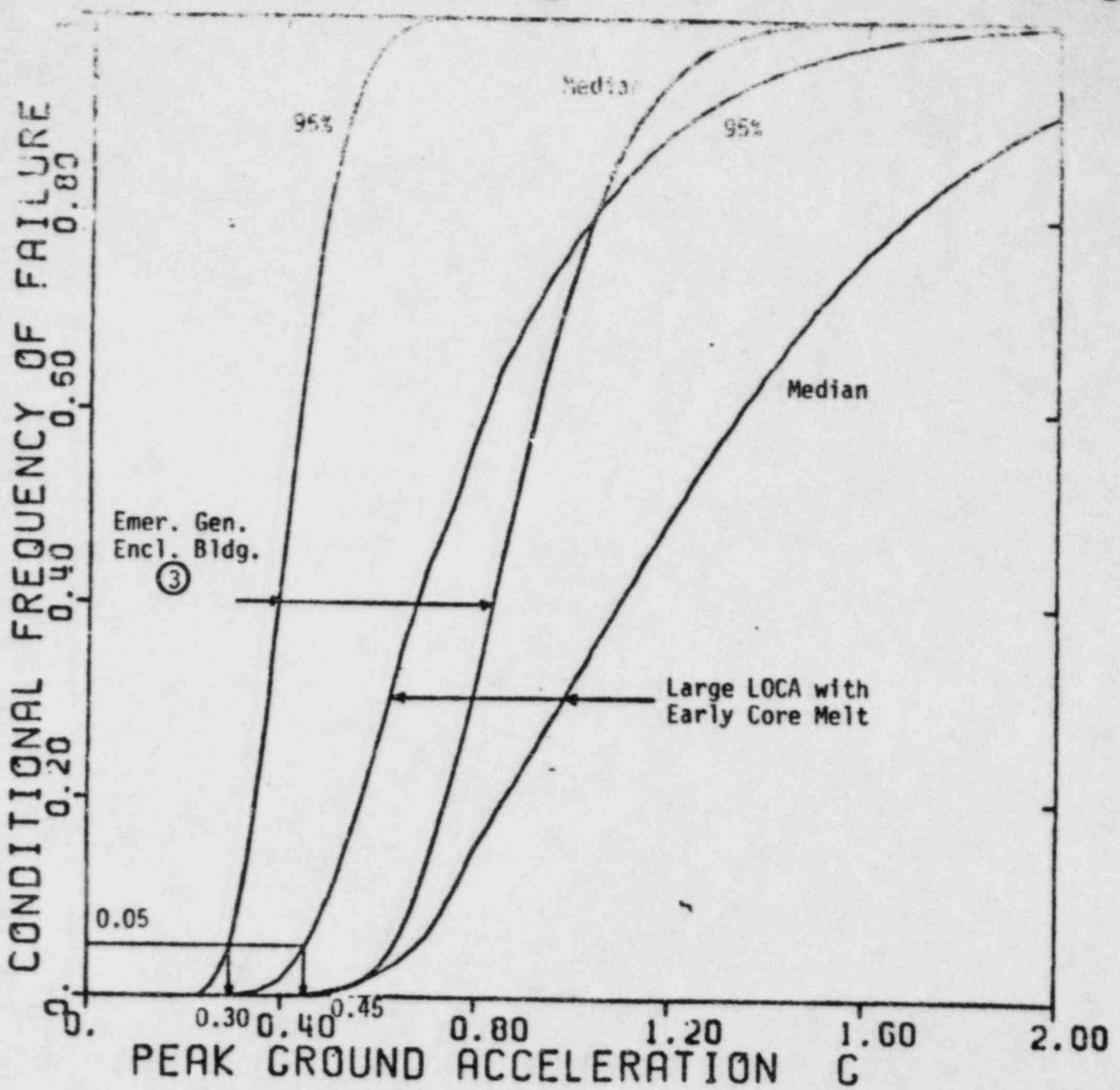
TE - Transient (loss of off-site power) with early core melt



FRAGILITY CURVES FOR EMERGENCY GENERATOR ENCLOSURE BUILDING

FRAGILITIES OF DOMINANT COMPONENTS

No.	Component and Failure Mode		Plant Damage States	Â (g's)	95% Confidence Bounds on Median (g's)	High Confidence Low Frequency Failure Level (g's)
(3)	EGECLPSE	Emergency Generator Enclosure Building	AE TE SE	0.88	0.41 - 1.88	0.30
(4)	RWST	Refueling Water Storage Tank (Buckling)	AE SE TE	0.88	0.49 - 1.59	0.30
(5)	EDGOILCL	Emergency Diesel Generator (Oil Cooler Anchor Bolt Failure)	AE TE SE	0.91	0.45 - 1.84	0.30
(6)	COREGEOM	Reactor Vessel Core Geometry Distortion	SE	0.99	0.58 - 1.70	0.35
(7)	DFCNTBLD	Control Building (Diaphragm Failure)	[illegible] TE SE	1.00	0.58 - 1.72	0.39
(9)	CRDS	Control Rod Drive System (Failure to SCRAM)	SE	1.00	0.54 - 1.86	0.33
(12)	SWPHSLD	Service Water Pumphouse (Sliding)	AE TE SE	1.30	0.60 - 2.92	0.40
(15)	RCSPIPE	RCS Piping (Large LOCA)	AE	1.59	0.69 - 3.67	0.31
(16)	RCSSMPIP	RCS Piping (Small LOCA)	SE	1.59	0.69 - 3.67	0.31
(20)	ESFBLDG	Engineered Safeguards Features Bldg. (Basemat/Shear Wall Failure)	AE,TE,SE	1.70	0.84 - 3.46	0.57
(27)	CONTWALL	Containment Crane Wall	V3	2.20	1.18 - 4.10	0.62
(30)	SWPUMPS	Service Water System Pumps	AE,TE,SE	2.40	1.01 - 5.72	0.61
(34)	CABTRAY	Cable Trays	AE,TE,SE	2.70	1.36 - 5.38	0.62



FRAGILITY CURVES FOR COMPONENT AND PLANT DAMAGE STATE

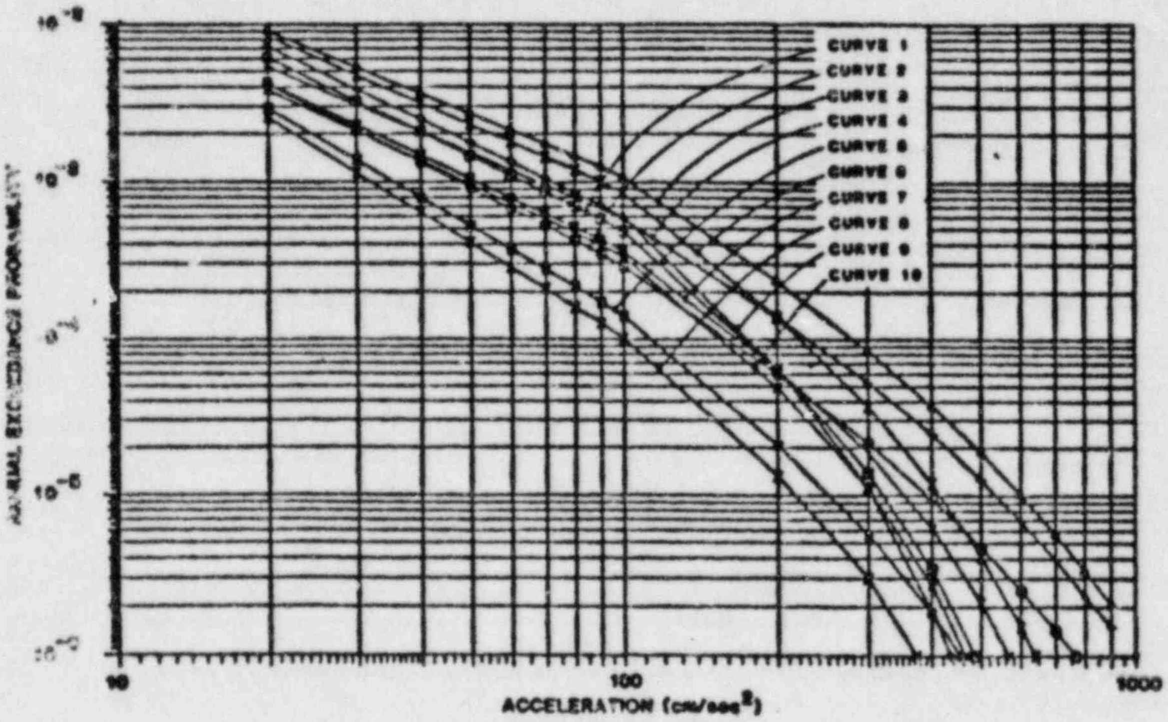
FRAGILITIES OF DIFFERENT PLANT DAMAGE STATES

BASE CASE

	Plant Damage State	$\dot{A}$ (g's)	90% Confidence Bounds on Median (g's)	High Confidence Low Frequency of Failure Level (g's)
V3	LOCA w/containment bypass	2.05	1.16 - 3.45	0.60
AE	Large LOCA with Early Core Melt	1.22	0.75 - 1.91	0.45
SE	Small LOCA or ATWS with Early Core Melt	0.77	0.58 - 1.04	0.40
TE	Transient (loss of offsite power) with Early Core Melt	0.61	0.39 - 0.84	0.26

SEISMIC HAZARD CURVES FOR MILLSTONE

(DAMES & MOORE)

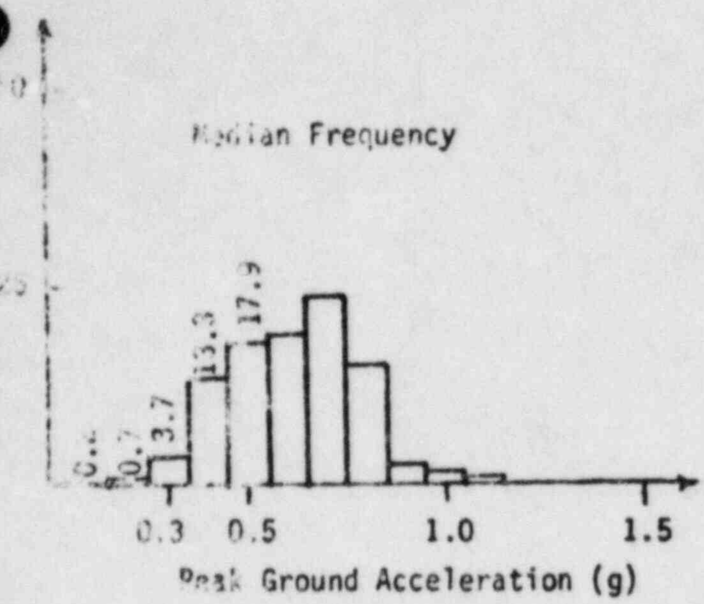


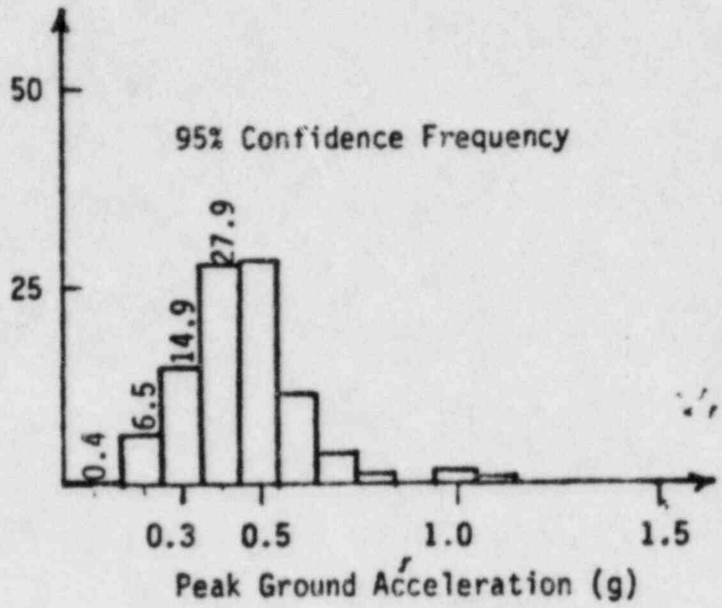
SEISMICALLY-INDUCED ANNUAL FREQUENCIES
OF PLANT DAMAGE STATES
BASE CASE

Plant Damage State	Annual Frequency		
	Median	Mean	5% - 95% Confidence Bounds
V3	2×10^{-9}	1×10^{-7}	$0 - 7 \times 10^{-7}$
AE	8×10^{-8}	7×10^{-7}	$1 \times 10^{-10} - 3 \times 10^{-6}$
SE	4×10^{-7}	2×10^{-6}	$2 \times 10^{-9} - 8 \times 10^{-6}$
TE	2×10^{-6}	6×10^{-6}	$2 \times 10^{-8} - 2 \times 10^{-5}$

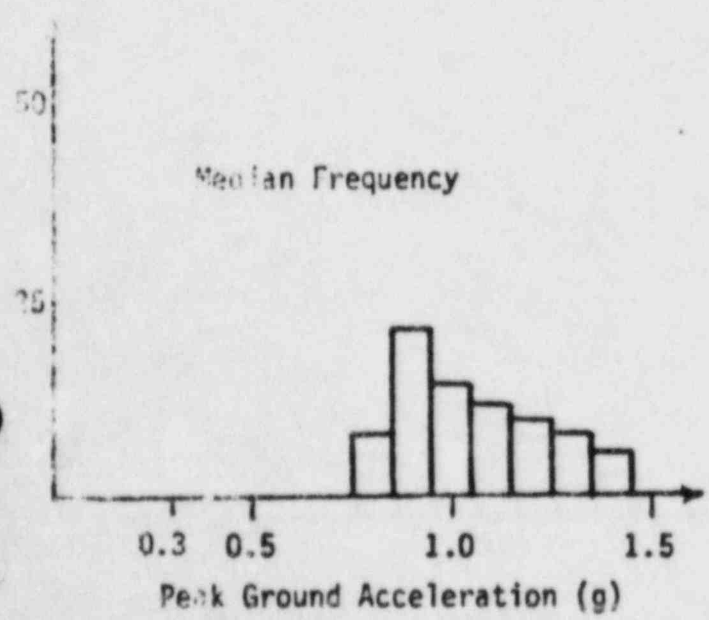
PERCENT CONTRIBUTION OF DIFFERENT ACCELERATION RANGES

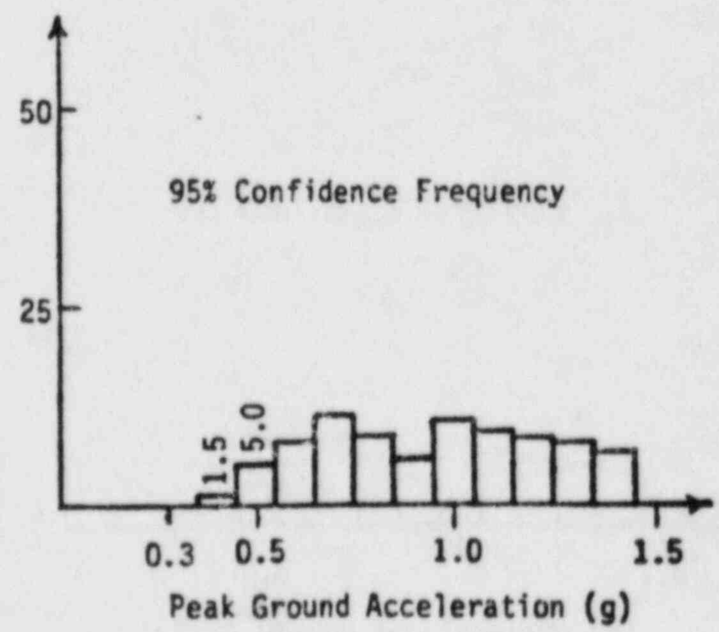
PLANT DAMAGE STATE TE





PLANT DAMAGE STATE V3





OVERALL CONCLUSION

RESULTS OF NEW BRUNSWICK STUDIES, SEISMIC HAZARD, AND MARGIN STUDIES SHOW DESIGN BASIS SSE IS ADEQUATE.

NU

NORTHEAST UTILITIES SERVICE COMPANY

MR. GEORGE R. PITMAN
MANAGER GENERATION
ELECTRICAL ENGINEERING

ATWS MITIGATION

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ATWS MITIGATION

- FINAL RULE
  - PUBLISHED ON JUNE 26, 1984
- HARDWARE REQUIREMENTS
  - BASED ON VALUE/IMPACT STUDIES
  - WESTINGHOUSE PLANTS - AMSAC REQ'D
    - BACKUP PROTECTION FOR CERTAIN EVENTS
    - DIVERSE TRIP OF TURBINE
    - DIVERSE AUTO INITIATION OF AUXILIARY FEEDWATER
  - NON-SAFETY RELATED EQUIPMENT CAN BE UTILIZED
    - NRC QA PROGRAM GUIDANCE FORTHCOMING
    - DESIGN CONSIDERATIONS SPECIFIED IN PREAMBLE TO RULE
    - RELIABILITY ASSURANCE PROGRAM ENCOURAGED IN PREAMBLE
- SCHEDULE FOR IMPLEMENTATION
  - REQ'S LICENSEES TO SUBMIT PROPOSED SCHEDULE
  - IMPLEMENTATION TIED TO >5% POWER LICENSE UNLESS OTHERWISE JUSTIFIED
- MILLSTONE 3 INTENTION REGARDING COMPLIANCE
  - PROPOSED SCHEDULE WILL BE SUBMITTED
  - AMSAC WILL BE INCORPORATED INTO DESIGN