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Statement Before the Advisory Committee on  
Reactor Safeguards, Washington, D.C. on the Midland  
Nuclear Plants

My purpose in being here today is to bring some insights to you on the role of the Advisory Committee on Reactor Safeguards (ACRS) as the public perceives it, and <sup>to</sup> compare it to what has actually been accomplished for public safety by this Committee as seen by those few of us who have a long and extensive experience with the nuclear power licensing process.

The public has lost confidence in the nuclear power plant licensing process. Since this ACRS review is a part of that process, the reasons for this loss of confidence should be of importance to you.

Chairman Palladino has appointed a Task Force to study the nuclear licensing process. In my view, this forum for review of the Midland nuclear plants can provide much substance for studying the reasons for loss of public confidence and what is deficient in your review methods.

This loss of confidence in nuclear plant licensing has come about in spite of long and detailed licensing staff reviews and a supposedly objective overview by this prestigious ACRS. <sup>at many plants</sup> It has occurred primarily because very serious problems have come to light/following operating license approval after these extensive reviews. These problems have been the source of much pain, anxiety and high cost to the public. The ACRS must accept some responsibility.

Now, I was personally very impressed with the tough questions that the ACRS subcommittee asked the NRC staff and the applicant in Midland last week. I was also impressed with the range and quality of expertise that this Committee has.

Therefore, it is important to look at other factors to identify reasons why the ACRS reviews are losing their value as far as the public is concerned.

I believe I should establish my credentials for what I am to say here today.

As a science writer and editor, I was aware of the role of the ACRS from its beginnings. I have followed the patterns of its work much more closely

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since I first became involved in the Midland nuclear plant licensing. The misleading propaganda with which the Midland nuclear plants, as well as all nuclear plants, were being promoted in the late '60's, as well as the incredible record of poor quality control that was being disclosed during the Palisades operating license hearings at that time where Consumers Power Co. was also the applicant, brought me into the Midland nuclear plant licensing procedure. I have been involved in nuclear plant licensing since that time--over 10 years.

In 1970, I also asked for a special graduate program at the University of Michigan which would allow me to study in any department of the University, if the department head approved, that would increase my knowledge and access to libraries and other resources in order to follow <sup>the Midland n-plant licensing with more expertise and to follow</sup> nuclear power development in general. The Midland project was touted as the world's largest nuclear-industrial project, tying together as it does a huge chemical complex, The Dow Chemical Co. and two large nuclear plants. It was being built by Consumers Power Co. and Bechtel, the same utility and architect engineer who had done so poorly at the Palisades nuclear plant. I considered it a worthy commitment of my time, energy and study to follow its construction since these plants are two miles from my home. My Masters' thesis at the University of Michigan was on the environmental and social impact of nuclear power. It is from this background that I am making the following observations.

I have a little good news. The ACRS is good at identifying many current safety problems and potential hazards in nuclear power. I have found the Committee's data very useful on many occasions and have applied what I was able to during the Midland nuclear plant licensing. But, the Committee itself has not followed up on their own recommendations. I mentioned a number of useful suggestions that the ACRS Committee had made in 1969 that applied to the Midland nuclear plants and other installations in my statement before the Midland subcommittee on May 20. I also proved that 10 years or more later, little or nothing had been done about many of them at nuclear installations.

Where citizen intervenors have taken up your ideas, however, there have been positive results. For example, in 1969, the ACRS recommended that some method should be devised to control the hydrogen that would form over the reactor core under certain accident conditions. By March, 1979, this had not been followed up at many plants including Three Mile Island-2, and there it had frightening consequences. With strong citizen intervenor participation in the Midland licensing procedures, <sup>however,</sup> it was followed up and there were hydrogen recombiners in these plants already installed in March, 1979. This demonstrates that third party input has an important safety value.

Those of us who have a comprehensive knowledge of what has been happening at the construction site at Midland have followed details of what is revealed in the hearing transcripts and documents. We have listened to the summaries, especially as they have to do with QA and QC matters, that the NRC staff and the applicant have provided for the review of the subcommittee on Midland. We assure you that these summaries grossly misrepresent and whitewash the extent of the problems of these nuclear plants.

Barbara Stamiris, a citizen intervenor, who has done extensive work on the soil settlement issue, stated in her oral statement at the Midland review that she was "shocked" at the glossing over of serious problems and the omissions in these summaries. As she promised, she has written a detailed and documented review for the ACRS of the extent of QA and QC problems which were not mentioned. Her statement indicates the extent to which both the NRC staff and the applicant have covered-up the seriousness of these issues.

NRC inspectors themselves have made some significant comments which were not relayed to you.

Last August, Joseph Kane who is chief geotechnical engineer for the NRC staff stated that if safety were the major consideration that removal and replacement of the diesel generator building would have been the better option even with the amount of stress that building showed before preloading began. But since costs and construction schedules are so important at Midland, that option couldn't be exercised, <sup>Joseph Kane said.</sup> (p 4209-4210) In other words, the NRC geotechnical specialist had assessed the serious problems with that building years ago



and came to the same conclusion that our expert witness, Dr. Charles Anderson, made in his final statement to the ACRS subcommittee on May 21 of this year. But the ACRS subcommittee was not advised of this.

Another Region III inspector, Eugene Gallagher, said under oath, "You're talking about a plant 70% complete that is crippled." (p. 2466) He also said the problems at Midland were unprecedented at any other site. (p. 2463) In another instance, Gallagher said he had a hard time giving quality control assurance as far as Consumers Power Co. was concerned because the utility and Bechtel had obviously had a hard time moving soil from one place to another and doing it right, and in operating the plant they would be handling highly sophisticated equipment some of which had never been in use before. (p. 2441)

Many other significant items have not been discussed. For example, underground safety piping is overstressed in at least 12 locations due to uneven settlement. This piping--the cooling lifelines of the plant--will require a permanent stress monitoring system. Unusual corrosion of stainless steel piping was identified in 1979, but the combined effect of this corrosion with settlement stress has not been addressed. (Feb. 18, '82 Testimony)

This plant will operate in an area with more chemical pollutants than is usual because of the proximity of The Dow Chemical Co. It is known that the combination of radiation and chemicals result in multiple factor interaction that can be significant due to synergistic effects. The corrosion potential of this interaction has not been addressed. Corrosion is a serious problem for nuclear plants even in better environments.

Quality control problems have beset the Midland nuclear plants construction for years. The ASLB Appeals Board found the QA so bad in the earliest construction of the plant, that they elicited a promise of reform <sup>from Cons. Power Co.</sup> on this issue <sup>as a condition of affirming the license.</sup> in 1973<sub>A</sub>. In spite of this, the same QA-QC problems occurred. When our attorney brought this matter to the Appeal Board's attention, the Board finally angrily wrote, "What we have here is a pattern of repeated, flagrant and significant QA violations of a non-routine character--coupled with an unredeemed promise of reformation." (Letter to L. Manning Muntzing, Nov. 26, 1973)



This is about as adverse a characterization of management attitude as could be made. ~~But~~ Add to this the fact that both Bechtel and Consumers Power Co. knew that the soil was poorly compacted sitewide in 1977 but went ahead and built safety-related and other buildings on it anyway, and you have an attitude that approaches criminal negligence.

The letter to Muntzing led to the first show cause hearing on quality control in the country. But, this did not improve matters as Ms. Stamiris has pointed out in her statement to this Committee.

Michigan's other reactors have had serious problems that should have been identified before ACRS approval was given.

At the Palisades nuclear plant, the rad waste holding tank never was able to operate. Did the applicant's or NRC staff review disclose this to the ACRS in their summary review of that plant? The company continued to operate the plant and not only didn't notify the NRC, but deliberately concealed the fact. Did the staff or the company disclose the extent of the QA problems at Palisades? These have resulted in one of the poorest operating records in the nation and have been a costly burden to ratepayers and stockholders alike.

The ACRS is responsible for oversight in proposed changes at operating facilities (p. 387, Nuclear Safety, Vol. 20, No. 4, July, 1979) However, the attempt to experiment with a full loading of plutonium fuel at the Big Rock nuclear plant was approved by the Atomic Energy Commission simply with an amendment to the original license with no public notice and no ACRS review. No environmental impact statement had ever been made for Big Rock. As one of the early plants, it did not have, and still does not have, the basic safety systems that are required at other plants. Yet, Consumers boasted in 1972 that they were going to begin the plutonium economy for the nation at Big Rock. (Nucleonics Week, Dec. 2, 1972)

Only an extraordinary and dedicated effort by a citizens' group, the West Michigan Environmental Action Council, halted full plutonium loading at Big Rock. Partial loading of plutonium, however, has gone on at Big Rock for years. Citizens who are fighting fuel compaction at Big Rock were allowed by their Board to review the issue of <sup>the possibility of</sup> criticality ~~of~~ compacting spent fuel storage for this reason. Without expert witnesses or funds, their ability to

explore this issue is very limited. Some of the expertise of this ACRS Committee should be there to help them. Their hearings come up this month. Here is a major risk being forced on people since we have so much excess electrical capacity in Michigan (over 35% by Consumers Power Co. testimony) that we have no need for the Big Rock facility to operate at all. But, the ACRS remains distant from the real problems citizens face even though citizens are paying them to provide safety.

On the national scene, ACRS, of course, approved TMI-2 with all of its many problems which brought it to within <sup>an</sup> hour of a total meltdown in March, 1979. ACRS also approved Brown's Ferry where a fire disclosed the weakness of design for electrical equipment that controls safety systems. The same problem exists at the Donald C. Cook plants in Michigan. The Union of Concerned Scientists has recommended that those plants be shut down for this and other deficiencies. But, no reviews and recommendations are made on these types of issues. The public must wait for accidents to happen to get any action.

The ACRS has approved through their routine review process Diablo Canyon, Zimmer, Davis Besse, Rancho Seco, Ginna, Crystal River and TMI-1 and 2 and many other nuclear plants which have subsequently had serious problems or have had serious flaws found in construction or design.

These problems are disturbing and painful for the public immediately affected. They are costly for everyone. Is it any wonder that public confidence in nuclear power plant licensing is so low?

I am convinced that ACRS itself is competent. But, all of these facts and examples point to the fact that the method of review which ACRS has accepted in the past is faulty. In fact, from a legal, technical and scientific point of view, <sup>I contend that</sup> the data base on which ACRS has been depending <sup>writing</sup> for its final letters on nuclear plants to the chairman of the NRC is and always has been untenable and unsound.

This same kind of review had been planned as the routine for Midland. But we decided at Midland to change the routine and create a third party objective view through citizen disclosure of important facts from the record that have not been revealed. I believe that Barbara Stamiris and I have demonstrated that without some objective probing of the summaries provided by

the NRC staff and the applicant, the ACRS has a very limited and inaccurate data base for its review. (Both the Kemeny Commission and Rogovin Reports following the TMI accident have recommended third party review through *funding* citizen intervention). We have also provided an objective review of a critical unresolved problem, -the soil settlement issue and resulting question of the structural integrity of at least two safety-related buildings, -with Dr. Charles Anderson as our consultant.

It has been obvious from all that transpired in Midland <sup>on May 19-21</sup> ~~last week~~ that Consumers Power Co. is bitterly opposed to any objective review of that plant's construction.

But, at least this time you have some additional facts to consider beyond those of the staff and the applicant.

However, the fact remains that the ACRS meets and, on such a speedy basis, hearing only the nuclear promoters with no independent review, makes judgments of great importance to the public that affects their health, safety and economy. This process raises questions about the credibility of ACRS judgment. These reviews are also a costly item for citizens as part of nuclear regulation.

The fact that every letter without exception at the operating license stage always and inevitably states after 6 or 8 paragraphs of recommendations, that the facility can be operated without undue risk to public safety also raises questions about the credibility of your deliberations.

In the past, of course, for the general public, this type of letter from such an august body has provided an <sup>illusion of an</sup> assurance of safety. But the many serious problems now make people realize that this illusion of safety is worse than no review at all.

Some nuclear facilities we now know are so bad they should never have been allowed to operate. TMI-2 is one, Palisades, with its poor quality control and negligence in management is another. Diablo Canyon and Zimmer should not be allowed to operate. With its history of QA violations and incredibly poor management decisions and attitudes, Midland should not be allowed to operate either.



My conclusion is this, that to the extent that the ACRS review letter for the operating license is primarily based on the limited and carefully controlled information from the NRC staff and applicant with no objective third party review, the ACRS becomes just another part of the promotional package for the nuclear industry. It raises the question, in these difficult times, <sup>with the excess reserve electrical capacity that we have in Michigan and in this country</sup> whether the public can afford promotion of a technology that cannot make it in the free market system.

*In the decision-making process with nuclear technology, human survival is the issue. There is no margin for error, failure or the chance to do it better next time. The consequences are irreversible. In this sense, these decisions are as profound as mankind has ever had to make. You are the professionals upon whom we must depend to seek and establish the proper course for this technology for humanity. We cannot allow to do any less than just that.*

*Mary Sinclair*  
Mary Sinclair, M.S.  
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1 concerning whether some of these things should have been antici-  
2 pated.

3 BY MS. STAMIRIS:

4 Q Do you believe some of these problems should have been  
5 anticipated?

6 MR. ZAMARIN: I will object to the question. I do not  
7 know what the "problems" are.

8 CHAIRMAN BECHHOEFER: Are you referring to the two  
9 Mr. Kane mentioned?

10 MS. STAMIRIS: Yes. The additional distortion of piping  
11 and the additional cracking.

12 CHAIRMAN BECHHOEFER: Right.

13 WITNESS KANE: It seems to me there are two questions.  
14 One had to do with removal and replacement as being superior. And  
15 now the soils is the second question. Which one am I being asked  
16 to address?

17 BY MS. STAMIRIS:

18 Q Why don't you state one and answer it?

19 MR. ZAMARIN: Can we have a question of the witness?

20 CHAIRMAN BECHHOEFER: Mr. Kane can answer the question  
21 about if, with 20-20 hindsight, would removal and replacement have  
22 been a better option in 1978?

23 → WITNESS KANE: The answer depends on the facts that must  
24 be addressed. When you are considering it from the standpoint  
25 of safety alone, it is my opinion that removal and replacement is

1 a better solution. If you are considering the other facets --  
2 that is, the cost, the impact on schedule, and these are facets  
3 that engineers must address -- then it may not be the superior  
4 option. And I am saying "may not," because the decision to go  
5 with the preloading or the surcharging has an inherent assumption  
6 that ultimately it can be proven that the problems with overstres-  
7 sing and the pipes and the cracking of the structures are not so  
8 severe that it cannot be demonstrated that it is acceptable. So  
9 there is a risk in going with preloading.

10 We have not reached the bottom line with regards to  
11 accepting the effectiveness of the surcharge. There are studies  
12 now being conducted. They have not yet been submitted to the NRC  
13 to which we must address ourselves.

14 CHAIRMAN BECHHOEFER: Let me ask the followup question  
15 so we do not get too confused.

16 Back in '78, should problems such as -- well, problems  
17 of additional distortion of the installed conduits and pipes and  
18 additional cracking of the building, should those problems have  
19 been anticipated?

20 WITNESS KANE: Yes. And I think the biggest difference  
21 between the Applicant and the NRC over the preloading program  
22 has been Consumers saying, "We want to go ahead and do this and  
23 make measurements and demonstrate its adequacy," and on the other  
24 side we have the NRC saying, "We have trouble accepting this  
25 observational method when in fact we know what surcharging can



be doing to the structure, and we would like some criteria by which you are going to evaluate the acceptability of these problems, the settlement and the cracking."

CHAIRMAN BECHHOEFER: And your response more or less anticipated what I viewed as a followup question. If these kinds of problems should have been anticipated, did Consumers or Bechtel, as the case may be, take sufficient -- assuming that those problems should have been anticipated, are there ways where the surcharging could have been planned by which these problems could be either minimized or alleviated?

MR. ZAMARIN: Chairman Bechhoefer, I hate to object to a Board question, but I do not think that he has testified that these problems were not anticipated. I think what he said in his last answer was there was a different approach taken; that was, by measuring cracks and things of that nature. And your question just now is based upon the assumption that these were not anticipated, and I do not think he said that.

CHAIRMAN BECHHOEFER: My question was a hypothetical: If these problems were ones which should have been anticipated, are there ways of minimizing or alleviating these problems? My next question after that would be: Did the company take these into account? My question was a hypothetical leading to --

MR. ZAMARIN: The problem I had with it, I think it implied that they had not considered them.

(Board conferring.)

E. Gallagher  
Testimony

post-December '79 testimony?

A To be honest with you, I have some real difficulties with that phrase "reasonable assurance". I'd like to ask the Board what you understand "reasonable assurance" to mean, because, quite frankly, I'm not certain.

Q Well, may I ask-- I don't know whether this will help. I will try.

In what areas do you have reservations about this statement?

MR. PATON: Judge Decker, could I interject? I think he said he had reservations as to the meaning of the word.

MR. DECKER: I understand that.

⑥ A I would agree that there is certainly the necessary tools and systems in effect to provide some acceptable level of confidence that the task can be accomplished. The reservation that I have is that having been so close to this problem for two and a half to three years, and knowing that simply the Company could not take soil material from one point of the site and place it in a sufficient manner to support the structures on another place on the site, and then recognize that we have extremely complex sophisticated and, in some cases, unprecedented remedial actions at a nuclear power plant, I have to have some reservation as to whether or not it can be successfully accomplished, and that may be just

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1 from my own shortcomings of what is technically feasible;  
2 but nevertheless, I certainly have some uneasiness about the  
3 suitability that the fixes can be accomplished successfully.

4 CHAIRMAN BECHHOEFER: Let me interrupt for  
5 one thing. If your recommendation concerning Mr. Selby,  
6 together with the recommendation on qualifications of QC  
7 inspectors--those were both put into effect, would you have  
8 less reservations, or is there anything else you can suggest  
9 to us as well?

10 THE WITNESS: What I'm simply saying is that  
11 the complexity of the remedy itself is somewhat difficult  
12 to come to grips with.

13 I do have one other, I guess, provision that  
14 might provide some better reasonable confidence that this  
15 task can be accomplished, and that is that the NRC as well  
16 provide a full-time geotechnical representative to observe,  
17 to witness, to inspect, to take independent measurements  
18 throughout the remedial fixes, and in doing so, provide the  
19 NRC with continuous confidence information, starting with the  
20 dewatering system installation, the monitoring of structures  
21 preloading of the borated water storage tank, valve pits,  
22 underpinning the auxiliary building and field water valve  
23 pits, and piping systems embedded in the fill.

24 In other words, have the NRC have independent  
25 and continuous observation of the soils settlement remedies



E. Gallagher

1 sites, to a much different degree, however.

2 Q But there have been, in fact, problems on other  
3 nuclear sites with something as simple as soils, haven't  
4 there?

5 A To a much lesser extent. The degree of the  
6 problem is what's important here. The extent of what has  
7 occurred at the Midland facility is unprecedented at any  
8 other facility.

9 Q The point remains, however, that other people  
10 have had some problems with something as simple as soils, or  
11 haven't they?

12 A Yes, of course.

13 Q In fact, a recent bulletin has been issued  
14 covering not only Midland but other plants as well, is that  
15 right?

16 A I wrote the bulletin.

17 Q So the answer is that, yes, a recent bulletin  
18 has been issued with regard to soils for not only this plant,  
19 but others?

20 A Excuse me. It was a circular; Inspection and  
21 Enforcement Circular.

22 Q To someone like me, they're the same. I'm  
23 sorry.

24 A It has a different regulatory posture.

25 Q So your answer is, yes, in fact there has been

in the same kind of a way that we were talking about Mr. Selby.

A I think you're comparing apples and oranges here. You're talking, one, about a failure to identify an item of non-compliance or withdrawing an item of non-compliance, and on the other hand, you're talking about a \$27 million-plus fiasco.

→ There are no comparisons. You're talking about a plant that's 70 percent complete, that is crippled. You're not talking about an insignificant error in an inspection report.

Q Actually, Mr. Gallagher, what we're talking about, I think, is a reasoned business judgment, a managerial judgment by the chief executive officer of a large utility, who has had years of experience in that, versus the judgment of a reactor inspector civil engineer.

I appreciate the fact that you note there are differences, because in fact there are. And it seems to me that simply stating that the chief executive officer ought to be held accountable doesn't take into account or consideration how large companies are run. And I wonder if you are really familiar with that?

MR. PATON: I object, Mr. Chairman. Mr.

Gallagher was asked if he had any ideas which would be helpful to the Board, and because he made a suggestion, he's now

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FIGURE 1

CRITERIA FOR ASSESSING CONSTRUCTION QA/QC

MANAGEMENT ATTITUDE

REGULATORY REQUIREMENTS AND INDUSTRY STANDARDS

ORGANIZATION FOR QUALITY

STAFFING FOR QUALITY

TRAINING FOR QUALITY

TIMELY PROBLEM IDENTIFICATION

EFFECTIVE PROBLEM RESOLUTION

APPROPRIATE IMMEDIATE ACTION

IDENTIFICATION AND CORRECTION OF ROOT CAUSE

PREVENT REPETITIVE PROBLEMS

MOTIVATION FOR QUALITY

RECEIVED  
ADVISORY COMMITTEE ON  
REACTOR SAFEGUARDS, U.S.N.R.C.

JUN 14 1982

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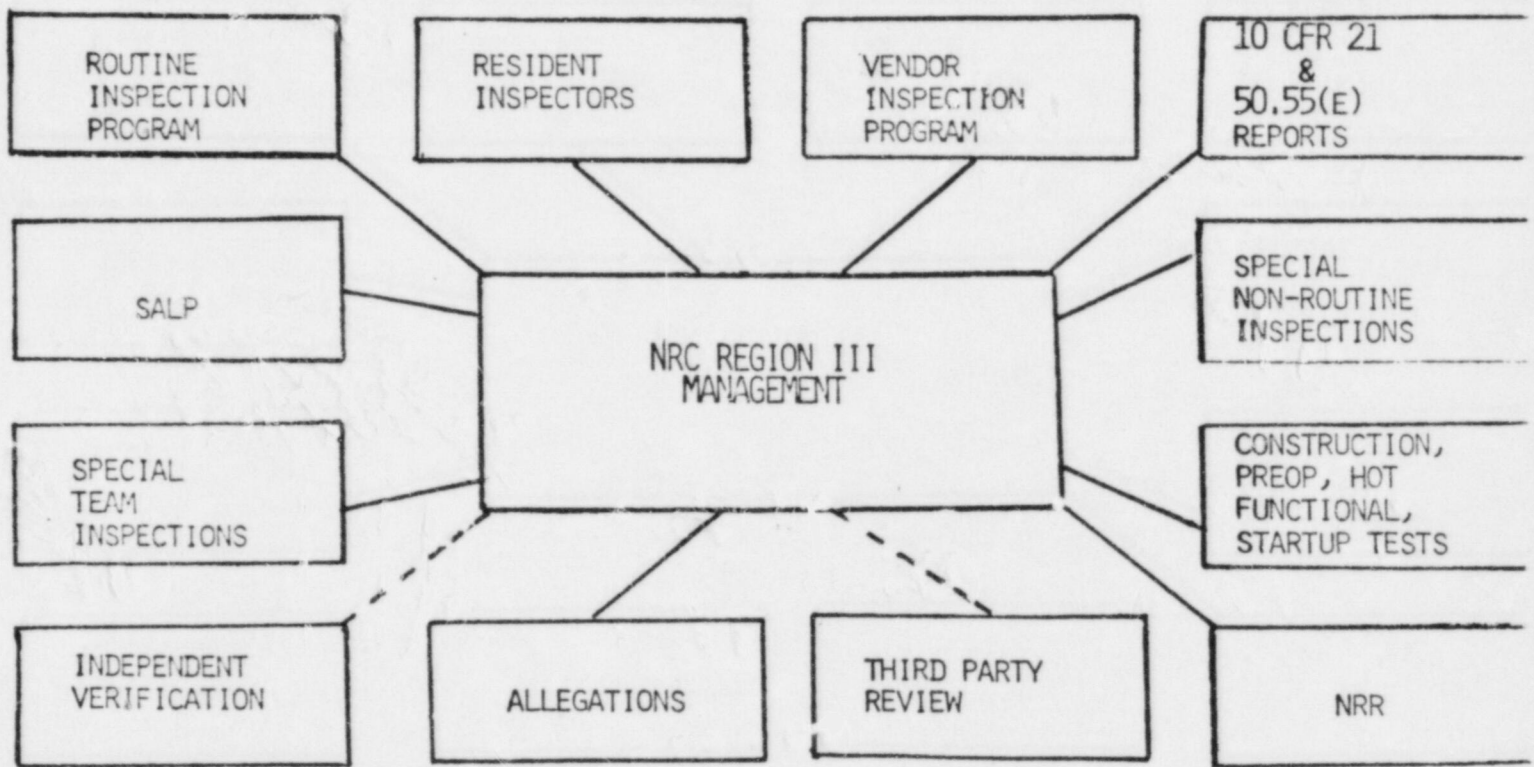
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FIGURE 2

SOURCES OF INFORMATION - MIDLAND PERFORMANCE



———— SOURCES CURRENTLY IN USE  
----- SOURCES WHICH MAY BE USED

JUNE 4, 1982

MIDLAND ACRS MEETING - INTRODUCTION BY NRC STAFF

OL REVIEW HISTORY TO DATE

11/18/77	OL APPLICATION DOCKETED
EARLY 1979	PREPARATION OF SER IN PROGRESS
3/28/79	TMI-2 ACCIDENT — MIDLAND REVIEW SUSPENDED
EARLY 1981	OL REVIEW FULLY RESUMED
2/5/82	DRAFT ENVIRONMENTAL STATEMENT ISSUED
MARCH-APRIL 1982	FINAL SER OPEN ITEM RESOLUTION MEETINGS HELD WITH APPLICANT
5/6/82	SER ISSUED
5/20-21, 6/2/82	ACRS SUBCOMMITTEE MEETINGS

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MIDLAND SER OPEN ITEM STATUS

<u>SER OPEN ITEM NO.</u>	<u>DESCRIPTION OF ITEM</u>	<u>NEXT ACTION</u>	<u>APPROX. DATE</u>
1.	NEARBY EXPLOSIVE HAZARDS	STAFF/APPL. MTG.	JULY 82
2.	TURBINE MISSILES	STAFF COMPLETE REVIEW	JUNE 82
3.	TORNADO MISSILE PROTECTION	STAFF/APPL. MTG.	JUNE 82
4.	ANALYSIS OF RCS & CORE COMPONENTS	APPL. SUBMIT ANALYSIS	MARCH 83
5.	SOILS SETTLEMENT ISSUE	APPLICANT SUBMITTAL	ONGOING
6.	SEISMIC & ENVIRONMENTAL QUALIFICATION OF EQUIPMENT	STAFF CONDUCT SITE AUDITS	ENV. JUNE 82 SEISMIC 09/82
7.	NATURAL CIRCULATION COOLDOWN ANALYSES	APPL. SUBMIT ANALYSIS	AUGUST 82
8.	HPI LINE MAKEUP NOZZLE CRACKING	APPLICANT SUBMITTAL	JULY 82
9.	REACTOR VESSEL HEAD VENT	APPLICANT SUBMITTAL	JUNE 82
10.	SECONDARY SYSTEM CONTAINMENT VALVE TESTING	STAFF COMPLETE REVIEW	JUNE 82
.	LEAK TESTING OF DHR AND RBCWS CONTAINMENT VALVES	STAFF COMPLETE REVIEW	JUNE 82
12.	APPENDIX R (FIRE PROTECTION)	STAFF COMPLETE EVALU.	JUNE 82
13.	AFW RING HEADER DISTORTION	APPLICANT SUBMITTAL	AUGUST 82
14.	EMERGENCY PREPAREDNESS PLAN	STAFF COMPLETE EVALU.	JUNE 82
15.	CONTROL ROOM DESIGN REVIEW	APPL. SUBMIT REPORT	DECEMBER 82
16.	SHUTDOWN DECAY HEAT REMOVAL REQUIREMENTS	APPL. SUBMIT RELIABILITY ANALYSIS	JUNE 82



## SPECIAL REVIEW AREAS

- QUALITY ASSURANCE
- REMEDIAL ACTIONS RELATING TO SOILS SETTLEMENT
- PROCESS STEAM SYSTEM
- B&W NSSS SENSITIVITY
- REACTOR VESSEL ANCHOR BOLTS
- PROXIMITY TO DOW FACILITIES
- SEISMIC RE-EVALUATION

## IMPROVEMENTS TO MIDLAND PLANT DESIGN

- PORV'S AND PORV BLOCK VALVES
- AFW SYSTEM
- FEEDWATER OVERFILL PROTECTION
- ANTICIPATORY REACTOR TRIP SYSTEM
- PRESSURIZER: LEVEL INDICATION AND HEATERS
- INADEQUATE CORE COOLING INSTRUMENTATION
- POST-ACCIDENT MONITORING INSTRUMENTATION
- HOT LEG VENTS
- FOGG LOGIC ADDED TO ESFAS
- OPERATIONAL IMPROVEMENTS