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TESTIMONY OF CRIS HILLMAN

AND TERRY POSTLEWAIT

ON

SINCLAIR CONTENTION 4

My name is Cris Hillman. I am employed by Consumers Power Company as the Plant Chemical Engineer at the Midland Nuclear Plant. In this job, my responsibilities include management and development of an integrated plant chemistry program. I have a BS in Chemical Engineering from Michigan State University and five years experience in chemical engineering in support of nuclear power plant operations at Palisades and Midland. Further information is contained in my resume in Attachement A. I believe as a result of this training and experience, I am qualified to address Sinclair Contention 4.

My name is Terry Postlewait. I am employed by Consumers Power Company as a Staff Engineer in the Design Production Department, Mechanical/Nuclear Section of the Midland Nuclear Plant Project at the Company headquarters in Jackson. In this job, my responsibilities include such activities as the review of mechanical systems design and support of licensing activities. As required, I interface with Bechtel and Consumers Power Company personnel in the resolution of design and construction problems. I have a BS in Mechanical Engineering from the University of Toledo and ten years experience in the design, installation and operation of mechanical equipment. Eight of these years have been with Consumers Power Company, associated with fossil and nuclear power plants. I have been on the Midland Project specifically since April of 1980. Further information is contained in my resume in Attachment B. I believe as a result of this training and experience, I am qualified to address Sinclair Contention 4.

Sinclair Contention 4 states:

> "The degradation of steam tube integrity due to corrosion induced wastage, cracking, reduction in tube diameter, and vibration induced cracks is a serious unresolved safety problem at the Midland Nuclear Plant. It is admitted that the chemistry of the cooling water is critical to prevention of steam tube failure, (NUREG-0886). However, the fact that these plants depend on cooling water from the cooling pond increases the likelihood of corrosion and poor water chemistry because the DEIS states that the plant dewatering system will first be discharged to the cooling pond. (DEIS at 5-2). That means that many wastes, including radioactive materials from leaks and spills on the reactor site, can enter the cooling pond and disrupt the chemistry of the pond. Therefore, due to this contribution of an undetermined amount and quality of ground dewatering inflows to the cooling pond, the NRC's bland assurance that corrosion is unlikely due to the lack of sodium thiosulfate, is unsatisfactory. (NRC Response to Interrogatory 9.j.) In fact, due to the contribution of groundwater, the NRC is not fully aware of the likely constituents of the cooling pond, and the findings required by 10 CFR §§ 50.57(a)(3)(i) and 50.57(a)(6) cannot be made."

I. Introduction

Sinclair Contention 4 is based on the faulty premise that the control of cooling (pond) water chemistry is critical to the prevention of steam generator tube failure (inaccurately deduced from misinterpretation of NUREG 0886). The fact is, NUREG 0886 refers to the control of secondary water chemistry, not cooling water (pond) chemistry, as being a key to minimizing steam generator tube degradation. As can be seen from the simplified sketch of the Midland Plant thermal cycle shown in Attachment C, cooling water from the cooling pond does not flow through the secondary system or the steam generators during normal operation. Regardless of what the cooling water chemistry may be, administrative procedures and design features of the plant are adequate to meet B&W specified secondary water chemistry limits and thus, steam generator tube corrosion will be minimized.

The water normally used in the secondary system is supplied by the Plant Makeup Demineralizer System and does not come, directly or indirectly, from the cooling pond. There are only two circumstances under which cooling water from the cooling pond can be introduced into the secondary system and come into contact with the steam generators. The first is leakage through the condenser. The second is emergency operation of the auxiliary feedwater system, taking water from the pond. These are discussed below.

II. Description of How Cooling (Pond) Water Can Enter the Secondary Cycle

A. Condenser Leaks

Attachment C includes a simplified schematic cross section of a typical condenser. Each Midland Unit utilizes such a condenser to condense the turbine exhaust steam for reuse in the secondary cycle. The condenser is basically a shell and tube type heat exchanger with the turbine exhaust steam being condensed on the shell side and the cooling water being pumped through the tubes. The cooling water flowpath is physically separated from that of the steam by means of the tubes and the tubesheets. Each tube-to-tubesheet joint is made watertight by mechanically expanding the tube into the corresponding hole in the tubesheet.

Cooling water can find its way into the secondary cycle via the condenser if the tube-to-tubesheet joint or the tube itself should develop a leak. Should this occur, the solution is to reroll the tube-to-tubesheet joint or to insert a mechanical plug in each end of the tube. These techniques are standard in the industry and are quite effective.

In-leakage of cooling water to the secondary system is normally indicated by on-line instrumentation. The sample point used to detect a suspected condenser leak is located in the condensate pump discharge piping as noted in Attachment C. The condensate pump discharge sample is continuously monitored for cation conductivity, pH, dissolved oxygen, sodium and silica. A cooling water-to-secondary leak will normally be indicated by an increase in sodium and/or cation conductivity level. Grab samples for cation conductivity and sodium are also taken from the same sample point and analyzed in the laboratory once per shift. This serves as a check of the on-line instrumentation and is used to either confirm or reject the suspected condenser leak.

In addition to the methods and practices described above, each condenser is equipped with a hotwell* sampling system. The system collects condensation and/or leakage from each tubesheet. Samples are then collected and analyzed in the laboratory on an as-needed basis. This system is useful in identifying which individual tube bundle contains the leak.

*The term "hotwell" is standard in the condenser industry and denotes the bottom section of the condenser in which the condensed steam (condensate)is collected prior to being pumped through the demineralizers to the steam generators.

Procedures are now in place that require management personnel be informed of off-normal chemistry conditions which includes suspected condenser leaks. Additionally, Technical Specification 16.6.8.4, Item C, Subsection vii has been proposed which concerns cooling water-to-secondary leakage. This proposed Technical Specification states: "When condenser in-leakage is confirmed, the leak shall be repaired, plugged or isolated within 96 hours."

Once a leaking portion of the condenser is identified, that half of the condenser can be isolated by shutting off one cooling water loop. The specific leaking element (eg, tube or tube-to-tubesheet joint)can then be further identified by means of portable leak detection equipment, and the leak corrected by plugging or rerolling the tube-to-tubesheet joint.

B. Auxiliary Feedwater System

The second path for potentially introducing cooling pond water into the secondary system is by way of the Auxiliary Feedwater (AFW) System. The AFW System, initiated by an Auxiliary Feedwater Actuation Signal (AFWAS), is used to supply water for shutdown to the secondary side of the steam generators in the event main feedwater is lost. During Plant operation, the AFW pumps are aligned to take suction from the condensate storage tank, in the event AFW is needed. Should an AFWAS occur, condensate from the condensate storage tank would be pumped to the secondary side of the steam generators. In the unlikely event that this supply of water to the AFW pump suction should be lost for a specified period of time and an AFWAS be present, suction is automatically transfereed to the service water system, which is a source of cooling pond water. In either of these cases, AFW is used only to shut the plant down, not to continue operating. The frequency of occurrence of the coincidental set of circumstances leading to the use of cooling pond water as a source of AFW is extremely low. The plant can be safely shut down in this scenario of using cooling pond water in the steam generator; prior to restarting the unit, necessary actions, inspections, etc would be performed to ensure integrity of the steam generators.

Note that the water in the condensate storage tank, referred to as "condensate," is a mixture of condensate from the secondary system and demineralized makeup water from the Plant Makeup Demineralizer System and is essentially the same quality as secondary system water. The Plant Makeup Demineralizer System takes its normal suction from the City of Midland water system but can use Dow Chemical Company's demineralized water as a backup source. In either case, the source water is processed through the plant makeup demineralizers to assure proper quality prior to being pumped to the condensate storage tank. The cooling pond is not a source for demineralized or makeup water.

III. Description of Secondary Water Chemistry Control

The secondary system of the plant is a water system which uses ammonia for pH control and hydrazine for oxygen control. The allowable maximum limits of these and other parameters are specified by B&W. The limits to be met by CP Co are in all cases the same or more stringent than the B&W recommendation.

The secondary systems of both Unit 1 and Unit 2 are equipped with full-flow deep bed condensate demineralizers. There are six condensate demineralizers in the system, five in service and one in standby. The demineralizers remove cationic and anionic impurities that exist in the condensate. The demineralizers are located downstream of the condensate pumps and have adequate capacity to purify the feedwater prior to its introduction to the steam generators. Thus, impurities which may enter the secondary system via a condenser leak are adequately removed prior to the condensate being sent to the steam generators.

Conclusions

Cooling pond water quality itself is not relevant to steam generator tube corrosion. This is because the cooling pond water does not flow through the steam generators under normal operating conditions. In the event that condenser in-leakage were to occur, the Midland Plant's design features and procedures are adequate to meet the B&W minimum standards for secondary system water quality and thus, minimize steam generator tube corrosion.

In the unlikely event that cooling pond water were to be introduced into the steam generators by means of emergency actuation of the AFW system, the plant can be safely shut down. Appropriate actions would be taken prior to restarting the unit to ensure the integrity of the steam generators.

Thus, there is reasonable assurance that corrosion of the steam generator tubes does not depend on cooling pond water chemistry; therefore, the NRC can make the findings required by 10 CFR 50.57(a)(3)(i) and 50.57(a)(6).

~~PRIVILEGED AND CONFIDENTIAL~~

ATTACHMENT A

Resume of Cris Hillman

Education and Training

1977	Bachelor of Science in Chemical Engineering: Michigan State University
1979	AICHE Today Series; Industrial Water Conditioning - 1.4 CEU credits
	Nuclear Steam Supply Technical Training, Babcock & Wilcox - 6 hours
	Mechanalysis Course (Vibration Testing), IRD - 16 hours
1980	Principles of Supervision, Consumers Power Company - 40 hours
1981	Radiochemistry for Supervisors, Babcock & Wilcox - 40 hours
	Human Aspects of Management, Consumers Power Company - 20 hours
1982	Westinghouse PWR Chemistry Course, Westinghouse - 5 weeks

Experience

1977-1978	Graduate Engineer, Palisades Nuclear Plant, Consumers Power Company. Worked on various projects during refueling outage.
1978	Associate Engineer, Palisades Nuclear Plant. Worked for Plant Chemical Engineer (Palisades). Duties included support of demineralizer operations and operator training on makeup demineralizer.
1978-1980	Associate Engineer, Midland Project Testing. Responsible for development and implementation of acceptance test procedures.
1980	Associate Engineer, B C Cobb Steam Plant. Trouble shoot and increase reliability of new demineralizer system.
	Associate Engineer, Midland Project Testing. Responsible for overall preparation and coordination of startup chemistry program including the writing of a startup chemistry manual. Responsible for startup and operation of plant makeup demineralizer system.
1980-Present	Chemical Engineer, Midland Nuclear Plant. Responsible for directing plant chemistry staff activities such as startup chemistry support, budget preparation, chemistry procedure preparation and review, and technical support for chemistry related activities.

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ATTACHMENT B

Resume of Terry Postlewait

Position	Staff Engineer, Midland Nuclear Plant Project, Design Production Department, Mechanical/Nuclear Section
Education	University of Toledo, 1970, BSME

Experience

Apr-Present 1980	Joined the Midland Project as a Senior Engineer in the Design Production Department. Duties include assistance to Safety & Licensing Department, review of design of mechanical systems, resolution of problems, commenting on development of specifications, procedures and drawings and as-needed assistance to engineering and field personnel. In June of 1982, promoted to Staff Engineer and involved with additional duties such as coordinating Design Production Department assistance to field activities involving completion/turnover of systems, participation in program to control design changes and assistance to Safety & Licensing Department in developing and administering the Spatial Systems Interaction Program and in efforts to obtain NPDES Permit and finalize the Midland Plant Environmental Statement.
Aug - Apr 1977 1980	Consumers Power Company Senior Engineer - Responsible for reviewing design of new, and modification to existing, power plants. Primarily involved with review of mechanical design of Midland Units 1 & 2. In December 1977, also assumed the duties of Project Engineer for completion of D E Karn Plant, Units 3 & 4 and modification work on Karn Unit 4 cold reheat piping to solve excessive noise and vibration problem.
Feb - Aug 1975 1977	Alyeska Pipeline Service Company Rotating Equipment Engineer - Assigned to the tanker loading terminal for the Trans-Alaskan pipeline. Duties included reviewing mechanical design, monitoring the contractor to ensure proper installation and alignment of rotating equipment, startup problem assistance and field design changes.
1971 - 1975	Consumers Power Company Associate & General Engineer - Duties included review of mechanical design for new nuclear and fossil generating units including specifications, bids and bid evaluations, QA requirements, witnessing performance tests and preoperational test reviews. Was primarily associated with review of mechanical design of D E Karn Plant 3 & 4.

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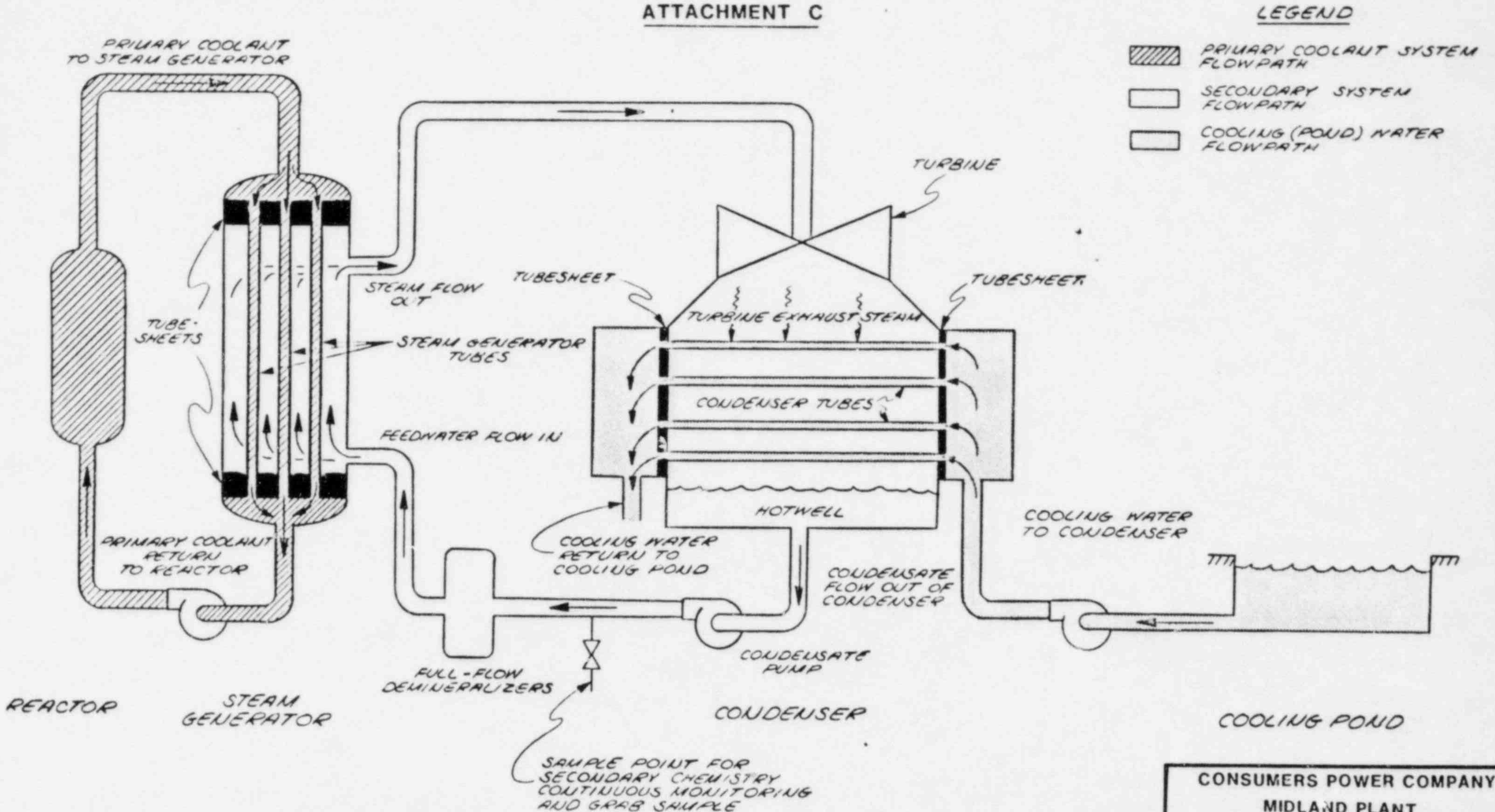
1965 - 1971	Surface Combustion Division, Midland Ross Corporation Technician and Design Engineer - Worked 1965 - 1970 as mechanical lab technician in development of steel and glass pelletizing processes, industrial heat treating furnaces and burners. Upon obtaining my BSME degree in 1970, worked as design engineer responsible for design and drafting on heat treating furnaces.
1965	Johns-Manville Laboratory Technician - Worked in R&D section developing fiberglass products and related manufacturing equipment.
1964 - 1965	Stauffer Chemical Company Chemical Laboratory Technician Performed qualitative analyses for on-line chemical processes.
1963 - 1964	Toledo-Beaver Tools Equipment Operator - Operated lathes, drill presses and mills in the production of pipe cutting and threading tools.

Additional Training

June 1977	Attended training on machinery vibration detection, analysis and balancing given to IRD Mechanalysis, Inc
June - Dec 1978 1982	Attended five courses on Programmatic Quality Assurance Training for the Midland Project
June 1978	Attended Technical Seminar on machinery vibration given by Mechanical Technology, Inc
May 1979	Attended Seminar on piping design given by Teledyne Engineering
Jan 1981	Attended one week training course on the B&W simulator

ATTACHMENT C



CONSUMERS POWER COMPANY MIDLAND PLANT
SIMPLIFIED SKETCH FOR SINCLAIR CONTENTION 4
TKP 1/10/83

RESUME OF WILLIAM BECKMAN

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13A.2.6 CHEMISTRY/HEATH PHYSICS SUPERINTENDENT

Education and Training

1967:	Bachelor of Science in Chemistry: Fairfield University, Fairfield, Connecticut
1971:	Naval Officer Candidate School, Newport, Rhode Island U.S. Navy - 6 months
1972:	Naval Nuclear Power School, Bainbridge, Maryland - 6 months
	Nuclear Power Training Unit, S1C Prototype, Windsor, Connecticut U.S. Navy - 6 months
1973-1975:	Various Service Schools
1976:	QA Indoctrination Workshop, Consumers Power Company - 3 days
1977:	Radiochemistry for Supervisors, Babcock & Wilcox - 10 days
	Principles of Supervision, Consumers Power Company - 5 days
1978:	Human Aspects of Management, Consumers Power Company - 5 days
1979:	Principles of Data Processing and FORTRAN Programming, Delta College - 4 credits
	Public Presentation Skills Course, Central Michigan University - 30 hours
	Principles of Leadership Effectiveness, Consumers Power Company - 3 days
1980:	Techniques of Supervision, Consumers Power Company - 5 days
	Managerial Economics, Consumers Power Company - 5 days
1981:	Annual Short course on Radiation Protection, University of Michigan - 10 days
	Selected Topics in Reactor Health Physics, HP Society, 1981 summer school, University of Kentucky - 5 days
	Effective Management, Consumers Power Company - 4 days

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Experience

1967-1971: Senior Sales Engineer, Stero Polymers, Goodyear Chemical Division, Goodyear Tire and Rubber

1971-1972: Attended various Service Schools, U.S. Navy

1972-1973: Qualified Engineering Officer of the Watch on S1C reactor plant, Windsor, Connecticut

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1973-1975: Engineering Officer of the Watch, responsible for watch supervision and overall safe operation of S5W reactor plant - 32 months

1973-1974: Main Propulsion Assistant and Radiological Controls Officer, USS John C. Calhoun SSBN 630B. Duties included supervision of nuclear plant mechanical maintenance radiation protection, chemistry, and radiochemistry - 24 months

1974-1975: Electrical Officer and Sonar Officer, USS John C. Calhoun SSBN 630B. Duties included supervision of nuclear plant electrical maintenance - 8 months 43

1975-1976: General Engineer, Chemistry Department, Palisades Nuclear Plant (CE PWR), Consumers Power Company. Duties included design and implementation of plant modifications and preparation of chemistry procedures - 9 months

1976: General Office, Palisades Nuclear Plant, coordinated and scheduled refueling outage - 6 months

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1976-1977: General Engineer, Midland Nuclear Plant. Duties included design reviews of plant systems with respect to chemistry, environmental, and radiological considerations

1977-1979: Chemical Engineer, Midland Nuclear Plant. Responsible for development of the Chemistry/Radiochemistry Department. Duties expanded for 9 months in 1977 to include supervision of the environmental and radiation protection programs

1980-Present: Chemistry/Health Physics Superintendent, Midland 43
Nuclear Plant 39