



Consumers
Power
Company

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December 12, 1982

82-13 #1

Mr J G Keppler, Regional Administrator
US Nuclear Regulatory Commission
Region III
799 Roosevelt Road
Glen Ellyn, IL 60137

MIDLAND NUCLEAR COGENERATION PLANT -
DOCKET NOS 50-329 AND 50-330
POSSIBLE FRAZIL ICE FORMATION IN SERVICE WATER INTAKE STRUCTURE
FILE: 0.4.9.69 SERIAL: 19113

This letter is an interim 50.55(e) report concerning the possibility of frazil ice formation in the service water intake structure. Frazil ice is the term used for ice particles which are ready to adhere to any underwater object having a minimum temperature of 32°F. This item was reported to Mr D Hunter of your staff on November 12, 1982.

The attachments to this letter provide a description of the deficiency and the investigative and corrective actions underway with regard to this problem.

Another report, either interim or final, will be sent on or before March 4, 1982.

James W. Cook

JWC/WRB/lr

Attachments: (1) Management Corrective Action Report MCAR-1, Report No 64,
dated 11/16/82

(2) MCAR-64, Interim Report 1, dated December 2, 1982

CC: Document Control Desk, NRC
Washington, DC

RJCook, NRC Resident Inspector
Midland Nuclear Plant

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CC CBechhoefer, ASLB Panel
RSDecker, ASLB Panel
FPCowan, ASLB Panel
JHarbour, ASLB Panel
AS&L Appeal Panel
MMCherry, Esq
MSinclair
BStamiris
CRStephens, USNRC
WDPaton, Esq, USNRC
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SHFreeman, Esq, Asst Attorney General
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Great Lakes QA Managers

Description (con't.)

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and pond turbulence and pond temperature. These conditions are in part dependent on plant heat rejection.

Frazil ice is not specifically addressed in the Midland FSAR. The effects of surface ice buildup in the cooling pond are addressed in FSAR Section 2.4.7, where it is stated that safety related water supplies are designed for ice forces and for blockages by submerged floes or ice jams. FSAR Section 9.2.5 (ultimate heat sink) does not address ice formation directly, but does state that "no reasonable combination of less severe natural phenomena and/or any site-related events can affect the ultimate heat sink."

Analyses to address the likelihood of frazil ice formation and subsequent blockage of the likelihood of frazil ice formation and subsequent blockage of the service water system intakes were performed by geotechnical services and reviewed by their consultant. These analyses concluded that the likelihood for frazil ice formation at the intake ranges from 0.05 to 0.3 events per year. This frequency was developed on the assumption of a given plant power level equivalent to one unit operating at 100% power.

While the calculated frequency of occurrence is quite low, Geotechnical services feels that it should be considered in the design of the Midland plant.

The Midland plant has substantial capability for mitigating the effects of service water intake blockage. However, since this capability has not been addressed for this purpose in the safety analysis or design process, it cannot be stated that frazil ice blockage would not be a safety concern.

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Attachment 2

Serial 19113

82-13 #1

Bechtel Associates Professional Corporation

SUBJECT: MCAR 64 (Issued 11/16/82)
Possible Frazil Ice Formation in the Service Water
Intake Structure

INTERIM REPORT 1

DATE: December 2, 1982

PROJECT: Consumers Power Company
Midland Plant Units 1 and 2
Bechtel Job 7220

Description of Deficiency

The Midland plant cooling pond and service water system design contained no specific features to mitigate potential frazil ice formation.

Summary of Investigation and Historical Background

Background

Frazil ice is "sticky" ice particles that have been known to block flow into intake structures by clogging trash racks. It forms as a result of supercooling of the surface water in conjunction with agitation, such as that caused by winds or flowing water. Conditions required for frazil ice formation and blockage of the service water intake include specific combinations of meteorological conditions (wind speed and air temperature) and pond turbulence when pond temperature is 32F. These conditions are in part dependent on plant heat rejection. Frazil ice formation is usually noted at intakes on rivers or large lakes rather than cooling ponds. Frazil ice formation has occurred at nuclear power plants (e.g., Nine Mile Point and Palisades) located on the Great Lakes. Frazil ice formation has not resulted to date in identified safety problems at operating nuclear plants.

Summary of Investigation

1. The extent to which frazil ice formation was considered in the Midland plant analysis and design prior to October 1981 is not clear. Specific design features to preclude frazil ice formation, such as a "warmup lines" or heating of the trash racks are not provided. FSAR Subsections 2.4.7 and 9.2.5 concerning design for ice forces and blockages by submerged floes or ice jams do not address frazil ice formation.

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2. An October 1981 discussion between Consumers Power Company and Bechtel concluded that conditions for frazil ice may exist at Midland at certain power conditions. No further work was to be performed pending review of the issue.
3. In July 1982, Consumers Power Company issued Safety Concern and Reportability Evaluation (SCRE) 55 addressing the problem. Consumers Power Company also requested Bechtel to develop a response to a proposed public hearing contention concerning NRC Generic Issue B-32. This resulted in a program to quantitatively evaluate the potential for frazil ice formation.
4. Analyses to address the potential of frazil ice formation and subsequent blockage of the service water system intake were performed by Bechtel and reviewed by consultants, J.F. Kennedy (Director of Iowa Institute of Hydraulic Research) and F.E. Parkinson (Vice President of LaSalle Hydraulic Laboratory, LTD.). These analyses concluded that the potential for frazil ice formation at the intake is low (on the order of 10^{-2} events per year). This analysis was based on daily average conditions and on the assumption of a given plant power level equivalent to one unit operating at 100% power. Frazil ice is not expected with both units at 100% power. While the calculated frequency of occurrence is low, it is possible and should be considered in the design of the Midland plant.

Analysis of Safety Implications

The potential for frazil ice formation at the service water system intake is low. Furthermore, should frazil ice form, there is even lower probability that its formation could significantly affect the safety of operations at the Midland plant. However, a possibility exists that blockage could happen and if it had remained uncorrected, could have adversely affected the safety of operations at the Midland plant. With the present design, the plant ultimate heat sink (UHS) could become unavailable under normal or accident conditions, such as loss of offsite power. If the heat sink were not available, heat removal capability would be lost from the component cooling water system, safeguard chillers, reactor building air cooling units, spent fuel pool, diesel generators, and nonsafety-related components.

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Although there is a potential for frazil ice formation, several features inherent in the Midland plant design mitigate the impact of frazil ice. Following a plant shutdown, plant safety would be ensured during the first several hours by use of the turbine driven auxiliary feedwater pump and the main steam safety valves to remove decay heat. In this period, loss of UHS is no more severe than the station blackout scenario that has been considered in the design to the extent described in the FSAR. If offsite power were not available, continuous operation of the diesel generators would not be possible because of lack of cooling water. Gradual loss of dc power would eventually occur and result in loss of decay heat removal capability. Inability to provide makeup water to the reactor coolant system could also be a concern because of lack of cooling water for the makeup pumps. It is likely, however, that intermittent operation of the diesel generators and makeup pumps could be achieved and decay heat removal and reactor coolant inventory could be maintained indefinitely.

Several features of the Midland Plant service water system design reduce the potential accumulation of frazil ice at the intake. These features include the use of the pond as a heat sink and the relatively deep location of the service water system intakes and the UHS, which is situated in the bottom of the cooling pond. As a heat sink, the cooling pond could normally be heated to a point where frazil formation is not possible. The relatively deep service water intake could reduce the probability that supercooled water conditions exist at the intake, because these conditions are the result of extreme meteorological conditions at the pond water surface.

Probable Causes

Frazil ice formation usually is a concern on rivers and large lakes rather than cooling ponds. There are no identified safety problems at operating nuclear power plants caused by frazil ice formation. The probable cause will be addressed in the next report.

Corrective Action

Corrective action will be taken to ensure that frazil ice formation will not cause blockage of the service water system intake structure

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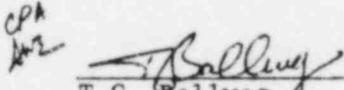
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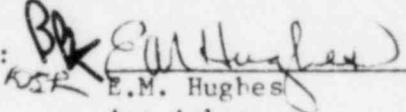
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and that the design conforms to the design basis stated in the FSAR. Design alternatives on how this can best be accomplished are under evaluation. Additional information will be provided in the next report.

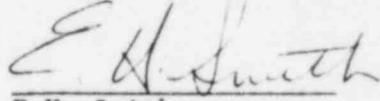
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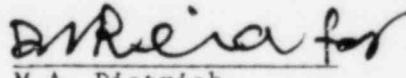
Based on the potential safety concerns, this item was considered potentially reportable in accordance with 10 CFR 50.55(e).

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