WOLF CREEK
NUCLEAR OPERATING CORPORATION

Neil S. "Buzz" Carns
Chairman, President and
Chief Executive Officer

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WM 96-0075

U. S. Nuclear Regulatory Commission
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Washington, D. C. 20555

Reference: Letter dated May 16, 1996, from James C. Stone, USNRC, To N. S. Carns, WCNOC

Subject: Docket No 50-482: Response to Review of Preliminary Accident Sequence Precursor Analysis of The Icing Event at Wolf Creek

Gentlemen:

This letter transmits Wolf Creek Nuclear Operating Corporation's (WCNOC) review comments of the preliminary Accident Sequence Precursor (ASP) analysis of the icing event that occurred at Wolf Creek on January 30, 1996. These comments are being provided as requested in the Reference.

WCNOC's comments on the preliminary ASP analysis are provided in the attachment. If you have any questions regarding this response, please contact me at (316) 364-8831, extension 4100, or Mr. Terry S. Morrill at extension 8707.

Very truly yours,

Neil S. Carns

NSC/jra

Attachment

cc: L. J. Callan (NRC), w/a
W. D. Johnson (NRC), w/a
J. F. Ringwald (NRC), w/a
J. C. Stone (NRC), w/a

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Response to the Preliminary Accident Sequence Precursor Analysis of the Wolf Creek Icing Event

Wolf Creek Nuclear Operating Corporation (WCNOC) has reviewed the NRC's preliminary Accident Sequence Precursor analysis for the icing event at Wolf Creek that occurred on January 30,1996, as requested by the Reference. In accordance with the Guidance for Peer Review in Enclosure 2 of the Reference, the comments provided below address the Event Description section and Additional Event-Related Information section. The comments are intended to clarify the descriptions of the event. Those who review the ASP, without the clarifications, will miss an opportunity to fully understand the nature of the event.

In any Probabilistic Safety Assessment (PSA) study, it is possible to construct models in a slightly different fashion and still yield similar results. The models and the results of the subject ASP analysis appear reasonable, given the event tree structure, assumptions and basic event probabilities. Therefore, there are no specific comments on the PSA analysis itself.

In addition to the specific comments below, WCNOC would like to offer one general comment: it appears from our review that the preliminary ASP analysis is based primarily on Licensee Event Report (LER) No. 482/96-001. However, that LER documents the loss of Circulating Water due to the icing event. The loss of Train A Essential Service Water because of the icing event is documented in LER No. 482/96-002.

Specific textual comments are as follows:

From the Reference, Event Description

Enclosure 1, Page 2:

"The lowest temperature for the CST was not reported."

WCNOC Comment:

The temperature of the Condensate Storage Tank (CST) would not have added to the LER. WCNOC reviewed the plant computer printouts and determined that the temperature of the CST, prior to the operational event, was 50.9°F (1/30/96, 0000 hours). During the event, the highest temperature of the CST was 65.3°F (1/30/96, 2219 hours). The lowest temperature of the CST during the event was 47.1°F (2/2/96, 1719 hours).

From the Reference, Additional Event-Related Description

Enclosure 1, Page 3:

"After the initial indication of ice buildup in the circulating water bays, the operators manually started the B train of the ESWS system. Operators failed to properly align the ESWS and to isolate it from the SWS when, for expediency, they were directed to align the ESWS from memory. The improper

alignment resulted in severely restricted warming line flow to the ESWS intake bays for the pumps."

WCNOC Comment:

The ASP analysis statement, "...The improper alignment resulted in severely restricted warming line flow...," is not accurate. As documented on page 7 of LER No. 482/96-002, the improper ESWS valve alignment resulted in a warming line flow of an estimated 1700 gpm. However, based on review of as-built information, it is estimated that the maximum flowrate through the warming line with a proper valve lineup would be about 2500 gpm. This flowrate is still far below the original design requirement of 4000 gpm for the warming line. Based on the U.S. Army Core of Engineers' recommendations for the applicable conditions, the warming line flowrate would have to have been approximately 4000 gpm to prevent freezing. Therefore, it can be concluded that it was the inadequate design, not the improper lineup, that resulted in the severely restricted flow during the event, and that the freezing would have occurred even if the ESWS had been aligned properly.

Additionally, WCNOC would like to clarify that the operator was not directed to align the ESWS from memory for expediency, as stated in the preliminary ASP analysis. The ESWS is normally supplied from the SWS and the ESWS had to be aligned to provide cooling water to several safety system components that were placed in jeopardy due to increasing SWS temperatures. This alignment is performed manually, since the EWSW does not have "auto-start" capability under these circumstances. The operator did not have the appropriate alignment procedure with him, and aligned the ESWS in what he thought was the warm weather lineup. The operator stated that he believed the alignment he chose was an approved alignment. The lineup the operator chose would have been the approved warm weather lineup, had the SWS been supplying the ESWS. Performing a system lineup from memory is allowed only during urgent situations with the provision that the lineup is checked as soon as practical after completion. The operator intended to obtain the correct procedure and check the alignment after he had completed it. However, he failed to follow up on this check. This is documented in the root cause (contributing factor) section on page 7 of LER No. 482/96-002.

Enclosure 1, Page 4

"The icing in the intake area was the result of a phenomenon known as frazil ice. The process starts when a body of water having a large surface area, such as the intake bay area, is subcooled by a loss of heat (as can happen on a very clear cold night)." The paragraph continues, "The water flow induced by the running circulating water pumps allowed the tiny ice crystals to readily accumulate on the metal surface of the trash racks. Because the ice rapidly expanded, flow through the trash rack was blocked without a gradual increase in the differential pressure indication across the trash rack. Thus little advance notice was given to the reactor operator that the frazil ice condition existed and that the intake screens were becoming blocked."

WCNOC Comment:

The subject paragraph is not clear that three separate items are being discussed:

- The process by which frazil ice is formed,
- Icing on the trash racks (ESWS pump house), and
- Icing on the intake screens (circulating water pump house).

WCNOC would like to clarify that the icing began at different locations within the two pump house structures and from different mechanisms. The problem with frazil ice was experienced with ESWS. As reported in LER No. 482/96-002, "The accumulation of frazil ice starts when water becomes supercooled or drops below its freezing temperature. The water will supercool first at the surface, and when turbulence is present, will mix through the entire lake depth. Small crystals of ice - frazil ice - will be carried along with the supercooled water. Because the crystals are supercooled and rapidly grow in size, they stick to any object they come into contact with, including trash racks." This is the process that caused the icing of the ESWS trash racks.

The icing problem with the CW traveling screens occurred from a different process. As reported in WCNOC Letter dated March 15, 1996, from N. S. Carns to the NRC, on the Wolf Creek Generating Station Icing Event Restart Issue, specifically Restart Issue No. 6, "Circulating water and service water systems; adequacy of design and operation for cold weather operation," in the Root Cause And Contributing Factors section:

> "The root cause of the event was that the design of the CW intake structure and associated traveling screens did not account for the harsh environmental conditions imposed on them during the events of January 30, 1996. A contributing factor to the event was the spraying of near freezing water onto the screens exposed to atmospheric conditions. This spray water caused an initial ice build-up on the screens, which grew when exposed to the water from the lake."

Thus, it was the spraying of water onto the traveling screens with the ambient air temperature at 7°F (see LER No. 482/96-002) that caused the CW traveling screens to freeze.