Nebraska Public Power District

COOPER NUCLEAR STATION
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March 5, 1982

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US NUCLEAR REGULATORY COMMISSION
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Mr. John T. Collins, Regional Administrator
U.S. Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive
Suite 1000
Arlington, Texas 76011

Dear Sir:

This report is submitted in accordance with Section 6.7.2.B.3 of the Technical Specifications for Cooper Nuclear Station and discusses a reportable occurrence that was discovered on February 3, 1982. A licensee event report form is also enclosed.

Report No.: 50-298-82-04
Report Date: March 5, 1982
Occurrence Date: January 9, 1982
Facility: Cooper Nuclear Station
Brownville, Nebraska 68321

Identification of Occurrence:
An inadequacy was observed in the implementation of administrative and procedural controls developed to implement the requirements of Section 3.11.C and 4.11.C of the Technical Specifications.

Conditions Prior to Occurrence:
The reactor was operating at 39% of rated thermal power during a planned power reduction.

Description of Occurrence:
The "indicated" Minimum Critical Power Ratio (MCPR) was discovered to have been below the MCPR operating limit at 1459 hours on January 9, 1982 without the initiation of appropriate corrective actions as required by Section 3.11.C of the Technical Specifications.

Designation of Apparent Cause of Occurrence:
The apparent cause of the occurrence was attributed to personnel error in that the surveillance requirements of Section 4.11.C of the Technical Specifications were not met.

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Analysis of Occurrence:

The operating limit MCPR's are designed to prevent the fuel cladding integrity safety limit MCPR of 1.07 from being violated during the course of any of the anticipated abnormal operational transients analyzed in the most current CNS Reload Licensing submittal. Section 4.11.C of the Technical Specifications require that MCPR be determined daily during reactor power operation at greater than 25% rated thermal power and following any change in power level or distribution that would cause operation with a limiting control rod pattern. During this occurrence, power was reduced both by decreasing core flow and inserting control rods. The power reduction was made to initiate a shutdown (if required) so personnel could enter the drywell to investigate an oil level alarm on "B" recirculation pump motor.

From approximately 1200 hours (start of power reduction) until 1459 hours (time of occurrence), core thermal limits, including MCPR, were evaluated as required. At 1459 hours, the core thermal limits were calculated by the process computer, however, it was not noted by the reactor engineer onsite or the control room operator that the calculated value of MCPR was below the Technical Specification limit. As a result, corrective action specified in Section 3.11.C of the Technical Specifications was not initiated. Following the computer calculations, power was further reduced by inserting additional control rods; core flow, however, was not decreased further as "A" recirculation pump was at minimum speed. During this time, core flow indication showed a flow of approximately 10 X 10^6 lb/hr (14%). At 2219 hours (after both recirculation pumps were back on line), a computer calculation showed all thermal limits including MCPR, to be within the Technical Specification limits. However, the requirements of Section 4.11.C of the Technical Specifications were not complied with for the power changes that occurred between 1459 hours and 2219 hours.

Subsequent to the discovery of this event, a thorough analysis demonstrated that in actuality, the MCPR limit was not violated at 1459 hours. This analysis determined that the indicated core flow of approximately 10 X 10^6 lb/hr was not correct because of the manner in which the core flow instrumentation functions during single recirculation loop operation. When the reactor is operating in the single loop mode, the core flow instrumentation responds by subtracting the indicated flow in the idle loop from the indicated flow in the active loop. This is because all flow through the idle loop is assumed to be backflow through the inactive jet pumps.

Based upon information from General Electric, it appears, however, that backflow is established in the idle loop only if the pump speed in the active loop is in a range greater than approximately 20 to 40%. The actual speed necessary to establish backflow would be dependent upon core thermal power and the particular hydraulic characteristics of the CNS reactor core. At a pump speed less than this 20 to 40% range, core flow assumes the characteristics of natural circulation flow. In this condition, flow through the idle loop is forward flow as opposed to backflow. The core flow instrumentation, however, in single loop operation will still subtract the flow in the idle loop from the active loop even though that flow is now forward flow. The resultant effect of this will be that core flow will indicate approximately 50% of what core flow actually is. Based upon core stability analysis data provided to the NRC as part of the CNS Cycle 7 licensing submittal, the most restrictive conditions regarding core stability are operation with natural circulation and operation on the 105% rod line. This analysis assumes then that core flow cannot attain a value less than natural circulation flow. Therefore, it can be concluded that at 39% core thermal power, core flow could not be less than the natural circulation value of 22 X 10^6 lb/hr (30%). By utilizing a core thermal limits evaluation model that runs off-line, it was determined that with a core flow of at least 12 X 10^6 lb/hr, MCPR would have been within the Technical Specification limit. If core flow is increased without varying the control rod pattern, MCPR will increase farther and farther from the Technical Specification limiting value. This effect is due to a flow biased multiplier that is applied to the MCPR limit at core flows less than rated core flow.

Conversely, if core thermal power is decreasing by fully (or almost fully) inserting control rods while holding core flow constant, MCPR will also increase due to the effect of the control rod insertions lowering the bundle power in the most limiting locations. Thus, it can be inferred with confidence, that during the interval from 1459 hours until 2219 hours, MCPR was not more limiting than the MCPR calculated at 1459 hours.

This occurrence was attributed to personnel error. However, since the MCPR limit was not actually violated, this occurrence had no adverse effect on the public health and safety. Because this event has a potential for repetition, actions as specified under corrective actions will be implemented to aid plant personnel in handling this problem in the future.

Corrective Action:

After the discovery of this occurrence, a brief descripton of the event was routed to all licensed station personnel. Additionally, the daily surveillance log will be revised to require the logging of the thermal limits by operations personnel each time they are evaluated by the process computer and the appropriate operations procedure will be revised to require the control room operator to input the natural circulation core flow value (for the appropriate core thermal power) into the process computer if required when operating with a single recirculation loop. These two procedures will be revised and in use by April 1, 1982. A copy of this LER will also be routed to all licensed personnel and the reactor engineers.

Sincerely,

L. C. Lessor
Station Superintendent
Cooper Nuclear Station

LCL:cg
Attach.