

SAFETY EVALUATION BY THE
DIVISION OF REACTOR LICENSING
NUCLEAR REGULATORY COMMISSION
OF MATTERS REMAINING FROM THE
FACILITY OPERATIONS LICENSE REVIEW
ARKANSAS NUCLEAR ONE - UNIT 1
DOCKET NO. 50-313

A. Identification of Review Items

When Facility License No. DPR-51 was issued for Arkansas Nuclear One - Unit 1 (ANO-1) on May 21, 1974, to Arkansas Power & Light Company (AP&L), two matters were left for post licensing review and resolution. These were the design of the Steam Line Break Instrumentation and Control System and the interconnection of a non-safety grade control system to components of the safety related Emergency Feedwater System. A third item, a modification of the shutdown bypass circuitry in the Reactor Protective System, was submitted for our review by AP&L on April 29, 1974.

B. Shutdown Bypass Circuitry Modification

The addition of another RPS power trip bistable in the shutdown bypass circuit of each of the four redundant channels enhances safety in that it replaces an administrative control function with an automatic function, and it reduces possibilities of error in resetting the overpower trip setpoint. This modification does not affect any other safety related system.

The detailed drawings of this modification which were furnished to the NRC staff were reviewed. The staff finds that the modification satisfies the requirements of IEEE Std 279-1971 and concludes that this modification enhances safety and is acceptable.

C. Emergency Feedwater System

When the ANO-1 reactor is shut down, decay heat must be removed from the reactor through at least one of the steam generators until the plant has been cooled and depressurized sufficiently to permit use of the Decay Heat Removal System. As long as offsite power is available, the Main Feedwater and Condensate Systems are able to furnish the needed flow to the steam generator. However, to provide an assured source of feedwater if offsite power is lost, AP&L has provided the Emergency Feedwater System (EFWS). The EFWS consists of two full capacity EFW pumps, two sources of feedwater and the piping, valves, and controls needed to deliver feedwater to either or both steam generators. The decay heat removal is achieved by delivering feedwater to at least one steam generator and venting the generated steam through the turbine bypass valves, the atmospheric dump valves, or the steam relief valves. AP&L was advised that the EFW system is required for safety and as such, it should meet the single failure criterion; and the instrumentation, control and electrical equipment should be designed to conform with IEEE Std 279-1971 and IEEE Std 308-1971. AP&L amended the design to satisfy the above stated criterion and standards.

Both manual and automatic controls are provided to establish EFW flow paths to the steam generators. The automatic function is accomplished through the Integrated Control System (ICS). In view of the non-safety grade status of the ICS, an analysis has been performed by AP&L to establish that in the event of a failure in the automatic control system there is sufficient time for the operator to initiate the operation of the EFW system manually before the core is endangered. In addition, AP&L proposed to install Class IE isolation devices between the ICS and the EFW System so that failures in the ICS could not propagate to the EFWS and prevent operator control of that system when manual control is needed. While the use of these isolation devices was under review, AP&L agreed to disconnect the automatic ICS controls from the EFWS. We have reviewed the final design of the EFWS with the use of ICS control through Class IE isolation devices and have concluded that the design satisfies the single failure criterion, IEEE Std 279-1971 and IEEE Std 308-1971 and is acceptable. This control arrangement does not affect any other safety related system.

D. Steam Line Break Instrumentation and Control System

The applicant has analyzed the response of the ANO-1 reactor to the uncontrolled blowdown of a single steam generator caused by a postulated steam line break. As presented in Section 14.2.2 of the FSAR, the analysis shows a return to 2.6% power after blowdown

of one steam generator, occurring in less than one minute. The analysis of a blowdown of both steam generators was requested since the main steam block valves were set up for remote manual control and the main feedwater valves are closed by the non-safety grade ICS. The applicant committed to install a reliable system of isolating the seismic category I section of the system to preclude such double blowdown. This system, the steam line break instrumentation and control system (SLBIC), will sense low steam pressure and automatically close the main steam and main feedwater block valves. We reviewed the original design of the SLBIC and found it unacceptable since it did not meet all the requirements of IEEE Std 279-1971.

Recognizing that the amount of reactivity inserted by a steam generator blowdown increases with core burnup, AP&L analyzed double steam generator blowdown to establish how far in core burnup the plant could proceed without the risk of unacceptable reactivity insertion. AP&L's final analysis of blowdown of both steam generators showed acceptable consequences up to 225 full power days (after which the SLBIC would be needed).

The applicant has since revised the design of the SLBIC and resubmitted sufficient information in Amendment No. 46 to the Final Safety Analysis Report and in supporting letters dated

September 20, 1974, and January 6, 1975. The final revisions to the SLBIC design included the following changes to resolve staff concerns:

- a. The SLBIC cabinets were relocated to the protected environment of the Class I electrical equipment room.
- b. The SLBIC pressure switches were relocated to the air compressor room outside the electrical equipment room so that the effects of a pressure sensing steam line rupture would not impair the operability of equipment in the electrical equipment room.
- c. The SLBIC emergency power supply channels were electrically and physically separated.
- d. Logic channel circuitry revisions were made to provide full testability and status indication.

We have reviewed the final design of the SLBIC and concluded that the design satisfies the single failure criterion and IEEE Std 279-1971 and is acceptable. The SLBIC shall be installed and its operability required by Technical Specifications before the first core burnup exceeds 225 effective full power days.

E. Conclusion

We have concluded, based on the considerations discussed above, that these three matters are acceptably resolved as indicated,

ensuring that Arkansas Nuclear One, Unit 1 can be operated without undue risk to the health and safety of the public.