July 16, 1981

Docket No. 50-219
LS05-81-07-047

Mr. I. R. Finfrock, Jr.
Vice President - Jersey Central
Power & Light Company
Post Office Box 388
Forked River, New Jersey 08731

RECEIVED
JUL 23 1981
U.S. NUCLEAR REGULATORY COMMISSION

Dear Mr. Finfrock:

SUBJECT: OYSTER CREEK - SEP TOPICS XV-3, XV-4, AND XV-14

By letter dated May 7, 1981, you submitted safety assessment reports for the above topics. The staff has reviewed these assessments and our conclusions are presented in the enclosed safety evaluation reports, which completes these topic evaluations for Oyster Creek.

These evaluations will be basic input to the integrated safety assessment for your facility. The assessments may be revised in the future if your facility design is changed or if NRC criteria relating to these topics are modified before the integrated assessment is completed.

Sincerely,

Dennis M. Crutchfield, Chief
Operating Reactors Branch No. 5
Division of Licensing

Enclosure:
As stated

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See next page

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OYSTER CREEK, SEP TOPIC XV-3 EVALUATION

Loss of External Load

I. INTRODUCTION

Upon loss of electrical load the main generator breaker opens causing the turbine generator to increase speed. This is sensed by the turbine speed governor, which initiates a rapid closure of the turbine control valves and a reactor scram (acceleration relay on the control valve system). Reactor system pressure is increased until turbine bypass valves and reactor system relief valves are opened to reduce system pressure.

The licensee has presented an analysis of the loss of external load transient in Amendment 65 to the FSAR, December, 1970. Since then the transient has not been reanalyzed, but reference is made to the results of a turbine trip event which is found to be a more limiting transient.

II. EVALUATION

The loss of load transient is bounded by the turbine trip event. Reactor scram is initiated directly by signals from closure of the turbine control valves.

During the loss of load transient the steam flow to the turbine is interrupted by closure of the turbine control valves, while for the turbine trip transient the flow is interrupted by closure of the stop valves which is more rapid than control valve closure. Thus the transient during loss of load is less severe than the turbine trip transient.

III. CONCLUSIONS

As part of the SEP review for Oyster Creek we have evaluated the licensee's analysis of loss of external load (Ref. 1), against the criteria of SRP Section 15.2.1. Based on this evaluation we have concluded that this transient is bounded by the turbine trip event which has been evaluated and found in conformance with the criteria of SRP Section 15.2.1.

Turbine Trip

I. INTRODUCTION

A turbine trip is actuated by fast closure of the turbine stop valves which abruptly interrupt steam flow to the turbine. Independent of the cause, a turbine trip is followed by a reactor scram initiated directly by turbine stop valve position switches.

The effect of turbine trip is a rapid increase in pressure in the steam lines and reactor vessel.

The licensee has performed three different analyses of turbine trip. The first assumes actuation of the turbine bypass and all five relief valves. The second analysis assumes the turbine bypass valves unavailable which is the most limiting single failure. The third analysis goes beyond the requirements of SRP section 15.2.1 in assuming failure of both bypass and relief systems and also failure to scram the reactor. In the last case the purpose is only to show that the peak pressure criteria is met, and the calculation is ended after the initial transient has been stabilized but the reactor is still left operating at high power and all 16 safety valves are relieving.

II. EVALUATION

The licensee has performed analyses using three different sets of core data. The data sets refer to cores loaded with GE's 7 x 7 fuel, Exxon's 7 x 7 fuel and Exxon's 8 x 8 fuel. For each core the nuclear characteristics are selected in a conservative manner and result in higher peak neutron flux than is expected throughout the core life.

The scram curves used in the analyses are conservative bounding curves to the calculated scram curves. However, the licensee has not indicated whether the calculated scram curves assume the most reactive control rod held out of the core. The initial core thermal power is assumed to be 100% of rated as opposed to 102% required by the SRP acceptance criteria.

The results of the analyses, assuming operation of the turbine bypass and relief systems, indicated that the pressure peaks to 1135 psia which is well below the lowest setting of the safety valves (1212 psig). Minimum MCHFR is 1.84.

The results of the analyses, assuming the turbine bypass unavailable, indicate that the maximum pressure reached at mid core is 1217 psia which is well below the 1375 psig (110%) maximum allowable pressure. Minimum MCHFR is 1.67. Based on this result we have found the protection against CHF after turbine trip acceptable because: 1) failure to insert the most reactive control rod would not influence minimum MCHFR since it is attained before any rod is inserted 2) our experience is that assuming an initial power of 102% instead of 100% would not significantly decrease the MCHFR 3) other assumptions used in the analysis meet the acceptance criteria.

To demonstrate compliance with the peak pressure criteria the licensee has performed an analysis of the turbine trip event assuming the reactor not scrammed and the turbine bypass and relief valves not available. The results of this analysis indicate that at 8 seconds the core power is stable at about 150% and the vessel pressure is slowly decreasing from its peak value of 1257 psia. Even though the calculation fails to meet the criterion on core initial thermal power of 102%, the assumptions of the reactor not scrammed and of the turbine bypass and relief valves not available are more conservative and we have found the results acceptable.

III. CONCLUSIONS

As part of the SEP review for Oyster Creek we have evaluated the licensee's analysis of the turbine trip event (Ref. 1), against the criteria of SRP Section 15.2.1. Based on this evaluation we have concluded that the analysis performed adequately bound the turbine trip analyses as required by SRP Section 15.2.1 even though some values of the parameters used in the analytical model are not as recommended. We therefore, find the results of the turbine trip analyses acceptable.

Loss of Condenser Vacuum

I. INTRODUCTION

In the extreme case of sudden loss of condenser vaccum the transient would be identical to the turbine trip transient with failure of bypass. The most limiting single failure during that transient would be a relief valve failure to open.

The licensee has not presented an analysis of loss of condenser vacuum but has referenced the results of turbine trip transients (Ref. 1).

II. EVALUATION

The worst case loss of condenser vacuum transient is identical to the turbine trip transient with failure of bypass. However, since loss of condenser vaccum results in a loss of bypass, an additional single failure should be assumed to satisfy the SRP 15.2.1, section II, acceptance criterion 2d.

The most limiting single failure that could produce the highest peak pressure is a relief valve failure to open. However, this event is bounded by the turbine trip analysis performed assuming the reactor not tripped and the turbine bypass and relief valves not available. A relief valve failure to open would not influence the minimum MCHFR because it is attained already before any relief valve is opened.

III. CONCLUSIONS

As part of the SEP review for Oyster Creek we have evaluated the licensee's analysis of loss of condenser vacuum (Ref. 1), against the criteria of SRP Section 15.2.1. Based on this evaluation we have concluded that this transient is bounded by the turbine trip event which has been evaluated and found in conformance with the criteria of SRP Section 15.2.1.

Closure of Main Steam Isolation Valve

I. INTRODUCTION

Inadvertent closure of the main steam isolation valves results in loss of the steam removal path from the reactor to the turbine and may cause vessel overpressurization. A direct scram is initiated on 10% closure of the isolation valves.

The licensee has analyzed closure of the main steam isolation valves (Ref 1) assuming the fastest possible closure time (3 seconds). A separate calculation is presented for each fuel type used in the core.

II. EVALUATION

The results of the analysis indicated that reactor scram has decreased the core thermal power to about 50% before isolation valve closure starts to throttle the steam flow and to 25% before the vessel pressure starts to increase. The core power decreases smoothly throughout the event and thus the transient is much milder than turbine trip with failure to bypass.

The maximum pressure at the safety valves is 1123 psia, which is well below the lowest setting of the safety valves (1212) psia).

III. CONCLUSIONS

The analysis on main steam isolation valve closure has been evaluated against the criteria of SRP 15.2.1 and we have concluded that it is in conformance with the criteria.

Steam Pressure Regulator Failure

I. INTRODUCTION

In case of a steam pressure regulator failure in the direction of decreasing flow the turbine control valve starts to close. After a slight increase in pressure an independent backup regulator takes over the pressure control and reopens the valve. Steam pressure is stabilized at the setting of the backup regulator which is about 5 psi higher than the normal operating pressure.

The most limiting single failure would be a failure of the backup regulator which is the only equipment needed to mitigate the initial event. Failure of the backup regulator is equivalent to a loss of external load.

The licensee has presented only a qualitative discussion on the event (Ref. 1).

II. EVALUATION

The event induces a very mild transient on the plant. In the case of the most limiting single failure the transient is bounded by the turbine trip analyses.

III. CONCLUSIONS

Steam pressure regulator failure is not as limiting as the turbine trip transient and a quantitative analysis of its consequences is not needed.

OYSTER CREEK, SEP TOPIC XV-4 EVALUATION

Loss of Non-Emergency A-C Power to the Station Auxiliaries

I. INTRODUCTION

Loss of non-emergency A-C power to the station auxiliaries initiates a direct reactor scram and a turbine trip. It also trips the condenser cooling water pumps, feedwater pumps and recirculation pumps. Coasting down of the recirculation flow and sudden loss of feedwater make the loss of non-emergency A-C power transient different from all transients analyzed under topic XV-3.

The licensee has presented calculation results only for a core loaded with GE's 7x7 fuel. Based on those results, the peak pressure is lower than in a turbine trip without bypass.

II. EVALUATION

Based on startup test results, the licensee has assumed availability of bypass for 1.5 seconds into the transient. Up to that point the pressure behavior is similar to the turbine trip with bypass, showing the minor influence of the recirculation flow and the feedwater flow to the pressure. Comparison of the results of loss of A-C power to turbine trip without bypass shows that the delayed loss of bypass reduces somewhat the peak pressure. Thus the pressure transient after loss of A-C power is bounded by turbine trip analyses.

A trip of the recirculation pumps, following loss of A-C power, may cause a mismatch between reactor thermal power and recirculation flow. This mismatch is not expected following a turbine trip. Therefore, special attention is required in the evaluation of the loss of A-C transient with regard to MCHFR expected during this transient.

A comparison of the results from the loss of A-C power analysis and the results from trip of all recirculation pumps analysis (SEP Topic XV-7) shows that following a loss of A-C power, the fuel surface heat flux decreases more rapidly than the decrease during recirculation pump trip. Thus, the MCHFR in a loss of A-C power transient is bounded by the MCHFR following the trip of all recirculation pumps transient.

Sudden loss of feedwater flow which is also caused by loss of A-C power does not lead to significant loss of vessel water inventory and the level remains stable throughout the transient.

III. CONCLUSIONS

As part of the SEP review of Oyster Creek, the analysis for loss of non-emergency A-C power has been revaluated and we have concluded that this transient is bounded by the turbine trip and all recirculation pump trip analyses which are evaluated under SEP topic XV-3 and XV-7 respectively.

OYSTER CREEK, SEP TOPIC XV-14 EVALUATION

Inadvertent Operation of ECCS that Increases Reactor Coolant Inventory

I. Introduction

The high pressure emergency cooling systems for Oyster Creek are isolation condensers, which rely on natural circulation and are not able to increase reactor coolant inventory.

The only system capable of delivering flow to the vessel at normal operating pressure is the feedwater system. The increase in feedwater flow transient is considered under Topic XV-1.

II. Evaluation

The licensee has not analyzed this event.

III. Conclusions

The topic is not relevant for Oyster Creek because the plant has no ECCS capable of increasing reactor coolant inventory.

REFERENCES

1. Letter from Ivan R. Finfrock, GPU, to W. Paulson, NRC, Subject: Oyster Creek Nuclear Generating Station Systematic Evaluation Program, Docket No. 50-219-1, dated May 7, 1981.