TABLE 4.1-1 (Continued)

Channel Description	Check	Calibrate	Test	Remarks
21. Containment Sump Level	N.A.	R	N.A.	
22. Turbine Trip Logic**	N.A.	N.A.	R	
23. Accumulator Level and Pressure	S	R	N.A.	
24. Steam Generator Pressure	S	R	M	
25. Turbine First Stage Pressure	S	R	M	
26. DELETED				
27. Logic Channel Testing	N.A.	N.A.	M(1) S/U(2)	(1) During hot shutdown and power operations. When periods of reactor cold shutdown and refueling extend this interval beyond one month, this test shall be performed prior to startup. (2) Logic channel testing for nuclear source range channels shall only be required prior to each reactor startup, if not performed within the previous seven (7) days.
28. DELETED				
29. 4 Kv Frequency	N.A.	R	R	

** Stop valve closure or low EH fluid pressure.

ATTACHMENT 1

REASON FOR AMENDMENT

REMOVAL OF THE TURBINE REDUNDANT OVERSPEED TRIP SYSTEM (TROTS)
REASON FOR AMENDMENT

The TROTS is a third level turbine trip function which was intended to provide backup overspeed protection to the original turbine rotor design. Its inclusion was required by ACRS as a condition to issuance of the operating license in 1970. CP&L has since replaced the turbine rotor with one of fully integral (FI) construction. The FI construction provides a lower probability of missile generation for design and intermediate overspeed. Further, a revised probability analysis has been performed (attached), with the benefit of years of nuclear steam turbine experience, which indicates the probability of turbine missile ejection is well below the NRC acceptance criterion of such events. The TROTS has never been required to function as designed by tripping the turbine on actual overspeed signals, but has been documented as the cause of four turbine/reactor trips due to failures in the system.

The TROTS has a history of maintenance and operational concerns. Maintenance for the system is frequent for a variety of problems including recalibration of the speed channels and replacement of failed components such as power supplies, magnetic pickups, and printed circuit boards. Operational concerns deal mainly with the plant trips and the spurious annunciations the system initiates in the control room.

The frequent non-routine maintenance activities required to ensure system operability indicate a degree of system unreliability which creates the potential to initiate plant trips. The system is also very sensitive to any outside electrical noise which has also created spurious alarms.

The potential for the system to create a plant trip centers on the design of the system to initiate a turbine/reactor trip upon overspeed. The TROTS initiates a plant trip in either of two ways as follows:

1. The TROTS consists of three speed channels which utilize signals received from magnetic pickups mounted at the turbine turning gear. A plant trip is initiated when two out of the three channels detect overspeed signals.

2. The TROTS includes a failure detection system which is built into the speed measuring circuitry to detect failure of the speed pickups, pickup wiring, or speed amplifier. Failure detection in any channel is locked in by seal-in relays which hold the failure alarm until the system is reset manually in the TROTS cabinet. Failure detection in any two of the three speed channels initiates a plant trip.

Although the system is subject to initiating a turbine trip during normal operation, the greatest concern lies in the following monthly testing required by the Technical Specifications and as originally recommended by Westinghouse to ensure system operability.

REMOVAL OF THE TURBINE REDUNDANT OVERSPEED TRIP SYSTEM (TROTS)
REASON FOR AMENDMENT

1. Logic and Detection Testing: To ensure the system's operability a monthly maintenance test is performed for the detection and logic circuitry. The system is also checked to ensure that each speed channel is within the required setpoints for detection overspeed at 111%. This monthly test purposely fails one speed channel at a time until all three channels are tested for operability. Because the system initiates a turbine trip when two out of three speed channels fail, a spurious signal in one of the two remaining operational channels will spuriously trip the turbine during testing. If one of the speed channels in service requires calibration, a spurious plant trip can result upon receipt of a signal that is not a true indication of overspeed. Also, a component failure in any channel combined with the purposely failed channel being tested will initiate a plant trip. This has been proven to be a credible event as the last plant trip initiated by the TROTS occurred during performance of this test.

2. Solenoid-Operated Dump Valve Testing: Other problems exist with the failure detection system. On occasion the system spuriously alarms indicating a channel failure. Troubleshooting for these situations has proven that the alarms are spurious when all system components are found operable. This situation also presents a potential spurious plant trip, especially during the monthly operations testing performed for the operability of the TROTS solenoid-operated dump valves. During the first test performed for the valves during reduced power operation in July 1988, a failure alarm in one channel was initiated, and subsequent to manual reset, a second failure alarm was spuriously initiated in another channel. A plant trip would have been initiated if the second failure alarm occurred prior to the manual reset of the first failure alarm.

Because each of these tests are performed monthly, the potential to create plant trip exists 12 times yearly for each test.

ATTACHMENT 2

SUPPORTING ANALYSES/SAFETY ANALYSIS

REMOVAL OF THE TURBINE REDUNDANT OVERSPEED TRIP SYSTEM (TROTS)
SUPPORTING ANALYSES/SAFETY ANALYSIS

Background:

The TROTS is a completely independent turbine overspeed detection and valve trip initiation system which provides a redundant method to trip the turbine upon failure of the Electro-Hydraulic Control System and the mechanical hydraulic trip function. The TROTS was not part of the original plant design; however, the system was installed prior to plant start up to satisfy the requirements of the Advisory Committee on Reactor Safeguards (ACRS) to minimize the likelihood of the turbine generator unit overspeeding above the design speed. The system is currently required as part of the licensing basis of the plant as documented in the plant Technical Specification; the original 1970 turbine missile analysis, "Likelihood and Consequences of Turbine Overspeed," and Safety Evaluation Reports dated May 1970, and May 1974.

In the original 1970 turbine missile analysis, the primary overspeed protection systems, such as the overspeed protection controller, auxiliary governor action, mechanical overspeed trip, and autostop oil solenoid dump, were not modeled in the calculation of the probability of the turbine unit overspeeding in excess of 118%. The resultant probability of 9.6×10^{-8} represented the reliability of the TROTS only.

In recent years Westinghouse has collected reliability data on both its nuclear and fossil steam turbines, and has demonstrated through probabilistic risk assessments that there is enough redundancy in the turbine control systems that failures of these systems generally do not show up in the top minimal cutsets that are most responsible for the overspeed probability. This is demonstrated at H. B. Robinson, Unit 2 as the TROTS has not been required to function as designed because the primary overspeed protection systems have been available to control the turbine speed.

As the original turbine missile analysis, "Likelihood and Consequences of Turbine Overspeed," quantified by a probabilistic risk assessment (PRA) the reliability of the TROTS to perform its function as designed, so has a PRA been performed for the existing turbine control and trip systems. The attached Westinghouse report, "Effects of Removing the Turbine Redundant Overspeed Trip System," provides the probability of turbine missile generation for H. B. Robinson, Unit No. 2, which is well below current NRC criteria for turbine missile generation and describes the systems credited and considered in the probabilistic risk assessment.

REMOVAL OF THE TURBINE REDUNDANT OVERSPEED TRIP SYSTEM (TROTS)
SUPPORTING ANALYSES/SAFETY ANALYSIS

In addition to the Westinghouse evaluation, Nuclear Mutual Limited (NML) was requested to evaluate the effects of the removal of the TROTS regarding property loss insurance. Results of the review conducted by M&M Protection Consultants for NML determined that the turbine would be adequately protected for insurance purposes with the removal of TROTS.

Evaluation:

The TROTS is not credited for providing overspeed trip protection for events analyzed in Chapter 15 of the FSAR. Therefore this change will not increase the probability of occurrence or the consequences of any accident previously evaluated in the FSAR since the TROTS is not related to the initiation or mitigation of any postulated FSAR, Chapter 15 accident. This change will not increase the probability of occurrence or the consequences of malfunction of equipment important to safety previously evaluated in the FSAR since no equipment is affected which is related to initiation or mitigation of any postulated FSAR, Chapter 15 accident. This change will not introduce new failure mechanisms which would initiate any new accident not previously anticipated or bounded by FSAR assumptions. The Westinghouse safety evaluation attached to the report "Effects of Removing the Turbine Redundant Overspeed Trip System," indicates that this change will not reduce the margin of safety as defined in the bases of any technical specification as no limits for the TROTS are defined.

Furthermore, the revised probabilistic risk assessment performed by Westinghouse, which incorporates the new fully integral (FI) rotor construction, demonstrates that the probability of missile generation significantly less than current NRC criteria, and prior operating experience for H. B. Robinson, Unit No. 2 has demonstrated that the Electro-Hydraulic Control System and associated turbine protective devices have been available to control turbine speed with no reliance on the TROTS. Intuitively, removal of a third level system such as TROTS could involve some decrease in the margin of safety. Due to differences in the analytical techniques between the original turbine missile analysis and the analysis performed to confirm the acceptability of TROTS removal, a direct, quantified determination of the magnitude of reduction is not possible. However, a comparison of the magnitude of specific results support a conclusion that a decrease in the margin of safety is not significant. That is: The calculated probability of failure to limit the turbine to 118 percent of rated speed (design overspeed) considering only the additional overspeed detection and tripping system (TROTS) for the original shrunk fit disk turbine was 9.6×10^{-8} per year per the original analysis. The current revised analysis, "Study on Effects of Removing the Turbine Redundant Overspeed Trip System & Evaluation of Surveillance Testing and Impact on Destructive Overspeed Probability," June 1989, yields a probability of turbine missile ejection (destructive overspeed) per year of approximately 7.5×10^{-8} for the presently installed fully integral rotor. The probabilities of occurrence of the events of significance in both analyses are commensurately extremely small, well below NRC acceptance criteria, and thus potential changes of even an order of magnitude would also be insignificant. Additionally, the probability of missile ejection is dominated by the probability of reaching destructive overspeed, which is not predicted to be significantly increased with TROTS removed. Therefore, removal of the system will not have an adverse impact on plant safety.

Conclusion:

Based on the above information, the removal of the TROTS will not adversely impact the level of safety of the plant, but will improve unit reliability and eliminate transients which occur each time the system spuriously trips the plant. The unreliability of the system which creates plant trips and excessive maintenance and operational activities makes it prudent from a cost, operational, and unit reliability perspective to remove the TROTS. The cost of a plant trip is not justified for the minimal protection offered by the system, since it has been demonstrated that the turbine Electro-Hydraulic Control System and associated trip functions provide an acceptable level of protection for turbine overspeed based on a revised probabilistic risk assessment which incorporates the FI rotor design, and operating experience. Further, removal of TROTS will reduce the likelihood of unnecessary challenges to safety systems.