LIMITING CONDITION FOR OPERATION

3.3.2 PRESSURE SUPPRESSION SYSTEM PRESSURE AND SUPPRESSION CHAMBER WATER TEMPERATURE AND LEVEL

Applicability:

Applies to the interrelated parameters of pressure suppression system pressure and suppression chamber water temperature and level.

Objective:

To assure that the peak suppression chamber pressure does not exceed design values in the event of a loss-of-coolant accident.

Specification:

a. The downcomers in the suppression chamber shall have a minimum submergence of three and one half feet and a maximum submergence of four and one quarter feet whenever the reactor coolant system temperature is above 215F.

b. During normal power operation, suppression chamber water temperature shall be less than or equal to 85F.

SURVEILLANCE REQUIREMENT

4.3.2 PRESSURE SUPPRESSION SYSTEM PRESSURE AND SUPPRESSION CHAMBER WATER TEMPERATURE AND LEVEL

Applicability:

Applies to the periodic testing of the pressure suppression system pressure and suppression chamber water temperature and level.

Objective:

To assure that the pressure suppression system pressure and suppression chamber water temperature and level are within required limits.

Specification:

a. At least once per day the suppression chamber water level and temperature and pressure suppression system pressure shall be checked.

b. A visual inspection of the suppression chamber interior, including water line regions, shall be made at each major refueling outage.

LIMITING CONDITION FOR OPERATION	SURVEILLANCE REQUIREMENT
c. If Specifications a and b above are not met within 24 hours, the reactor shall be shut down using normal shutdown procedures.	c. Whenever heat from relief valve operation is being added to the suppression pool, the pool temperature shall be continually monitored and also observed and logged every 5 minutes until the heat addition is terminated.
d. During testing of relief valves which add heat to the torus pool, bulk pool temperature shall not exceed 10F above normal power operation limit specified in b above. In connection with such testing the pool temperature must be reduced within 24 hours to below the normal power operation limit specified in b above.	d. Whenever operation of a relief valve is indicated and the bulk suppression pool temperature reached 160F or above while the reactor primary coolant system pressure is greater than 200 psig, an external visual examination of the suppression chamber shall be made before resuming normal power operation.
e. The reactor shall be scrammed from any operating condition when the suppression pool bulk temperature reaches 100F. Operation shall not be resumed until the pool temperature is reduced to below the normal power operation limit specified in b above.	e. Whenever there is indication of relief valve operation with the local temperature of the suppression pool reaching 200F or more, an external visual examination of the suppression chamber shall be conducted before resuming power operation.
f. During reactor isolation conditions, the reactor pressure vessel shall be depressurized to less than 200 psig at normal cooldown rates if the pool bulk temperature reaches 120F.	

BASES FOR 3.3.2 AND 4.3.2 PRESSURE SUPPRESSION SYSTEM PRESSURE AND SUPPRESSION CHAMBER WATER TEMPERATURE AND LEVEL

The combination of three and one half foot downcomer submergence, 85F suppression chamber water temperature at lake water temperature defined by specification 3.3.7/4.3.7 will maintain post accident system temperature and pressure within FSAR design limits (FSAR Section VI, XV, XVI).

The three and one half foot minimum and the four and one-quarter foot maximum submergence are a result of Suppression Chamber Heat-up Analysis and the Mark I Containment Program respectively. The minimum submergence provides sufficient water to meet the Suppression Chamber Heat-up Analysis post LOCA and the maximum submergence limits the torus levels to be consistent with the Mark I Plant Unique Anlaysis.

The 215F limit for the reactor is specified, since below this temperature the containment can tolerate a blowdown without exceeding the 35 psig design pressure of the suppression chamber without condensation.

Actually, for reactor temperatures up to 312F the containment can tolerate a blowdown without exceeding the 35 psig design pressure of the suppression chamber, without condensation.

Some experimental data suggests that excessive steam condensing loads might be encountered if the bulk temperature of the suppression pool exceeds 160F during any period of relief valve operation with sonic conditions at the discharge exit. This can result in local pool temperatures in the vicinity of the quencher of 200F. Specifications have been placed on the envelope of reactor operating conditions so that the reactor can be depressurized in a timely manner to avoid the regime of potentially high suppression chamber loadings.

In addition to the limits on temperature of the suppression chamber pool water, operating procedures define the action to be taken in the event a relief valve inadvertently opens or sticks open. As a minimum, this action would include: (1) use of all available means to close the valve, (2) initiate suppression pool water cooling heat exchangers, (3) initiate reactor shutdown, and (4) if other relief valves are used to depressurize the reactor, their discharge shall be separated from that of the stuck-open relief valve to assure mixing and uniformity of energy insertion to the pool.

Because of the large volume and thermal capacity of the suppression pool, the volume and temperature normally changes very slowly and monitoring these parameters daily is sufficient to establish any temperature trends. By requiring the suppression pool temperature to be continually monitored and frequently logged during periods of significant heat addition, the temperature trends will be closely followed so that appropriate action can be taken. The requirement for an external visual examination following any event where potentially high loadings

For reactor coolant temperatures less than 215F not enough steam is generated during a loss-of-coolant accident to pressurize the containment. For reactor coolant temperatures up to 312F, the resultant loss-of-coolant accident pressure would not exceed the design pressure of 35 psig.

Operation of only one containment spray pump is sufficient to provide the required containment spray cooling flow.[1] The specified flow of 3600 gpm at 87.7 psid primary, 89 psid secondary (approximately 95 percent to the drywell and the balance to the suppression chamber) is sufficient to remove post accident core energy released (FSAR Section VII). Requiring both pumps systems operable (400 percent redundancy) will assure the availability of the containment spray system.[1]

Allowable outages are specified to account for components that become inoperable in both systems and for more than one component in a system.

The containment spray raw water cooling system is considered operable when the flow rate is not less than 3000 gpm and the pressure on the raw water side of the containment spray heat exchangers is 10 psig greater than that on the torus water side (not less than 141 psig). The higher pressure on the raw water side will assure that any leakage is into the containment spray system.

Electrical power for all system components is normally available from the reserve transformer. Upon loss of this service the pumping requirement will be supplied from the diesel generator. At least one diesel generator shall always be available to provide backup electrical power for one containment spray system.

Automatic initiation of the containment spray system assures that the containment will not be overpressurized. This automatic feature would only be required if all core spray systems malfunctioned and significant metal-water reaction occurred. For the normal operation condition of 85F suppression chamber water, containment spray actuation would not be necessary for about 15 minutes.

[1] With two of the containment spray intertie valves open, operation of two containment spray pumps is required to assure the proper flow distribution to the containment spray headers to reduce containment pressure during the first fifteen minutes of the LOCA. Requiring two containment spray pumps to operate reduces the 400 percent redundance of the containment spray system, but there are still six combinations (two out of four pumps) that will assure two pump operation.

In conjunction with containment spray pump operation during each operating cycle, the raw water pumps and associated cooling system performance will be observed. The containment spray system shall be capable of automatic initiation from simultaneous low-low reactor water level and high containment pressure. The associated raw water cooling system shall be capable of manual actuation. Operation of the containment spray system involves spraying water into the atmosphere of the containment. Therefore, periodic system tests are not practical. Instead separate testing of automatic containment spray pump startup will be performed during each operating cycle. During pump operation, water will be recycled to the suppression chamber. Also, air tests to verify that the drywell and torus spray nozzles and associated piping are free from obstructions will be performed each operating cycle. Design features are discussed in Volume I, Section VII-B.2.0 (page VII-19*). The valves in the containment spray system are normally open and are not required to operate when the system is called upon to operate.

The test interval between operating cycle results in a system failure probability of 1.1×10^{-6} (Fifth Supplement, page 115*) and is consistent with practical considerations. Pump operability will be demonstrated on a more frequent basis and will provide a more reliable system.

The intent of Specification 3.3.7f is to allow control rod drive maintenance and instrument replacement at the time the suppression chamber is unwatered and to perform normal fuel movement activities in the refuel mode with an unwatered suppression chamber.

*FSAR

ATTACHMENT B

NIAGARA MOHAWK POWER CORPORATION

LICENSE NO. DPR-63

DOCKET NO. 50-220

Supporting Information and No Significant Hazards Consideration Analysis

Lake Ontario serves as the ultimate heat sink for various NMP1 safety related systems. Five year trends show an increase of Lake Ontario peak water temperature during mid-summer months (LER 91-04). The original FSAR assumed a peak lake temperature of 77°F. As a result, evaluations have been performed for affected safety systems to justify plant operability for lake water temperatures up to 81°F. Niagara Mohawk has just completed analysis supporting containment spray operation at a design basis temperature of 82°F which allows for a 1°F margin to the proposed limit of 81°F. The containment spray system, specification 3.3.2/4.3.2 required revision to reflect operation at this temperature. The change to specification 3.3.7/4.3.7 also incorporates the lake temperature into the requirements for operability of the containment spray system.

The containment spray system provides the cooling required to maintain the primary containment integrity during a LOCA. This system rejects heat to the ultimate heat sink through the containment spray system heat exchangers to the containment spray raw water system which takes suction from Lake Ontario through the intake canal. The containment spray system raw water (lake) temperature directly affects the heat removal capability of the containment spray heat exchangers. An increase in the design basis assumptions on lake temperature directly affects the ability of the containment spray system to perform its design basis function of cooling the suppression chamber.

The evaluation of this effect required a review of available documentation for the original FSAR suppression chamber heatup analyses to establish the base case for further analyses. This analysis was conducted under the Design Bases Reconstitution (DBR) program. The documentation of these calculations was not adequate to establish the methodology in sufficient detail to perform sensitivity studies relating to the maximum lake temperature. Therefore, the Design Basis Reconstitution (DBR) program analyzed the affect of higher lake temperature using the GE-Nuclear Energy methodology for performing this type of analysis. GE employed their SHEX-04 computer code with input assumptions consistent with those used by GE to perform this type of licensing analysis. The SHEX-04 computer program has been used by GE for analyses which have been reviewed and accepted by the NRC.

Since the methodology originally used in the FSAR could not be used, benchmark cases to transition from the original FSAR methods and input assumptions were developed. These benchmark cases included a case which analyzed the original FSAR system input assumptions coupled with new decay heat and metal water reaction assumptions coupled with new decay heat and metal water reaction assumptions. This case is used to evaluate the relative effect of changing containment spray system parameters (i.e. lake temperature) and torus initial conditions. This case showed that ~ 80% of the suppression pool temperature increase within 30 minutes. Analyses show that increasing downcomer submergence and decreasing initiation time of containment spray raw water compensates for the increase in maximum lake water temperature. The resultant peak

suppression pool temperature remains less than the above case, therefore preserving the original margin of safety.

In addition, the DBR analysis evaluated the maximum suppression chamber temperatures calculated by SHEX-04 for the design basis accident on an absolute basis to verify that all the applicable design criteria were satisfied. These criteria included core spray NPSH concerns, primary containment temperature limits and torus attached piping stress and piping supports.

The FSAR analysis of the maximum bulk suppression chamber temperature is based on the containment design basis accident which is identified as the instantaneous rupture of the reactor coolant system corresponding to a double ended break of the largest pipe in the containment (coolant recirculation line). This accident was used to determine containment leakage and was also used to calculate the maximum suppression chamber temperature. The FSAR analysis assumed a hypothetical 27.5% metal water reaction by assuming all core spray systems fail in order to evaluate the suppression chamber pressure response to the hydrogen release. The approach taken by the DBR analysis included a benchmark case using this hypothetical metal water reaction. However, the DBR analysis only evaluated the absolute magnitude of the long term containment suppression chamber maximum temperature consistent with the current USAR design basis "Loss-of-Coolant Accident" which assures that 10CFR50.46 limits are not exceeded. The LOCA analysis is based on the Loss of Offsite Power, the single failure of one of the emergency diesel generators, and the dynamic effects of the postulated pipe break, which result in one core spray pump set available to provide core cooling. Therefore, the DBR analysis of the suppression chamber temperature response considers core spray available and assumes Reg. Guide 1.7 metal water reaction consistent with the LOCA analysis and 10CFR50.46 limits, and uses the 1979 ANS Decay heat curve consistent with the LOCA analysis.

The DBR analysis evaluated the containment suppression chamber heatup assuming the containment spray system is operated in the drywell and wetwell spray mode or with Emergency Operating Procedures (i.e. combination of spray and torus cooling). The results of the analysis show that the peak bulk torus water temperature is between 158.9°F and 163°F respectively. The peak temperature occurs between 2 and 2-1/2 hours after the design basis accident event. The difference between the DBR analysis peak temperatures and FSAR analysis peak of 140°F at 1 hour is primarily because of the change in methods not the change in maximum lake temperature assumptions. Review of the DBR analysis profile shows that the temperature increases to 140°F within 10 minutes because of the design basis accident reactor blowdown. From 10 minutes until the peak temperature is reached the torus heatup is governed by the decay heat. When the heat removal rate exceeds the decay heat, the temperature parameters such as raw water temperature only nominally affect the peak temperature since 80% of the temperature rise occurs prior to initiation of containment cooling.

The lake temperature change from 77°F to 82°F changes the peak torus temperature approximately by 2 to 3 degrees and at most by 5°F. Operation with a second heat exchanger would significantly reduce the time at which the heat removal is greater than the heat added (i.e., from ~2 hours to ~1 hour) which would terminate the temperature increase at about 150°F. Two heat