3.7 - LIMITING CONDITIONS FOR OPERATION

K. Suppression Chamber

The suppression chamber shall be OPERABLE with:

1. The suppression pool water level between 14' 6.5" and 14' 10.5",

2. A suppression pool maximum average water temperature of ≤95°F during OPERATIONAL MODE(s) 1 or 2, except that the maximum average temperature may be permitted to increase to:

   a. ≤105°F during testing which adds heat to the suppression pool.

   b. ≤110°F with THERMAL POWER ≤1% of RATED THERMAL POWER.

   c. ≤120°F with the main steam line isolation valves closed following a scram.

3. A total leakage between the suppression chamber and drywell of less than the equivalent leakage through a 1 inch diameter orifice at a differential pressure of 1.0 psid.

APPLICABILITY:

OPERATIONAL MODE(s) 1, 2 and 3.

ACTION:

1. With the suppression pool water level outside the above limits, restore the water level to within the limits

4.7 - SURVEILLANCE REQUIREMENTS

K. Suppression Chamber

The suppression chamber shall be demonstrated OPERABLE:

1. By verifying the suppression pool water level to be within the limits at least once per 24 hours.

2. At least once per 24 hours by verifying the suppression pool average water temperature to be ≤95°F, except:

   a. At least once per 5 minutes during testing which adds heat to the suppression pool, by verifying the suppression pool average water temperature to be ≤105°F.

   b. At least once per hour when suppression pool average water temperature is ≥95°F, by verifying:

      1) Suppression pool average water temperature to be ≤110°F, and

      2) THERMAL POWER to be ≤ 1% of RATED THERMAL POWER after suppression pool average water temperature has exceeded 95°F for more than 24 hours.

   c. At least once per 30 minutes with the main steam isolation valves closed following a scram and suppression pool average water temperature >95°F, by verifying suppression pool average water temperature to be ≤120°F.

3.7 - LIMITING CONDITIONS FOR OPERATION

within 1 hour or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

2. In OPERATIONAL MODE(s) 1 or 2 with the suppression pool average water temperature >95°F, except as permitted above, restore the average temperature to ≤95°F within 24 hours or reduce THERMAL POWER to ≤1% RATED THERMAL POWER within the next 12 hours.

3. With the suppression pool average water temperature >105°F during testing which adds heat to the suppression pool, except as permitted above, stop all testing which adds heat to the suppression pool and restore the average temperature to ≤95°F within 24 hours or reduce THERMAL POWER to ≤1% RATED THERMAL POWER within the next 12 hours.

4. With the suppression pool average water temperature >110°F, immediately place the reactor mode switch in the Shutdown position and operate at least one low pressure coolant injection loop in the suppression pool cooling mode.

5. With the suppression pool average water temperature >120°F, depressurize the reactor pressure vessel to <150 psig (reactor steam dome pressure) within 12 hours.

4.7 - SURVEILLANCE REQUIREMENTS

3. Deleted.

4. Deleted.

5. At least once per 18 months by conducting a drywell to suppression chamber bypass leak test at an initial differential pressure of 1.0 psid and verifying that the measured leakage is within the specified limit. If any drywell to suppression chamber bypass leak test fails to meet the specified limit, the test schedule for subsequent tests shall be reviewed and approved by the Commission. If two consecutive tests fail to meet the specified limit, a test shall be performed at least every 9 months until two consecutive tests meet the specified limit, at which time the 18 month test schedule may be resumed.

3.8 - LIMITING CONDITIONS FOR OPERATION	4.8 - SURVEILLANCE REQUIREMENTS

C. Ultimate Heat Sink

The ultimate heat sink shall be OPERABLE with:

1. A minimum water level at or above elevation 500 ft Mean Sea Level, and

2. An average water temperature of ≤85°F. 75

APPLICABILITY:

OPERATIONAL MODE(s) 1, 2, 3, 4, 5 and *.

ACTION:

With the requirements of the above specification not satisfied:

1. In OPERATIONAL MODE(s) 1, 2 or 3, be in at least HOT SHUTDOWN within 12 hours and in COLD SHUTDOWN within the next 24 hours.

2. In OPERATIONAL MODE(s) 4 or 5 declare the diesel generator cooling water system inoperable and take the ACTION required by Specification 3.8.B.

3. In OPERATIONAL MODE *, declare the diesel generator cooling water system inoperable and take the ACTION required by Specification 3.8.B. The provisions of Specification 3.0.C are not applicable.

C. Ultimate Heat Sink

The ultimate heat sink shall be determined OPERABLE at least once per 24 hours by verifying the average water temperature and water level to be within their limits.

* When handling irradiated fuel in the secondary containment, during CORE ALTERATION(s), and operations with a potential to drain the reactor vessel.

discontinuities in the vicinity of the relief valve discharge since these are expected to be the points of highest stress.

Add insert from next page

Under full power operating conditions, blowdown from an initial suppression chamber water temperature of 95°F results in a water temperature of approximately 145°F immediately following blowdown which is low enough to provide complete condensation via T-quencher devices. At this temperature and atmospheric pressure, the available net positive suction head exceeds that required by the emergency core cooling system pumps, thus there is no dependency on containment overpressure during the accident injection phase.

Experimental data indicates that excessive steam condensing loads can be avoided if the peak temperature of the suppression pool is maintained sufficiently low during any period of safety relief valve operation for T-quencher devices. 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 safety or relief valve inadvertently opens or sticks open. As a minimum this action shall include: (1) use of all available means to close the valve, (2) initiate suppression pool water cooling, (3) initiate reactor shutdown, and (4) if other safety or relief valves are used to depressurize the reactor, their discharge shall be separated from that of the stuck-open safety or relief valve to assure mixing and uniformity of energy insertion to the pool.

In conjunction with the Mark I Containment Short Term Program, a plant unique analysis was performed which demonstrated a factor of safety of at least two for the weakest element in the suppression chamber support system and attached piping. The maintenance of a drywell-suppression chamber differential pressure and a suppression chamber water level corresponding to a downcomer submergence range of 3.67 to 4.00 feet will assure the integrity of the suppression chamber when subjected to post-LOCA suppression pool hydrodynamic forces.

3/4.7.L Suppression Chamber and Drywell Spray

Following a Design Basis Accident (DBA), the suppression chamber spray function of the low pressure coolant injection (LPCI)/containment cooling system removes heat from the suppression chamber air space and condenses steam. The suppression chamber is designed to absorb the sudden input of heat from the primary system from a DBA or a rapid depressurization of the reactor pressure vessel through safety or relief valves. There is one 100% capacity containment spray header inside the suppression chamber. Periodic operation of the suppression chamber and drywell sprays may also be used following a DBA to assist the natural convection and diffusion mixing of hydrogen and oxygen when other ECCS requirements are met and oxygen concentration exceeds 4%. Since the spray system is a function of the LPCI/containment cooling system, the loops will not be aligned for the spray function during normal operation, but all components required to operate for proper alignment must be OPERABLE.

Attachment B
Revised UFSAR and Technical Specification Bases Pages

Insert to Page B 3/4.7 - 6, Section 3/4.7.K

Under full power operating conditions, blowdown to the suppression chamber with an initial water temperature of 95°F results in a water temperature of approximately 145°F. This peak temperature is low enough to provide complete condensation via T-quencher devices. However, a maximum average suppression pool temperature of 75°F and approximately 2 psi of containment pressure is required to assure adequate net positive suction pressure for the ECCS pumps during the first 10 minutes following certain analyzed accidents. No positive containment pressure is required to assure adequate net positive suction pressure for the ECCS pumps after the first 10 minutes.

3.7 - LIMITING CONDITIONS FOR OPERATION

K. Suppression Chamber

The suppression chamber shall be OPERABLE with:

1. The suppression pool water level between 14' 6.5" and 14' 10.5",
2. A suppression pool maximum average water temperature of ≤75°F during OPERATIONAL MODE(s) 1 or 2, except that the maximum average temperature may be permitted to increase to:
   a. ≤85°F during testing which adds heat to the suppression pool.
   b. ≤100°F with THERMAL POWER ≤1% of RATED THERMAL POWER.
   c. ≤110°F with the main steam line isolation valves closed following a scram.
3. A total leakage between the suppression chamber and drywell of less than the equivalent leakage through a 1 inch diameter orifice at a differential pressure of 1.0 psid.

APPLICABILITY:

OPERATIONAL MODE(s) 1, 2 and 3.

ACTION:

1. With the suppression pool water level outside the above limits, restore the water level to within the limits

4.7 - SURVEILLANCE REQUIREMENTS

K. Suppression Chamber

The suppression chamber shall be demonstrated OPERABLE:

1. By verifying the suppression pool water level to be within the limits at least once per 24 hours.
2. At least once per 24 hours by verifying the suppression pool average water temperature to be ≤75°F, except:
   a. At least once per 5 minutes during testing which adds heat to the suppression pool, by verifying the suppression pool average water temperature to be ≤85°F.
   b. At least once per hour when suppression pool average water temperature is ≥ 75°F, by verifying:
      1) Suppression pool average water temperature to be ≤ 100°F, and
      2) THERMAL POWER to be ≤ 1% of RATED THERMAL POWER after suppression pool average water temperature has exceeded 75°F for more than 24 hours.
   c. At least once per 30 minutes with the main steam isolation valves closed following a scram and suppression pool average water temperature >75°F, by verifying suppression pool average water temperature to be ≤110°F.

3.7 - LIMITING CONDITIONS FOR OPERATION

within 1 hour or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

2. In OPERATIONAL MODE(s) 1 or 2 with the suppression pool average water temperature >75°F, except as permitted above, restore the average temperature to ≤75°F within 24 hours or reduce THERMAL POWER to ≤1% RATED THERMAL POWER within the next 12 hours.

3. With the suppression pool average water temperature >85°F during testing which adds heat to the suppression pool, except as permitted above, stop all testing which adds heat to the suppression pool and restore the average temperature to ≤75°F within 24 hours or reduce THERMAL POWER to ≤1% RATED THERMAL POWER within the next 12 hours.

4. With the suppression pool average water temperature >100°F, immediately place the reactor mode switch in the Shutdown position and operate at least one low pressure coolant injection loop in the suppression pool cooling mode.

5. With the suppression pool average water temperature >110°F, depressurize the reactor pressure vessel to <150 psig (reactor steam dome pressure) within 12 hours.

4.7 - SURVEILLANCE REQUIREMENTS

3. Deleted.

4. Deleted.

5. At least once per 18 months by conducting a drywell to suppression chamber bypass leak test at an initial differential pressure of 1.0 psid and verifying that the measured leakage is within the specified limit. If any drywell to suppression chamber bypass leak test fails to meet the specified limit, the test schedule for subsequent tests shall be reviewed and approved by the Commission. If two consecutive tests fail to meet the specified limit, a test shall be performed at least every 9 months until two consecutive tests meet the specified limit, at which time the 18 month test schedule may be resumed.

3.8 - LIMITING CONDITIONS FOR OPERATION

C. Ultimate Heat Sink

The ultimate heat sink shall be OPERABLE with:

1. A minimum water level at or above elevation 500 ft Mean Sea Level, and

2. An average water temperature of ≤75°F.

APPLICABILITY:

OPERATIONAL MODE(s) 1, 2, 3, 4, 5 and *.

ACTION:

With the requirements of the above specification not satisfied:

1. In OPERATIONAL MODE(s) 1, 2 or 3, be in at least HOT SHUTDOWN within 12 hours and in COLD SHUTDOWN within the next 24 hours.

2. In OPERATIONAL MODE(s) 4 or 5 declare the diesel generator cooling water system inoperable and take the ACTION required by Specification 3.8.B.

3. In OPERATIONAL MODE *, declare the diesel generator cooling water system inoperable and take the ACTION required by Specification 3.8.B. The provisions of Specification 3.0.C are not applicable.

4.8 - SURVEILLANCE REQUIREMENTS

C. Ultimate Heat Sink

The ultimate heat sink shall be determined OPERABLE at least once per 24 hours by verifying the average water temperature and water level to be within their limits.

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* When handling irradiated fuel in the secondary containment, during CORE ALTERATION(s), and operations with a potential to drain the reactor vessel.

discontinuities in the vicinity of the relief valve discharge since these are expected to be the points of highest stress.

Under full power operating conditions, blowdown to the suppression chamber with an initial water temperature of 95°F results in a water temperature of approximately 145°F. This peak temperature is low enough to provide complete condensation via T-quencher devices. However, a maximum average suppression pool temperature of 75°F and approximately 2 psi of containment pressure is required to assure adequate net positive suction pressure for the ECCS pumps during the first 10 minutes following certain analyzed accidents. No positive containment pressure is required to assure adequate net positive suction pressure for the ECCS pumps after the first 10 minutes.

Experimental data indicates that excessive steam condensing loads can be avoided if the peak temperature of the suppression pool is maintained sufficiently low during any period of safety relief valve operation for T-quencher devices. 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 safety or relief valve inadvertently opens or sticks open. As a minimum this action shall include: (1) use of all available means to close the valve, (2) initiate suppression pool water cooling, (3) initiate reactor shutdown, and (4) if other safety or relief valves are used to depressurize the reactor, their discharge shall be separated from that of the stuck-open safety or relief valve to assure mixing and uniformity of energy insertion to the pool.

In conjunction with the Mark I Containment Short Term Program, a plant unique analysis was performed which demonstrated a factor of safety of at least two for the weakest element in the suppression chamber support system and attached piping. The maintenance of a drywell-suppression chamber differential pressure and a suppression chamber water level corresponding to a downcomer submergence range of 3.67 to 4.00 feet will assure the integrity of the suppression chamber when subjected to post-LOCA suppression pool hydrodynamic forces.

3/4.7.L Suppression Chamber and Drywell Spray

Following a Design Basis Accident (DBA), the suppression chamber spray function of the low pressure coolant injection (LPCI)/containment cooling system removes heat from the suppression chamber air space and condenses steam. The suppression chamber is designed to absorb the sudden input of heat from the primary system from a DBA or a rapid depressurization of the reactor pressure vessel through safety or relief valves. There is one 100% capacity containment spray header inside the suppression chamber. Periodic operation of the suppression chamber and drywell sprays may also be used following a DBA to assist the natural convection and diffusion mixing of hydrogen and oxygen when other ECCS requirements are met and oxygen concentration exceeds 4%. Since the spray system is a function of the LPCI/containment cooling system, the loops will not be aligned for the spray function during normal operation, but all components required to operate for proper alignment must be OPERABLE.

Attachment B

Revised UFSAR and Technical Specification Bases Pages

Affected Updated Final Safety Analyses Report Pages

6.2 - 25	6.2 - 49
Table 6.2 - 7	6.2 - 57
6.2 - 59	6.3 - 77
6.3 - 78	6.3 - 79
Table 6.3 - 17	Table 6.3 - 18
Figure 6.3 - 80	9.2 - 2
Table 9.2 - 1	

6.2.1.3.3 Containment Long-Term Response to a Design Basis Accident

The original DBA analyses showed that after the blowdown immediately following a postulated recirculation line break, the temperature of the suppression chamber water would approach 130°F, and the primary containment system pressure would equalize at about 27 psig as discussed in Section 6.2.1.3.2. Most of the noncondensible gases would be transported to the suppression chamber during blowdown. However, soon after initiation of the containment spray, the gases would redistribute between the drywell and the suppression chamber via the vacuum-breaker system as the spray reduces drywell pressure.

The core spray system would remove decay heat and stored heat from the core, thereby minimizing core heatup and any metal-water reaction. The core heat is removed from the reactor vessel through the broken recirculation line in the form of hot liquid. This hot liquid combines with liquid from the containment spray and flows into the suppression chamber via the drywell-to-suppression-chamber connecting vent pipes. Steam flow would be negligible. The energy transported to the suppression chamber water would ultimately be removed from the primary containment system by the containment cooling heat exchangers.

To assess the long-term pressure and temperature response of the primary containment after the postulated blowdown, and to demonstrate the adequacy and redundancy of the core and containment cooling systems, an analysis was made of the recirculation line break under various conditions of core and primary containment cooling. The original licensing basis long-term pressure and temperature response of the primary containment was analyzed for the following cooling conditions:

A. Operation of two core spray system loops and one of the two containment cooling loops with two LPCI pumps in service;

B. Operation of only one of the two core spray system loops and both of the containment cooling loops each with two LPCI pumps in service;

C. Operation of only one of the two core spray system loops and one of the two containment cooling loops with two LPCI pumps in service; and

D. Operation of only one of the two core spray system loops and one-half of one containment cooling loop, i.e., one LPCI pump in service.

For each of the above listed analyses, two containment cooling service water (CCSW) pumps providing a total flow of 7000 gal/min per operating heat exchanger were assumed to be in service. <Insert A>

The initial pressure response of the system while the reactor vessel is blowing down (the first 30 seconds after the break) is as reported in Section 6.2.1.3.2 for all cases considered here. For each case, the temperature of the suppression pool was calculated as a function of time, conservatively considering the pool to be the only heat absorber in the system. The effects of decay energy, stored energy in the core, INSERT A to page 6.2-25

at a cooling water inlet temperature of 95 degrees F. The plant is currently operating under temperature limitations which prohibit operation when the cooling water inlet temperature or the torus bulk water temperature exceeds 75 degrees F. Under the current temperature limit, a CCSW flowrate of 5600 gpm ensures that the required 20 psi differential between the CCSW and LPCI systems is maintained at the LPCI heat exchanger during the limiting DBA LOCA with a diesel generator failure and a containment cooling pump combination of 1 LPCI pump/2 CCSW pumps.

and the LPCI suppression pool cooling mode discharge pipe configuration. The T-quencher was modified by adding a number of holes on the tips of one of the quencher arms. The LPCI system was modified by installing a 90° elbow, with a reducing nozzle, at the end of the existing discharge lines. These modifications were intended to promote mixing in the suppression pool during SRV discharge. Test results show a substantial improvement in pool mixing. The difference between bulk and local temperature was reduced to approximately 15°F for the test, with one loop of LPCI operating in the suppression pool cooling mode.

A plant-specific analysis was performed to determine the suppression pool temperature limit for Dresden. Figure 6.2-39 shows the resulting local pool temperature limit for Dresden Units 2 and 3 as a function of reactor pressure.

Figure 6.2-39 shows that for all plant transients involving SRV operation during which the steam flux through the T-quencher perforations exceeds 94 lbm/ft^2-sec, the suppression pool local temperature limit is 200°F. For all plant transients involving SRV operations during which the steam flux through the T-quencher perforations is less than 42 lbm/ft^2-sec, the suppression pool local temperature limit shall ensure 20°F subcooling.

The Dresden T-quenchers are submerged in 9.17 feet of water corresponding to 18.53 psia. The saturation temperature at 18.53 psia is 224°F. Thus, to achieve 20°F subcooling the local temperature limit with a steam flux of less than 42 lbm/ft^2-sec is 204°F.

To demonstrate that the local pool temperature limit is satisfied, seven limiting transients involving SRV discharges were analyzed. Table 6.2-6 presents a summary of the transients analyzed and the corresponding pool temperature results. Three of the transients conservatively assumed the failure of one RHR loop, in addition to the single equipment malfunction or operator error which initiated the event. This conservative assumption exceeds the current licensing basis for anticipated operational transients. As noted in Table 6.2-6, the containment cooling heat exchanger heat transfer rate assumed in these analyses is 416.7 Btu/s-°F per loop. This was derived from the containment cooling heat exchanger specification which states an overall heat transfer rate of 105 x 10^6 Btu/hr is achieved given CCSW flow of 7000 gal/min at 95°F, and LPCI flow through the heat exchanger of 10,700 gal/min at 165°F. <Insert B>

Each of the SRV discharge transients was analyzed assuming an initial pool temperature of 95°F, which is the Technical Specification pool temperature limit for normal power operation. The notes to Table 6.2-6 list other initial conditions and assumptions included in these analyses.

The analyses of Table 6.2-6, Case 2C, normal depressurization at isolated hot shutdown, shows a maximum local pool temperature of 153°F. This demonstrates that with no system failures and in the event of a nonmechanistic scram, depressurization of the reactor pressure vessel via SRVs at 100°F/hr results in local pool temperatures well below the condensation stability limit shown in Figure 6.2-39.

INSERT B to page 6.2-49

This limit ensures that an equivalent amount of containment heat removal is provided assuming an overall LPCI heat exchanger duty of 98.6 E6 BTU/hr.

Table 6.2-7

CONTAINMENT COOLING EQUIPMENT SPECIFICATIONS

Containment Cooling Heat Exchangers

Number	2
dP - river water to containment water	20 psi
Primary (shell) design pressure	375 psi
Secondary (tube) design pressure	375 psi

Containment Cooling Heat Exchanger Capability

Basis	LPCI Flow (gal/min)	LPCI[1] Temp. °F	CCSW Flow (gal/min)	CCSW[2] Temp. °F	Heat Load (Btu/hr)
Heat exchanger design specification	10,700	165	7000 (1)	95 (2)	105×10^6 (3)

Heat Exchanger Codes

Shell Side	Carbon Steel A212, Grade B
Code	ASME Section III (1965, Class C) Requirements per manufacturer's specification sheet. Certificate of Shop Inspection indicates construction per applicable code. Berlin Chapman Specification Sheet specifies heat exchanger built to ASME Section III.
Radiography requirements	Tested in accordance with GE Specification 21A5451, Section 4.0 which states testing per ASME Section III, Class C. Manufacturer's data sheet specified joint efficiency of 100% and radiography as complete.

<INSERT C>

INSERT C to Table 6.2-7

Notes

(1) CCSW flow is 5600 gpm to maintain the required pressure differential between CCSW and LPCI systems when LPCI is operating at rated flows during the limiting DBA LOCA with a Diesel Generator failure and a containment cooling pump combination of 1 LPCI/2 CCSW pumps. The pressure differential across the LPCI heat exchanger prevents release of radioactivity in the event of a tube leak in the LPCI heat exchanger during a design basis accident.

(2) CCSW inlet temperature is limited to less than or equal to 75 degrees F when the plant is operating to compensate for the reduced flow, heat exchanger duty and resolve low pressure ECCS net positive suction head concerns.

(3) Actual heat exchanger performance is 98.6 E6 BTU/hr.

The containment cooling heat exchangers are sized on the basis of their required duty to meet the containment capability. This duty is determined by calculating the amount of heat which must be rejected from the suppression pool (assuming HPCI operation) to ensure that in the event of a LOCA, the terminal suppression pool temperature does not exceed 170°F. Refer to Section 6.2.1 for a description of the suppression pool cooling requirements. The heat exchangers are designed to withstand the maximum pressures corresponding to the shutoff heads of the CCSW and LPCI pumps. When service water is flowing, the pressure on the tube side of the heat exchanger is maintained 20 psi above the pressure on the shell side to prevent shell side water leakage into the service water and subsequent discharge to the river. Local instrumentation is provided to monitor the ΔP between the LPCI heat exchanger tube side and shell side. Additional containment cooling heat exchanger design information is provided in Table 6.2-7.

Since the LPCI flow passes through the containment cooling heat exchangers, containment heat may be rejected during post-LOCA LPCI mode operation by starting the CCSW pumps (when sufficient electrical power is available) to provide cooling to the heat exchangers. This results in the transfer of heat from the suppression pool to the CCSW system. During this mode of operation, suction is taken from the suppression pool, pumped through the containment cooling heat exchangers to the reactor vessel, and back to the drywell via the postulated break. When the drywell water level reaches the level of the containment vent pipes, the water flows through the vent pipes to the suppression pool.

Stagnant water conditions in the containment cooling heat exchangers (EPNs 2(3)-1503-A&B) during standby conditions cause both pitting and corrosion of the 70-30 CuNi tubes.[34] This has resulted in heat exchanger tube leaks and excessive equipment outage durations. Various materials were evaluated for better corrosion resistance and AL-6XN was selected as the replacement tube material. A limited number of tubes will be replaced with AL-6XN tubes as tubes fail. (AL-6XN has been accepted by ASME under Code Case N-438).

A heat transfer analysis was performed by the heat exchanger manufacturer to demonstrate that the use of AL-6XN tubes will not change the heat removal capabilities of the heat exchanger to the extent that the suppression pool temperature would exceed its licensing limit. The analysis used Heat Transfer Research Institute proprietary computer programs. The heat exchanger heat transfer rate was calculated to be 95.2 X 10^6 Btu/hr assuming that all the tubes were replaced. This would constitute a 9% drop from the original heat exchanger design duty of 105 X 10^6 Btu/hr and a 7% drop from the FSAR value of 102 X 10^6 Btu/hr. To ensure that other design basis evaluations are not invalidated by replacement of these tubes, the number of tubes plugged or replaced in each heat exchanger will be limited such that the total reduction in heat removal capability will not exceed that which would result from plugging 6% of the 70-30 CuNi heat exchanger tubes. The 6% limit is based on the number of excess tubes provided in the containment cooling heat exchanger design. The 6% replacement limitation will ensure that the design basis heat exchanger capability will not be reduced. The relationship between plugging tubes and replacing 70-30 CuNi tubes with AL-6XN tubes is shown in Figure 6.2-42.

Fibrous insulation is a molded insulation used only on parts of the recirculation system and the 4-inch and smaller lines. The total amount of such material used in the drywell is only 0.16% by volume or 0.05% by weight of the suppression pool water. Any postulated accident would dislodge only a fraction of this material.

Miscellaneous items are expected to contribute a negligible volume of contaminates in comparison to the suppression pool water volume. Any particles contributed are expected either to be stopped by strainers if they reach that position or to be colloidal rust type particles which would have little or no effect on ECCS pump seals or bearings.

As well as having limited contaminate sources, minimal probability of problems exist because of the circuitous path from the drywell to ECCS pump suctions. Particles first must pass through 1 x 1 ½-foot openings from the drywell to the 8-foot suppression pool downcomers. The downcomers are connected to large spherical shells which are interconnected by 4-foot diameter pipes forming the inner suppression pool ring header. From this header, the path to the suppression pool is through 96 circumferentially spaced 24-inch diameter pipes which extend below the suppression pool water line. The path then proceeds through four suppression pool suction strainers located about ⅓ of the suppression pool water level height above the suppression pool bottom. From the strainers the path leads into a 24 inch suction ring header and then to the pump suctions. This path is quite circuitous, providing many places to trap foreign objects and also spreading the particles that do get through uniformly throughout the suppression pool volume. Larger pieces of metal will settle to the bottom of the suppression pool, and lighter materials such as unibestos will float rather than be drawn into the ECCS pump inlets.

The average water velocity in the suppression pool during ECCS equipment operation is less than 0.1 ft/s and is not sufficient to transport particles (except for the smaller pieces in colloidal suspension). However, during a postulated blowdown from the drywell to the suppression pool, there will be a less idealized situation. The suppression pool water will be disturbed and a certain portion of materials will be near the suction strainers. The strainers are stainless steel perforated plates with 3/32 inch diameter openings. Larger pieces and part of longer pieces (of smaller diameter) will be stopped and the strainer effective area will be somewhat reduced. To account for this possibility, hydraulic performance of the ECCS pump system is based on 100% plugging of one of the four strainers with one foot head loss assumed across each of the remaining strainers. Therefore, more than a 33% extra strainer capacity is available. This conclusion is conservatively based on simultaneous operation of all ECCS equipment at full rated flow.

Extended operation of all ECCS pumps is not required in order to satisfy long term decay heat removal requirements. Short term DBA-LOCA cooling analyses assume the use of two LPCI pumps and one core spray pump, or two core spray pumps, to provide adequate core cooling. However, on a long-term basis, only one LPCI and one core spray pump are necessary to provide required cooling to the containment and the core. This flow would require only one-eighth of the total screen area. Also, the suppression pool water is demineralized and does not contain special additives. Therefore, the pH is expected to remain essentially that could be accommodated without any clad temperature rise would be extended from 0.2 to 0.7 square feet. The 0.7 square foot break is equivalent to a double-ended rupture in an 8-inch line. For very large breaks the continued injection of feedwater does not influence the peak clad temperature curve so markedly. These breaks would cause the vessel to blowdown very rapidly with or without feedwater. The resultant core thermal transient would be terminated by flooding the inner shroud and since any feedwater flow would enter the vessel outside the shroud, feedwater cannot be considered as part of the flooding capacity. Hence, the end points of curves C and D are at essentially the same peak clad temperature.

6.3.3.4.3 Net Positive Suction Head for ECCS Pumps

Insert G

To demonstrate that adequate net positive suction head (NPSH) will be available to the core spray and LPCI pumps at all times, an analysis was performed based on the following degraded conditions:

A. An indefinite loss of offsite power.

B. An indefinite loss of one onsite diesel generator.

C. The maximum service water temperature — normally the service water is at least 10°F cooler than maximum, which would reduce the peak pool temperature.

D. The maximum pre-accident drywell temperature (150°F) and relative humidity (100%). Normal operating conditions are about 135°F/35% relative humidity which increases NPSH by about 4 feet due to increased gas pressure resulting from the increased moles of noncondensible gases in the containment. Even if a small leak preceded the accident, thereby increasing the drywell temperature and relative humidity, the moles of noncondensible gases contained in the primary containment would still be specified by the normal conditions since venting of these gases is not allowed. Therefore, the assumed initial conditions are very conservative.

E. A minimum pre-accident containment pressure (0 psig) — normal operating pressure is currently 1.10 to 1.25 psig, and there are no circumstances under which a subatmospheric pressure would occur.

F. Accidental actuation of containment sprays at rated flow — procedurally the operator will actuate the sprays only in the event of an abnormal rise in containment pressure. Therefore, actuation of the containment sprays requires an operator error. Actuation of the containment sprays will rapidly reduce the containment pressure.

G. Containment gas leakage at the rate of 5% per day.

DFL 96075

The results of the analysis are summarized in Figure 6.3-80 where the containment pressure available is shown to always ~~exceed the containment pressure required to operate the pumps at rated flow.~~ An evaluation was performed using the original design basis information and assumptions that validated this figure for the existing 1LPCI/2CCSW pumps configuration.

(Insert Attachment Here) DFL 96068

Insert G to page 6.3-77

The evaluation of post LOCA NPSH for Core Spray and LPCI pumps was divided into two portions:

- Short Term (less than 600 seconds- no operator action credited -vessel injection phase)
- Long Term (greater than 600 seconds -operator action credited - containment cooling phase)

It should be noted that the 600 second mark for operator action was established per UFSAR Sections 6.2.1.3.3 as the time in which credit for manual initiation of containment cooling can be taken.

CS/LPCI PUMP Post-LOCA Short Term Evaluation

This calculation examines the Net Positive Suction Head (NPSH) available to the Dresden LPCI and Core Spray (CS) pumps in the first 600 seconds following a DBA-LOCA. Specifically, the GE SIL 151 case was evaluated, which postulates a failure of the LPCI Loop Select logic. Such a failure results in 4 LPCI and 2 CS pumps operating, with the LPCI pumps injecting into a broken reactor recirculation loop (minimizing flow to reactor for Peak Clad Temperature considerations). Due to the high flows anticipated, the Core Spray pumps may cavitate, resulting in reduced system flow. This reduced flow was calculated and compared to the minimum flow required of the CS system. This calculation will be performed using a reduced initial torus temperature of 75°F and a torus pressure of 2 psig.

The minimum suppression pool pressure required to satisfy LPCI and CS pump NPSH requirements was determined under short-term post-LOCA conditions. If the pool pressure required is greater than the pressure available, then the potential exists for the pumps to cavitate, resulting in reduced flows. A minimum Core Spray system flow of 10,552 (5276 per pump) is required for the first 200 seconds post-accident to ensure the PCT remains below 2200°F while a nominal Core Spray flow of 4500 gpm is acceptable beyond 200 seconds.

NPSH Required (NPSHR) curves for the LPCI/CS pumps are provided on the original vendor pump curves. These NPSHR curves represent the point at which a 3% reduction in pump developed head has occurred. Cavitation tests were performed on this pump model by the vendor at various flow rates. The test data indicates that the pump remains stable for several feet below the NPSHR value, which is expected, before the pump head collapses (full cavitation). Based on the flow rates at which the pumps were tested, it is possible to develop a reduced NPSHR curve that represents the point at which full cavitation has been achieved. Thus, given a known set of conditions (temperature, pressure, level), the reduced flows at which the pumps will operate was determined as follows:

1. Assume initial operating pump flow rate (maximum pump flow).

2. Determine the suppression pool pressure required to satisfy the pump's reduced NPSH requirements using the assumed pump flow and the expected torus temperature at 200 seconds post-LOCA.
3. Reduce pump flow estimate until the pool pressure required equals the minimum pool pressure available. It is at this flow that the pump will be in full cavitation and the total developed head (TDH) will drop off. Since this drop-off is essentially vertical, the pump curve will intersect the system curve at this flow, i.e., this is the flow at which the system will operate.

Maximum LPCI and Core Spray pump flows used are as follows. These flows were calculated at 0 psid between the reactor and the containment.

Core Spray 1-Pump Maximum Injection Flow	5800 gpm
LPCI 4-Pump Maximum Injection Flow to broken loop	20,600 gpm

For the purposes of this evaluation, a suppression pool pressure of 2 psig was assumed. This is consistent with the discussion provided in Dresden UFSAR Section 6.3.3.4.3, in which the presence of 2 psig in the drywell is expected since this is one of the signals which initiates the ECCS. This assumption is conservative based on the following:

- The Dresden post-LOCA containment pressure response (Dresden UFSAR Figure 6.2-19) indicates an expected suppression pool pressure of >15 psig at 200 seconds, and >10 psig at 600 seconds.
- The Quad Cities post-LOCA expected suppression pool pressure is >20 psig at 200 seconds and 600 seconds (Quad Cities UFSAR Figure 6.2-16).

While no Dresden-specific short-term containment temperature response exists, a reasonable estimate can be made using the following existing analyses:

- The temperature profiles for Quad Cities are available and are considered representative for use at Dresden, based on plant similarities with respect to containment size, core power, and reactor operating parameters. The Quad Cities containment response (Quad Cities UFSAR Figure 6.2-18) indicates the pool temperature at 200 seconds is 144°F, and at 600 seconds is 147°F, based on a 90°F initial pool temperature. These values were developed using original analysis techniques, including the May-Witt decay heat model, no feedwater flow and no pump heat added. If corrected to a 95°F initial pool temperature (assuming a one-to-one short-term temperature relationship), these values are conservative.

Therefore, for the purposes of this evaluation, the conservative Quad Cities temperatures will be used.

It is assumed that a reduction in initial suppression pool temperature will result in a corresponding linear reduction in the short-term pool temperature response, since pool cooling is not active. Given this assumption, therefore, for a reduced initial pool temperature of 75°F (15°F reduction from Quad Cities values based on 90°F initial torus temperature), the pool temperature at 200 seconds post-LOCA is 129°F, and at 600 seconds is 132°F.

A drawdown of 2.1 feet was used.

GE SIL 151 includes a case of all 4 LPCI pumps injecting into both reactor recirculation loops simultaneously, with one loop broken. While it is expected that this case may result in slightly higher LPCI pump flow rates, a significant amount of water will be injected into the reactor through the intact loop. Therefore, any reduction in Core Spray system flow due to cavitation below the minimum required flow will be made up by the LPCI flow injecting into the reactor. Therefore, it is expected that the PCT will not be challenged in this case.

It was determined that when all six ECCS pumps are running, the potential exists for the LPCI and Core Spray pumps to cavitate. The LPCI pump NPSH deficit is relatively small and will result in a negligible reduction in flow due to cavitation (< 100 gpm per pump). The reduced flow at which the Core Spray pumps will operate in the first 200 seconds was estimated to be greater than 5300 gpm per pump, which is adequate to ensure the PCT remains below 2200°F. The Core Spray pump reduced flow beyond 200 seconds would be at least 5300 gpm per pump, which is greater than the nominal 4500 gpm per pump required. Therefore, it is concluded that adequate NPSH exists to ensure the LPCI/CS pumps can perform their safety function using a reduced initial torus temperature of 75°F and a torus pressure of 2 psig.

CS/LPCI Pump Post-LOCA Long Term Evaluation

The minimum suppression pool pressure required to ensure LPCI and CS pump protection was determined under long-term post-LOCA conditions at the bounding NPSH condition. Since the suppression pool pressure remains constant after 600 seconds (14.7 psia), the bounding NPSH condition occurs at the time of peak suppression pool temperature. If the pressure required is less than 14.7 psia, then the pump NPSH requirements have been met. If the required pressure is greater than 14.7 psia, then the potential exists for the pumps to cavitate. In these situations, LPCI pump flows will be reduced to below-nominal values and new cases were run to establish the ability of the operator to throttle the pumps to an acceptable condition. This acceptable condition was defined by the following criteria:

1) Adequate NPSH to the pumps - minimum pressure available is greater than minimum pressure required for the LPCI and CS pumps.

2) Adequate containment cooling - the minimum containment cooling flow analyzed is 5000 gpm (LPCI) through a single LPCI heat exchanger.

If an acceptable condition cannot be achieved by throttling, then cases involving reduced suppression pool temperatures was explored.

Various pump combinations were explored to determine the bounding NPSH case for the LPCI and Core Spray pumps. It was shown that NPSH for the LPCI/CS pumps with 4 LPCI/2 CS pumps running is the bounding NPSH case. This calculation is bounding for NPSH due to use of the following conservative inputs:

- maximum long-term suppression pool temperature post-LOCA, thus maximizing the vapor pressure and minimizing NPSH margin
- torus pressure at time of peak temperature is atmospheric, thus minimizing NPSH margin
- Technical Specifications minimum suppression pool level including drawdown, minimizing elevation head and minimizing NPSH margin
- increased clean, commercial steel suction friction losses by 15% to account for aging effects

An NPSH analysis was performed for the LPCI/CS pumps under bounding, long-term post-accident conditions with atmospheric pressure in the torus. Selecting inputs to minimize NPSH margin, it was determined that the potential exists for the LPCI and CS pumps to cavitate in most of the pump scenarios. For these cases, throttling of the LPCI pumps may be required to ensure NPSH requirements are met. Specific cases involving throttled LPCI pumps were evaluated to establish the ability of the operator to throttle the pumps to an acceptable condition. The results of these cases were as follows:

- In the 3 LPCI/2 Core Spray case, the single pump LPCI loop may need to be throttled to below 5000 gpm, and containment heat removed with the 2-pump loop. This will ensure the LPCI heat exchanger receives its rated LPCI flow. Alternatively, a LPCI pump can be dropped to gain the required NPSH margin.

- In the 1 LPCI/2 Core Spray case, an NPSH deficit still exists after maximum throttling of the LPCI pump to 5000 gpm. It was determined that a reduction in the peak suppression pool temperature to 160°F would result in positive NPSH margin. This is achieved by maintaining a CCSW maximum inlet temperature of 75 deg F and a torus water maximum initial temperature of 75 deg F.

Therefore, at a reduced suppression pool peak temperature of 160°F, it is concluded that under all post-LOCA pump combinations, positive NPSH margin can be obtained by throttling the available LPCI pumps.

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Operators have been trained to recognize cavitation conditions and to protect their equipment by throttling flow if evidence of cavitation which would occur if adequate NPSH was not available is observed. The control room has indication of both discharge pressure and flow on each division of Core Spray and LPCI. The Emergency Operating Procedures (EOP's) also provided guidance to maintain adequate NPSH for the Core Spray and LPCI pumps. The NPSH curves provided in the EOP's utilize torus bulk temperature and torus bottom pressure to allow the operator to determine maximum pump or system flow with adequate NPSH. These curves are utilized as long as the core is adequately flooded.

Attachment for UFSAR section 6.3.3.4.3 Page 6.3-77 DFL 96-068 Deleted

The original TS Bases 3.7A states that a full loop of suppression pool cooling (2 LPCI/2 CCSW) will provide sufficient cooling that reliance on overpressure is not required to assure adequate NPSH for the ECCS pumps. This case is less restrictive than the above analysis in that offsite power would need to be available to support the equipment lineup. The above analysis demonstrates that in the most limiting scenario, NPSH requirements can be met without crediting overpressure, but with little or no margin.

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Additional analyses were performed to determine the available NPSH for LPCI pumps assuming various malfunctions as defined in GE SIL 151. The analyses considered the following LPCI pump operating configurations:

A. Case 1 — Three and four pump combinations injecting simultaneously into both recirculation loops with one broken loop.

B. Case 2 — Three and four pump combinations injecting into one broken loop. The break in this case is assumed at the injection point in the recirculation loop, and no credit is taken for recirculation piping resistance.

C. Case 3 — Three and four pump combinations injecting into the intact loop with the discharge valve open.

The following assumptions were made in the calculations:

A. Torus water temperature of 130°F was assumed and was considered to be the maximum temperature.

B. No credit was taken for the increase in torus level after the LOCA.

C. Atmospheric pressure about the suppression pool and in the drywell was taken to be 14.7 psia.

D. Reactor pressure was taken as 56 psig.

E. The containment cooling heat exchanger bypass valve was assumed open.

F. LPCI design flow point of 5350 gal/min was used.

G. Runout was interpreted as a point on the flow characteristic curve at which cavitation occurs because the net positive suction required exceeds the available NPSH.

LPCI pump (DFL 96-068)

H. The suction valve isolates even if the discharge valve does not and, thus, will prevent backflow through the pump.

The results of these analyses are presented in Tables 6.3-17 and 6.3-18. A review of the data indicates only a few instances in which the required NPSH exceeds the available NPSH. In fact, all configurations for which a small deficit in required NPSH exists involve postulated failures or breaks which prevent the reflooding of the vessel by the LPCI system. The most extreme case is a 3-foot deficiency in one of the Case 2 three-pump combinations. The presence of a 2-psig pressure in the drywell will offset this deficiency, and 2 psig in the drywell is one of the signals which initiates the ECCS. Although drywell pressure is taken as atmospheric, for the breaks assumed in the calculations, there will be an estimated 20 to 35 psig in the drywell and suppression chamber. It is, therefore, concluded that a condition will not exist wherein the NPSH will not be sufficient to prevent cavitation. However, the pump vendor has conducted cavitation tests at points between 4000 and 6000 gal/min with no significant effect on the pump internals after an hour of such operation.

During a LOCA, the operator's concern will be restoration of the vessel water level. The LPCI flow will be among the parameters closely monitored in the minutes immediately after the LOCA. The operator has several motor-operated valves available to him in the main control room to adjust flowrates or even isolate flow paths. It is, therefore, concluded that operator observation and response to flow conditions will be completed shortly after the LOCA.

Because of the falling head characteristics of these pumps, the brake horsepower requirements are nearly constant from 4000 to 6000 gal/min. It is thus concluded that no overload will occur for either the LPCI pumps or for the emergency diesel generators powering them in the event of a loss of offsite power.

It is, therefore, concluded that for the conditions evaluated, no threat to the long-term cooling capability exists.

Hence, adequate NPSH is ensured at all times to allow continuous operation of the LPCI and core spray pumps. ~~at rated flow~~

The HPCI subsystem takes suction from the condensate storage tank which remains cold throughout the plant cooldown so that the NPSH available is unaffected by torus heatup. If suction were taken from the torus, the maximum torus water temperature would be less than 140°F and the minimum NPSH available would be 30 feet compared to the 21 feet required by the HPCI pump.

6.3.4 Tests and Inspections

6.3.4.1 Core Spray Subsystem

Provisions have been designed into the core spray subsystem to test the performance of its various components. These provisions and tests are summarized as follows:

A. Instrumentation

- Operational test of entire subsystem.
- Periodic subsystem tests using test lines.

B. Valves

- Preoperational test of entire subsystem.
- Periodic subsystem tests using test lines.
- Test leak-off lines between isolation valves.
- Test drainline on pump side of outboard isolation valves.
- Motor-operated valves can be exercised independently.

C. Pumps

- Preoperational test of entire subsystem.
- Periodic subsystem tests using test lines.
- Monitoring pump seal leakage.

Table 6.3-17

LPCI SYSTEM PERFORMANCE WITH THREE PUMPS IN OPERATION FOR CASES OUTLINED IN GENERAL ELECTRIC SIL 151

Case No.	Pump Flows (gal/min)		NPSHR (feet of water)		NPSHA at 130°F (feet of water)	
	A and/or B	C and/or D	A and/or B	C and/or D	A and/or B	C and/or D
1	11,220	5,920	35	39	34	41
	5,750	11,620	37	37	41	34
2	11,490	5,920	37	39	34	41
	5,880	11,620	39	37	41	34
3	10,370	5,300	30	32	36	41
	5,300	10,320	32	30	41	36

Case No. 1 — Three pumps injecting into two recirculation loops with one loop broken.

Case No. 2 — Three pumps injecting into one broken loop. Break at the injection point in the recirculation loop. No credit taken for recirculation piping resistance.

Case No. 3 — Three pumps injecting into one intact loop with the discharge valve open.

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Table 6.3-18

LPCI SYSTEM PERFORMANCE WITH FOUR PUMPS IN OPERATION
FOR CASES OUTLINED IN GENERAL ELECTRIC SIL 151

Case No.	Pump (Pair) Flows (gal/min)		NPSHR (feet of water)	NPSHA at 130°F (feet of water)
	AB Pair	CD Pair	–	-
1	10,860	11,000	34.0	33.9
2	10,640	10,770	33.0	34.3
3	9,560	9,470	28	36.1

The following assumptions were used in the calculations:

1. Design flow, pump pair: 10,700 gal/min.
2. Runout flow, pump pair: 12,000 gal/min.
3. NPSH calculated for greater pump flow in each case.
4. Friction drop for NPSH calculation at flows other than design obtained by square of flows factor.
5. Torus water temperature from GE process diagram 730E775.
6. Pressure above torus 14.7 psia (reference Regulatory Guide 1.1).
7. Strainer nearest pump is plugged (reference GE 730E775).

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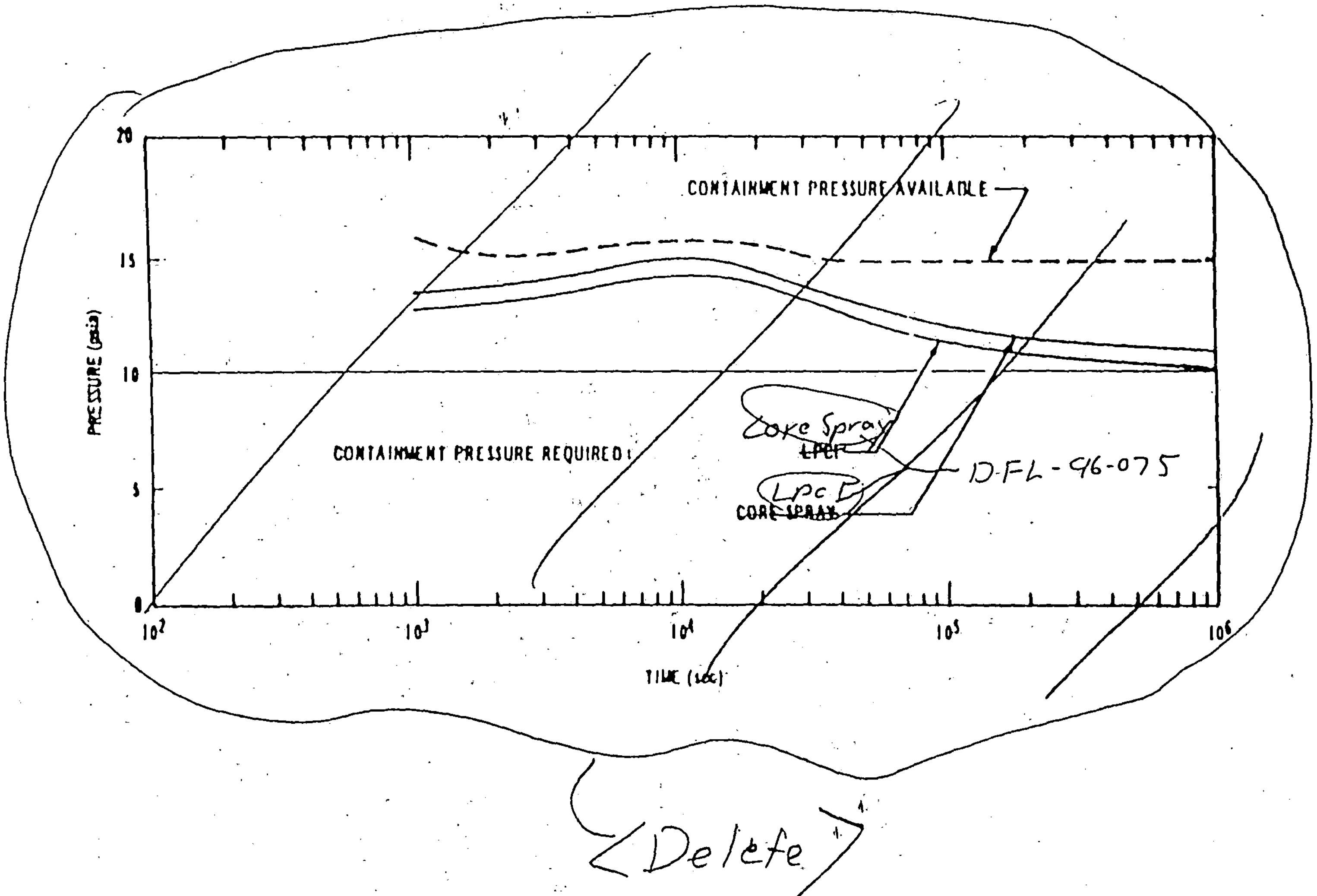

DRESDEN STATION
UNITS 2 & 3

MINIMUM CONTAINMENT PRESSURE AVAILABLE AND CONTAINMENT PRESSURE REQUIRED FOR PUMP NPSH

FIGURE 6.3-80

diagrams of the CCSW systems for Units 2 and 3 are shown in Figures 9.2-1 (Drawing M-29, Sheet 2) and 9.2-2 (Drawing M-360, Sheet 2), respectively.

The CCSW system provides cooling water for the containment cooling heat exchangers during both accident and nonaccident conditions, as described in Section 6.2.2. System piping is arranged to form two separate, two pump, flow networks (loops). Each pair of CCSW pumps takes a suction from the crib house via separate supply piping. Two CCSW pumps discharge into a common header which routes the cooling water to that loop's associated heat exchanger. At the heat exchanger, heat is transferred from the low pressure coolant injection (LPCI) subsystem to the CCSW system, and subsequently to the river.

During normal plant operation, the CCSW system is not operating. Following an accident or other plant evolution which requires containment heat removal, the CCSW system is manually started. Each CCSW pump is rated at 500 hp with a service factor of 1.15. The CCSW pumps are powered by normal ac or diesel generator ac power. Additional CCSW pump information is provided in Table 9.2-1.

The CCSW pumps develop sufficient head to maintain the cooling water heat exchanger tube side outlet pressure 20 psi greater than the LPCI subsystem pressure on the shell side ~~while maintaining rated heat exchanger flow~~. The ΔP is maintained by a differential pressure control valve. Maintaining this pressure differential prevents reactor water leakage into the service water and thereby into the river.. INSERT D

The four CCSW pumps are located in the turbine building. Two of the four CCSW pumps (pumps B and C) are located in a single, common watertight vault for flood protection. To prevent the CCSW pump motors from overheating, the vault has two vault coolers. The cooling water for each cooler is provided from its respective CCSW pump discharge line through a four-way valve. This valve also permits flow reversal of the cooling water through these coolers to help clean the tubes. Refer to Section 3.4 for a discussion of the flood protection features at Dresden.

A continuous fill of the CCSW system is provided by the service water system or, in the case of a loss of power to the service water pumps, the diesel generator cooling water system may be aligned to provide the continuous fill. This eliminates the potential for water hammer upon CCSW system startup. The diesel generator cooling water system is discussed in Section 9.5.5.

The Unit 2 CCSW loops also provide a safety-related source of service water to the control room air conditioning condensers. Refer to Sections 6.4 and 9.4.1 for a description of the control room ventilation system.

9.2.1.3 Safety Evaluation

Containment cooling is not immediately required following a design basis loss-of-coolant accident (LOCA). The required timing of the initiation of containment cooling functions by CCSW is described in Section 6.2.2. One of the two heat exchangers, two CCSW pumps, and one LPCI pump all in the same loop are the minimum requirements for containment cooling.

INSERT D to page 9.2-2

In order to maintain this pressure differential at rated LPCI flow, the CCSW flowrate is 5600 gpm during the limiting DBA LOCA with a diesel generator failure with a containment cooling pump combination of 1 LPCI/2 CCSW pumps operating in one loop.

Table 9.2-1

CONTAINMENT COOLING SERVICE WATER EQUIPMENT SPECIFICATIONS

Containment Cooling Service Water Pumps

Number	4 (2 needed to provide required cooling capacity)
Type	Horizontal, centrifugal
Power source	Auxiliary transformer or emergency diesel
Capacity	3,500 gal/min each — 7,000 gal/min total
Head (approximately)	435 feet

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During the limiting DBA LOCA with a diesel generator failure, the containment cooling pump combination is 1 LPCI/2 CCSW pumps. The CCSW pump flowrate of 5600 gpm will maintain the required pressure differential between the CCSW system and the LPCI system required to prevent the release of radioactivity in the event of a tube leak in the LPCI heat exchanger

Attachment C
Significant Hazards Consideration

The Commission has provided standards for determining whether a significant hazards consideration exists as stated in 10CFR50.92(c). A proposed amendment to an operating license involves no significant hazards consideration if operation of the facility in accordance with the proposed amendment would not: (1) involve a significant increase in the probability or consequences of an accident previously evaluated; or (2) create the possibility of a new or different kind of accident from any accident previously evaluated; or (3) involve a significant reduction in a margin of safety.

ComEd proposes to amend Appendix A, Technical Specification 3/4.7.K, "Suppression Chamber," 3/4.8.C, "Ultimate Heat Sink", and the associated Bases of Facility Operating Licenses DPR-19 and -25. The amendment request changes current limits on the maximum average water temperature in the Suppression Chamber by reducing the temperature limit from less than or equal to 95 degrees F to less than or equal to 75 degrees F. Related Action limits and allowances are similarly reduced to maintain the existing margin of safety to the limiting analyses parameters. The amendment request also requests the average Ultimate Heat Sink temperature be reduced from less than or equal to 95 degrees F to less than or equal to 75 degrees F. Finally, the amendment request clearly identifies the dependence of the safety analyses on a two psi pressure in the containment following a postulated DBA to assure adequate NPSH is available to the ECCS pumps.

ComEd has evaluated the proposed License Amendment and determined that it does not represent a significant hazards consideration. Based on the criteria for defining a significant hazards consideration established in 10 CFR 50.92, operation of Dresden Units 2 and 3 in accordance with the proposed amendment will not:

1) Involve a significant increase in the probability or consequences of an accident previously evaluated because of the following:

The proposed changes to the TS limits on suppression pool and ultimate heat sink average water temperature are required to assure that the safety analyses assumptions regarding containment function following a design basis accident remain representative of the facility. Therefore the consequences of accidents previously evaluated are not affected by the proposed change. The proposed changes to the average water temperature limits do not affect the probability of an accident previously evaluated because these water temperature limits have not been identified as causes or contributors to any previously evaluated design basis accidents.

In addition, the License Amendment will allow the plant safety analyses to credit nominal containment pressure in its determination of the adequacy of NPSH for the ECCS pumps. The consequences of previously analyzed accidents are not significantly affected by this proposed License Amendment. Containment pressure is described in UFSAR section 6.3.3.4.3 for an evaluation of the adequacy of the NPSH available to the ECCS pumps during DBA conditions. The amendment requests clarification that two psi of containment pressure is an assumption utilized in the design basis safety evaluations applicable to

Dresden. This change will be implemented by changes to the applicable Technical Specifications Bases and the UFSAR which clarify the inconsistencies with section 6.3.3.4.3 of the UFSAR.

The associated systems related to this proposed amendment are not assumed in any safety analysis to initiate any accident sequence for Dresden Station; therefore, the probability of any accident previously evaluated is not increased by the proposed amendment. No modes of operation are introduced by the proposed changes such that adverse consequences are observed for Dresden Station.

2) **Create the possibility of a new or different kind of accident from any accident previously evaluated because:**

The proposed license amendment for Dresden Station does not create the possibility of a new or different kind of accident previously evaluated for Dresden Station. No new modes of operation are introduced by the proposed changes. This change merely restricts the average water temperatures of the suppression pool and the ultimate heat sink, and resolves discrepancies regarding use of two psi of containment pressure as an input assumption for facility safety analyses. Therefore, the proposed changes do not create the possibility of a new or different kind of accident.

3) **Involve a significant reduction in the margin of safety because:**

The proposed license amendment does not adversely affect existing plant safety margins or the reliability of the equipment assumed to operate in the safety analysis. The proposed changes will preserve the existing margin of safety.

The proposed changes and subsequent revised analytical assumptions and calculation results demonstrate that adequate containment heat removal is available and that ECCS pump NPSH availability is maintained. The proposed changes maintain existing levels of system and component reliability, and the proposed changes do not involve a significant reduction in the margin of safety. Finally, the proposed license amendment for Dresden Station will not reduce the availability of systems required to mitigate accident conditions; therefore, the proposed changes do not involve a significant reduction in the margin of safety.

Guidance has been provided in "Final Procedures and Standards on No Significant Hazard Considerations," Final Rule, 51 FR 7744, for the application of standards to license change requests for determination of the existence of significant hazards considerations. This document provides examples of amendments which are and are not considered likely to involve significant hazards considerations.

This proposed amendment does not involve any irreversible changes, a significant relaxation of the criteria used to establish safety limits, a significant relaxation of the bases for the limiting safety system settings or a significant relaxation of the bases for the limiting conditions for operations. Therefore, based on the guidance provided in the Federal Register and the criteria established in 10 CFR 50.92(c), the proposed change does not constitute a significant hazards consideration.

ENVIRONMENTAL ASSESSMENT

ComEd has evaluated the proposed amendment against the criteria for identification of licensing and regulatory actions requiring environmental assessment in accordance with 10 CFR 51.21. It has been determined that the proposed changes meet the criteria for a categorical exclusion as provided under 10 CFR 51.22 (c)(9). This conclusion has been determined because the changes requested do not pose significant hazards consideration or do not involve a significant increase in the amounts, and no significant changes in the types, of any effluents that may be released off-site. Additionally, this request does not involve a significant increase in individual or cumulative occupational radiation exposure.

Attachment D
Supporting Calculations