ATTACHMENT A

PROPOSED TECHNICAL SPECIFICATIONS

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
INDIAN POINT UNIT NO. 2
DOCKET NO. 50-247
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3.3 ENGINEERED SAFETY FEATURES

Applicability

Applies to the operating status of the Engineered Safety Features.

Objective

To define those limiting conditions for operation that are necessary (1) to remove decay heat from the core in emergency or normal shutdown situations, (2) to remove heat from containment in normal operating and emergency situations, (3) to remove airborne iodine from the containment atmosphere following a Design Basis Accident, (4) to minimize containment leakage to the environment subsequent to a Design Basis Accident.

Specifications

The following specifications apply except during low-temperature physics tests.

A. SAFETY INJECTION AND RESIDUAL HEAT REMOVAL SYSTEMS

1. The reactor shall not be made critical except for low-temperature physics tests, unless the following conditions are met:

   a. The refueling water storage tank contains not less than 345,000 gallons of water with a boron concentration of at least 2000 ppm.

   b. Deleted

   c. The four accumulators are pressurized to at least 615 psig and each contains a minimum of 775 ft^3 and a maximum of 815 ft^3 of water with a boron concentration of at least 2000 ppm. None of these four accumulators may be isolated.

   d. Three safety injection pumps together with their associated piping and valves are operable.

   e. Two residual heat removal pumps and heat exchangers together with their associated piping and valves are operable.

f. Two recirculation pumps together with the associated piping and valves are operable.

g. Valves 842 and 843 in the mini-flow return line from the discharge of the safety injection pumps to the RWST are de-energized in the open position.

h. Valves 856A, C, D and E, in the discharge header of the safety injection header, are in the open position. Valves 856B and F, in the discharge header of the safety injection header, are in the closed position. The hot-leg valves (856B and F) shall be closed with their motor operators de-energized by locking out the circuit breakers at the Motor Control Centers.

i. The four accumulator isolation valves shall be open with their motor operators de-energized by locking out the circuit breakers at the Motor Control Centers.

j. Valve 1810 on the suction line of the high-head SI pumps and valves 882 and 744, respectively on the suction and discharge line of the residual heat removal pumps, shall be blocked open by de-energizing the valve-motor operators.

k. The refueling water storage tank low-level alarms are operable and set to alarm between 74,200 gallons and 99,000 gallons of water in the tank.

2. During power operation, the requirements of 3.3.A.1 may be modified to allow any one of the following components to be inoperable at any one time. If the system is not restored to meet the requirements of 3.3.A.1 within the time period specified, the reactor shall be placed in the hot shutdown condition utilizing normal operating procedures. If the requirements of 3.3.A.1 are not satisfied within an additional 48 hours, the reactor shall be placed in the cold shutdown condition utilizing normal operating procedures.

    a. One safety injection pump may be out of service, provided the pump is restored to operable status within 24 hours and the remaining two pumps are operable.

b. One residual heat removal pump may be out of service, provided the pump is restored to operable status within 24 hours and the other residual heat removal pump is operable.

c. One residual heat removal heat exchanger may be out of service provided that it is restored to operable status within 48 hours.

d. Any valve required for the functioning of the system during and following accident conditions may be inoperable provided that it is restored to operable status within 24 hours and all valves in the system that provide the duplicate function are operable.

e. Deleted

f. One refueling water storage tank low-level alarm may be inoperable for up to 7 days provided the other low-level alarm is operable.

3. When RCS temperature is less than or equal to 305°F, the requirements of Table 3.1.A-2 regarding the number of safety injection (SI) pumps allowed to be energized shall be adhered to.

B. <u>CONTAINMENT COOLING AND IODINE REMOVAL SYSTEMS</u>

1. The reactor shall not be made critical unless the following conditions are met:

a. The spray additive tank contains not less than 4000 gallons of solution with a sodium hydroxide concentration of not less than 33% by weight.

b. The five fan cooler-charcoal filter units and the two spray pumps, with their associated valves and piping, are operable.

2. During power operation, the requirements of 3.3.B.1 may be modified to allow any one of the following components to be inoperable. If the system is not restored to meet the requirements of 3.3.B.1 within the time period specified, the reactor shall be placed in the hot shutdown

condition utilizing normal operating procedures. If the requirements of 3.3.B.1 are not satisfied within an additional 48 hours, the reactor shall be placed in the cold shutdown condition utilizing normal operating procedures.

a. One fan cooler unit may be inoperable during normal reactor operation for a period not to exceed 7 days provided both containment spray pumps are operable.

b. One containment spray pump may be inoperable during normal reactor operation, for a period not to exceed 72 hours, provided the five fan cooler units and the remaining containment spray pump are operable.

c. Any valve required for the functioning of the system during and following accident conditions may be inoperable provided it is restored to operable status within 7 days or 72 hours for the fan cooler or containment spray systems respectively, and all valves in the system that provide the duplicate function are operable.

d. The spray additive tank and its associated piping, valves and eductors may be inoperable during normal reactor operation for a period not to exceed 72 hours provided both containment spray pumps and the five fan cooler units are operable.

C. <u>ISOLATION VALVE SEAL WATER SYSTEM (IVSWS)</u>

1. The reactor shall not be brought above cold shutdown unless the following requirements are met:

   a. The IVSWS shall be operable.

   b. The IVSW tank shall be maintained at a minimum pressure of 52 psig and contain a minimum of 144 gallons of water.

2. The requirements of 3.3.C.1 may be modified to allow any one of the following components to be inoperable at any one time:

   a. Any one header of the IVSWS may be inoperable for a period not to exceed seven consecutive days.

b. Any valve required for the functioning of the system during and following accident conditions may be inoperable provided it is restored to an operable status within seven days and all valves in the system that provide a duplicate function are operable.

3. If the IVSWS System is not restored to an operable status within the time period specified, then:

   a. If the reactor is critical, it shall be brought to the hot shutdown condition utilizing normal operating procedures. The shutdown shall start not later than at the end of the specified time period.

   b. If the reactor is subcritical, the reactor coolant system temperature and pressure shall not be increased more than 25°F and 100 psi, respectively, over existing values.

   c. In either case, if the IVSW System is not restored to an operable status within an additional 48 hours, the reactor shall be brought to the cold shutdown condition utilizing normal operating procedures. The shutdown shall start no later than the end of the 48-hour period.

D. <u>WELD CHANNEL AND PENETRATION PRESSURIZATION SYSTEM (WC & PPS)</u>

1. The reactor shall not be brought above cold shutdown unless:

   a. All required portions of the four WC & PPS zones are pressurized at or above 47 psig.

   b. The uncorrected air consumption for the WC & PPS is less than or equal to 0.2% of the containment volume per day.

2. The requirements of 3.3.D.1 may be modified as follows:

   a. Any one zone of the WC & PPS may be inoperable for a period not to exceed seven consecutive days.

   b. The uncorrected air consumption for the WC & PPS may be in excess of 0.2% of the containment volume per day for a period not to exceed seven consecutive days.

c. With the portion of the weld channel pressurization system inoperable, and it is determined that it is not repairable by any practicable means, then that portion may be disconnected from the system.

3. If the WC & PP System is not restored to an operable status within the time period specified, then:

   a. If the reactor is critical, it shall be brought to the hot shutdown condition utilizing normal operating procedures. The shutdown shall start no later than at the end of the specified time period.

   b. If the reactor is subcritical, the reactor coolant system temperature and pressure shall not be increased more than 25°F and 100 psi, respectively, over existing values.

   c. In either case, if the WC & PP System is not restored to an operable status within an additional 48 hours, the reactor shall be brought to the cold shutdown condition utilizing normal operating procedures. The shutdown shall start no later than the end of the 48-hour period.

E. <u>COMPONENT COOLING SYSTEM</u>

1. The reactor shall not be made critical unless the following conditions are met:

   a. Three component cooling pumps together with their associated piping and valves are operable.

   b. Two auxiliary component cooling pumps together with their associated piping and valves are operable.

   c. Two component cooling heat exchangers together with their associated piping and valves are operable.

2. During power operation, the requirements of 3.3.E.1 may be modified to allow one of the following components to be inoperable at any one time. If the system is not restored to meet the conditions of 3.3.E.1 within the time period specified, the reactor shall be placed in the hot shutdown condition utilizing normal operating procedures. If the requirements of

3.3.E.1 are not satisfied within an additional 48 hours, the reactor shall be placed in the cold shutdown condition utilizing normal operating procedures.

a. One of the three operable component cooling pumps may be out of service provided the pump is restored to operable status within 14 days.

b. An additional component cooling pump may be out of service provided a second pump is restored to operable status within 24 hours.

c. One auxiliary component cooling pump may be out of service provided the pump is restored to operable status within 24 hours and the other pump is operable.

d. One component cooling heat exchanger or other passive component may be out of service for a period not to exceed 48 hours provided the system may still operate at design accident capability.

F. <u>SERVICE WATER SYSTEM</u>

1. DESIGNATED ESSENTIAL HEADER

a. The reactor shall not be above 350°F unless three service water pumps with their associated piping and valves are operable on the designated essential header.

b. When the reactor is above 350°F and one of the three service water pumps or any of its associated piping or valves is found inoperable, and an essential service water header that meets the requirements of 3.3.F.1.a. cannot be restored within 12 hours, the reactor shall be placed in the hot shutdown condition within the next 6 hours and subsequently cooled below 350°F using normal operating procedures.

2. DESIGNATED NON-ESSENTIAL HEADER

a. The reactor shall not be above 350°F unless two service water pumps with their associated piping and valves are operable on the designated non-essential header.

b. When the reactor is above 350°F and one of the two service water pumps or any of its associated piping or valves is found inoperable, and a non-essential service water header that meets the requirements of 3.3.F.2.a cannot be restored within 24 hours, the reactor shall be placed in the hot shutdown condition within the next 6 hours and subsequently cooled below 350°F using normal operating procedures.

3. INTERCONNECTION OF HEADERS

Isolation shall be maintained between the essential and non-essential headers at all times when the reactor is above 350°F except for a period of up to 8 hours when the header may be connected to facilitate safety-related activities.

4. SERVICE WATER INLET TEMPERATURE

a. The reactor shall not be above 350°F unless the service water inlet temperature is less than or equal to 95°F, or

b. When the reactor is above 350°F and the service water inlet temperature exceeds 95°F, the reactor shall be placed in the hot shutdown condition within the next 7 hours and subsequently cooled below 350°F using normal operating procedures.

c. The provisions of Specification 3.0.1 do not apply.

5. SERVICE WATER INLET TEMPERATURE MONITORING INSTRUMENTATION

a. The service water inlet temperature monitoring instrumentation shall measure the Hudson River water temperature at the Indian Point Unit No. 2 intake structure,

b. The service water inlet temperature monitoring instrumentation shall be operable when intake water temperature, averaged over a 24 hour period, reaches 80°F, and when the reactor is above 350°F,

c. When the requirements of Specification 3.3.F.5.b apply, temperature measurements shall be taken every 4 hours up to and including a service water inlet temperature of 90°F; when the service water inlet temperature exceeds 90°F, temperature measurements shall be taken once an hour,

d. If the service water inlet temperature monitoring instrumentation is declared inoperable, it shall be either restored to operable status or alternative measurements shall be taken with a calibrated portable instrument within the applicable measurement time frame requirements of Specification 3.3.F.5.c, and

e. If the requirements of Specification 3.3.F.5.d cannot be met, the reactor shall be placed in the hot shutdown condition within the next 7 hours and subsequently cooled below 350°F using normal operating procedures.

G. HYDROGEN RECOMBINER SYSTEM AND POST-ACCIDENT CONTAINMENT VENTING SYSTEM

1. The reactor shall not be made critical unless the following conditions are met:

   a. Both hydrogen recombiner units are operable.

   b. The post-accident containment venting system is operable.

2. During power operation, the requirements of 3.3.G.1 may be modified to allow any one of the following components to be inoperable. If the system is not restored to meet the requirements of 3.3.G.1 within the time specified, the reactor shall be placed in the hot shutdown condition utilizing normal operating procedures.

   a. One hydrogen recombiner unit may be inoperable for a period not to exceed thirty days, provided the other recombiner unit and the post-accident containment venting system are operable.

b. The post-accident containment venting system may be inoperable for a period not to exceed thirty days provided that both hydrogen recombiners are operable.

H. CONTROL ROOM AIR FILTRATION SYSTEM

1. The control room air filtration system shall be operable at all times when containment integrity is required.

2. From the date that the control room air filtration system becomes and remains inoperable for any reason, operations requiring containment integrity are permissible only during the succeeding 3.5 days. At the end of this 3.5 days period, if the conditions for the control room air filtration system cannot be met, the reactor shall be placed in the hot shutdown condition utilizing normal operating procedures. If the conditions are not satisfied within an additional 48 hours, the reactor shall be placed in the cold shutdown condition utilizing normal operating procedures.

3. Two independent toxic gas detection systems, each capable of detecting chlorine and anhydrous ammonia shall be operable at all times except as specified in 3.a, 3.b, or 3.c below. The alarm/trip setpoints for the chlorine and anhydrous ammonia gas detection systems shall be adjusted to actuate at a toxic gas concentration of less than or equal to 3.5 ppm and 25 ppm, respectively.

   a. With one toxic gas detection system inoperable, restore the inoperable detection system to operable status within 7 days.

   b. If 3.a above cannot be satisfied within the specified time, then, within the next 6 hours, initiate and maintain operation of the control room ventilation system in the recirculation mode of operation.

   c. With both toxic gas detection systems inoperable for any one toxic gas, within one hour initiate and maintain operation of the control room ventilation in the recirculation mode of operation.

I. CABLE TUNNEL VENTILATION FANS

1. The reactor shall not be made critical unless the two cable tunnel ventilation fans are operable.

2. During power operation, the requirement of 3.3.I.1 may be modified to allow one cable tunnel ventilation fan to be inoperable for seven days, provided the other fan is operable.

Basis

The normal procedure for starting the reactor is, first, to heat the reactor coolant to near operating temperature by running the reactor coolant pumps. The reactor is then made critical by withdrawing control rods and/or diluting boron in the coolant(1). With this mode of start-up, the energy stored in the reactor coolant during the approach to criticality is substantially equal to that during power operation, and therefore the minimum required engineered safeguards and auxiliary cooling systems are required to be operable. During low-temperature physics tests there is a negligible amount of stored energy in the reactor coolant; therefore, an accident comparable in severity to the Design Basis Accident is not possible, and the engineered safeguards systems are not required.

When the reactor is critical, the probability of sustaining both a major accident and a simultaneous failure of a safeguards component to operate as designed is necessarily very small. Thus operation with the reactor critical with minimum safeguards operable for a limited period does not significantly increase the probability of an accident having consequences which are more severe than the Design Basis Accident.

The operable status of the various systems and components is to be demonstrated by periodic tests, defined by Specification 4.5. A large fraction of these tests will be performed while the reactor is operating in the power range. If a component is found to be inoperable, it will be possible in most cases to effect repairs and restore the system to full operability within a relatively short time. Inoperability of a single component does not negate the ability of the system to perform its function(2), but it reduces the redundancy provided in the reactor design and thereby limits the ability to tolerate additional equipment failures. To provide maximum assurance that the redundant component(s) will operate if required to do so, the redundant component(s) are to be tested prior to initiating repair of the inoperable component. If it develops that (1) the inoperable component is not repaired within the specified allowable time period, or (2) a second component in the same or related system is found to be inoperable, the reactor will initially be put in the hot shutdown condition to provide for reduction of the decay heat from the fuel and consequent reduction of cooling requirements after a postulated loss-of-coolant accident. This will also permit improved access for repairs in some cases. After a limited time in hot shutdown, if the malfunction(s) are not corrected, the reactor will be placed in the cold shutdown condition, utilizing normal shutdown and cooldown procedures. In the cold shutdown condition there is no possibility of an accident that would release fission products or damage the fuel elements.

The plant operating procedures require immediate action to effect repairs of an inoperable component, and therefore in most cases repairs will be completed in less than the specified allowable repair times. The specified repair times do not apply to regularly scheduled maintenance of the engineered safeguards systems, which is normally to be performed during refueling shutdowns. The limiting times to repair are based on two considerations:

1. assurance with high reliability that the safeguard system will function properly if required to do so, and

2. allowance of sufficient time to effect repairs using safe and proper procedures.

Assuming the reactor has been operating at full-rated power for at least 100 days, the magnitude of the decay heat decreases after initiating hot shutdown. Thus the requirement for core cooling in case of a postulated loss-of-coolant accident while in the hot shutdown condition is significantly reduced below the requirements for a postulated loss-of-coolant accident during power operation. Putting the reactor in the hot shutdown condition significantly reduces the potential consequences of a loss-of-coolant accident, and also allows more free access to some of the engineered safeguards components in order to effect repairs.

Failure to complete repairs within 48 hours of going to the hot shutdown condition is considered indicative of a requirement for major maintenance, and therefore in such a case the reactor is to be put into the cold shutdown condition.

Valves 1810, 744 and 882 are kept in the open position during plant operation to assure that flow passage from the refueling water storage tank will be available during the injection phase of a loss-of-coolant accident. As an additional assurance of flow passage availability, the valve motor operators are de-energized to prevent an extremely unlikely spurious closure of these valves to take place. This additional precaution is acceptable since failure to manually re-establish power to close valves 1810 and 882, following the injection phase, is tolerable as a single failure. Valve 744 will not need to be closed following the injection phase. The accumulator isolation valve motor operators are de-energized to prevent an extremely unlikely spurious closure of these valves from occurring when accumulator core cooling flow is required.

With respect to the core cooling function, there is some functional redundancy for certain ranges of break sizes[3]. The measure of effectiveness of the Safety Injection System is the ability of the pumps and accumulators to keep the core flooded or to reflood the core rapidly where the core has been uncovered for postulated large area ruptures. The result of the performance is to sufficiently limit any increase in clad temperature below a value where emergency core cooling objectives are met[9]. The range of core protection as a function of break diameter provided by the various components of the Safety Injection System is presented in Figure 6.2-9 of the UFSAR.

The requirement regarding the maximum number of SI pumps that can be energized when RCS temperature is less than or equal to 305°F is discussed under Specification 3.1.A.

The containment cooling and iodine removal functions are provided by two independent systems: (1) fan-coolers plus charcoal filters and (2) containment spray with sodium hydroxide addition. During normal power operation, the five fan-coolers are required to remove heat lost from equipment and piping within containment at design conditions (with a cooling water temperature of 95°F)[12].
In the event of a Design Basis Accident, any one of the following combinations will provide sufficient cooling to reduce containment pressure at a rate consistent with limiting offsite doses to acceptable values: (1) five fan-cooler units, (2) two containment spray pumps, (3) three fan-cooler units and one spray pump. Also, in the event of a Design Basis Accident, three charcoal filters (and their associated recirculation fans) in operation, along with one containment spray pump and sodium hydroxide addition, will reduce airborne organic and molecular iodine activities sufficiently to limit offsite doses to acceptable values. These constitute the minimum safeguards for iodine removal, and are capable of being operated on emergency power with one diesel generator inoperable.

If offsite power is available or all diesel generators are operating to provide emergency power, the remaining installed iodine removal equipment (two charcoal filters and their associated fans, and one containment spray pump and sodium hydroxide addition) can be operated to provide iodine removal in excess of the minimum requirements.

Adequate power for operation of the redundant containment heat removal systems (i.e., five fan-cooler units or two containment spray pumps) is assured by the availability of offsite power or operation of all emergency diesel generators.

One of the five fan cooler units is permitted to be inoperable during power operation. This is an abnormal operating situation, in that the normal plant operating procedures require that an inoperable fan-cooler be repaired as soon as practical.

However, because of the difficulty of gaining access to make repairs, it is important on occasion to be able to operate temporarily without at least one fan-cooler. Compensation for this mode of operation is provided by the high degree of redundancy of containment cooling systems during a Design Basis Accident.

The Component Cooling System is different from the system discussed above in that the pumps are so located in the Auxiliary Building as to be accessible for repair after a loss-of-coolant accident[(6)]. During the recirculation phase following a loss-of-coolant accident, only one of the three component cooling pumps is required for minimum safeguards[(7)]. With two operable component cooling pumps, 100% redundancy will be provide. A total of three operable component cooling pumps will provide 200% redundancy. The 14 day out of service period for the third component cooling pump is allowed since this is the 200% redundant pump.

A total of six service water pumps are installed. Only two of the set of three service water pumps on the header designated the essential header are required immediately following a postulated loss-of-coolant accident[(8)]. The limit on the service water maximum inlet temperature assures that the service water and component cooling water systems will be able to dissipate the heat loads generated in the limiting design basis accident.[(12)]

During the second phase of the accident, one additional service water pump on the non-essential header will be manually started to supply the minimum cooling water requirements for the component cooling loop.

The limits for the accumulators and their pressure and volume assure the required amount of water injection following a loss-of-coolant accident, and are based on the values used for the accident analysis[(9)].

Two independent diverse systems are provided for removal of combustible hydrogen from the containment building atmosphere: (1) the hydrogen recombiners, and (2) the post-accident containment venting system. Either of the two (2) hydrogen recombiners or the post-accident containment venting system are capable of wholly providing this function in the event of a design basis accident.

Two full-rated hydrogen recombination systems are provided in order to control the hydrogen evolved in the containment following a loss-of-coolant accident. Either system is capable of preventing the hydrogen concentration from exceeding 4% by volume within the containment. Each system is separate from the other. The containment atmosphere sampling system consists of a sample line which originates in each of the containment fan cooler units. The fan and sampling pump head together are sufficient to pump containment air in a loop from the fan cooler through a containment penetration to a sample vessel outside the containment, and then through a second penetration to the sample termination inside the containment. The recombiner will operate at hydrogen concentration above 0.25% by volume. Conservative calculations indicate that the hydrogen content within the containment will not reach 4% by volume.

The Post-Accident Containment Venting System consists of a common penetration line which acts as a supply line through which hydrogen-free air can be admitted to the containment, and an exhaust line, with parallel valving and piping, through which hydrogen-bearing gases from containment may be vented through a filtration system.

The supply flow path makes use of instrument air to feed containment. The nominal flow rate from either of the two instrument air compressors is 200 scfm. If the instrument air system is not available, the station air system is available as a backup.

The exhaust line penetrates the containment and then is divided into two parallel lines. Each parallel line contains a pressure sensor and all the valves necessary for controlling the venting operation. The two lines then rejoin and the exhaust passes through a flow sensor and a temperature sensor before passing through roughing, HEPA and charcoal filters. The exhaust is then directed to the plant vent.

The post-accident containment venting system is a passive system in the sense that a differential pressure between the containment and the outside atmosphere provides the driving force for the venting process to take place. The system is designed such that a minimum internal containment pressure of 2.14 psig is required for the system to operate properly.

The flow rate and the duration of venting required to maintain the hydrogen concentration at or below 3 percent of the containment volume are determined from the containment hydrogen concentration measurements and the hydrogen generation rate. The containment pressure necessary to obtain the required vent flow is then determined. Using one of the air compressors, hydrogen-free air is pumped into the containment until the required containment pressure is reached. The air supply is then stopped and the supply/exhaust line is isolated by valves outside the containment. The addition of air to pressurize the containment dilutes the hydrogen; therefore, the containment will remain isolated until analysis of samples indicates that the concentration is again approaching 3 percent by volume. Venting will then be started. This process of containment pressurization followed by venting is repeated as may be necessary to maintain the hydrogen concentration at or below 3 volume percent.

The post-accident venting system is used only in the absence of hydrogen recombiners and only when absolutely necessary. From the standpoint of minimizing offsite radiation doses, the optimum starting time for the venting system, if needed, is the latest possible time after the accident. Consistent with this philosophy, the selected venting initiation point of 3 percent hydrogen maximizes the time period before venting is required while at the same time allows a sufficient margin of safety below the lower flammability limit of hydrogen.

The control room air filtration system is designed to filter the control room atmosphere for intake air and/or for recirculation during control room isolation conditions. The control room system is designed to automatically start upon control room isolation. Control room isolation is initiated either by a safety injection signal or by detection of high radioactivity in the control room. If the control room air filtration system is found to be inoperable, there is no immediate threat to the control room and reactor operation may continue for a limited period of time while repairs are being made. If the system cannot be repaired within 3.5 days, the reactor is placed in the hot shutdown condition.

The control room ventilation system is equipped with toxic gas detection systems consisting of redundant monitors capable of detecting chlorine and anhydrous ammonia. These toxic gas detection systems are designed to isolate the control room from outside air upon detection of toxic concentration of the monitored gases in the control room ventilation system. The operability of the toxic gas detection systems provides assurance that the control room operators will have adequate time to take protective action in the event of an accidental toxic gas release. Selection of the gases to be monitored and the setpoint established for the monitors are based on the results described in the Indian Point Unit No. 2 Control Room Habitability Study dated June 10, 1991.

The cable tunnel is equipped with two temperature-controlled ventilation fans. Each fan has a capacity of 21,000 cfm and is connected to a 480v bus. One fan will start automatically when the temperature in the tunnel reaches 100°F. Under the worst conditions, i.e., loss of outside power and all the Engineered Safety Features in operation, one ventilation fan is capable of maintaining the tunnel temperature below 104°F. Under the same worst conditions, if no ventilation fans were operating, the natural air circulation through the tunnel would be sufficient to limit the gross tunnel temperature to below the tolerable value of 140°F. However, in order to provide for ample tunnel ventilation capacity, the two ventilation fans are required to be operable when the reactor is made critical. If one ventilation fan is found inoperable, the other fan will ensure that cable tunnel ventilation is available.

Valves 856A, C, D and E are maintained in the open position during plant operation to assure a flow path for high-head safety injection during the injection phase of a loss-of-coolant accident. Valves 856B and F are maintained in the closed position during plant operation to prevent hot-leg injection during the injection phase of a loss-of-coolant accident. As an additional assurance of preventing hot-leg injection, the valve motor operators are de-energized to prevent spurious opening of these valves. Power will be restored to these valves at an appropriate time in accordance with plant operating procedures after a loss-of-coolant accident in order to establish hot-leg recirculation.

Valves 842 and 843 in the mini-flow return line from the discharge of the safety injection pumps to the refueling water storage tank are de-energized in the open position to prevent an extremely unlikely spurious closure which would cause the safety injection pumps to overheat if the reactor coolant system pressure is above the shutoff head of the pumps.

The specified quantities of water for the RWST include unavailable water (4687 gals) in the tank bottom, inaccuracies (24,800 gals) in the alarm setpoints, the minimum quantity required during the injection (246,000 gals)[12] for accident mitigation and the minimum quantity required during the recirculation phase (60,000 gals) for post-LOCA NaOH requirements inside containment. The minimum RWST inventory (i.e., 345,000 gals) provides approximately 9,500 gallons margin.

The seven-day out-of-service period for the Weld Channel and Penetration Pressurization System and the Isolation Valve Seal Water System is allowed because no credit has been taken for operation of these systems in the calculation of offsite accident doses should an accident occur. No other safeguards systems are dependent on operation of these systems[11]. The minimum pressure settings for the IVSWS and WC & PPS during operation assures effective performance of these systems and assures that the containment design pressure of 47 psig is not exceeded. Portions of the Weld Channel Pressurization System are in areas that are not accessible, such as below the concrete floor of containment or in high radiation areas. If it is determined that it is not practicable to repair an inoperable portion of the system, then that portion may be disconnected.

References

(1) UFSAR Section 9
(2) UFSAR Section 6.2
(3) UFSAR Section 6.2
(4) UFSAR Section 6.4
(5) Reference Deleted
(6) UFSAR Section 9.3
(7) UFSAR Section 9.3
(8) UFSAR Section 9.6.1
(9) UFSAR Section 14.3
(10) Indian Point Unit No. 2, UFSAR Sections 6.2 and 6.3 and the Safety Evaluation accompanying "Application for Amendment to Operating License" sworn to by Mr. William J. Cahill, Jr. on March 28, 1977.
(11) UFSAR Sections 6.5 and 6.6
(12) WCAP-12312, "Safety Evaluation for An Ultimate Heat Sink Temperature to 95°F at Indian Point Unit 2", July, 1989.

Table 4.4-1

Containment Isolation Valves

Valve No.	System(1)	Test Fluid(2)	Minimum Test Pressure (PSIG)
549	PRT to Gas Analyzer	Water(4)	52
548	" " " "	Water(4)	52
518	PRT N_2 Supply	Gas	47
3418	" " "	Gas	47
3419	" " "	Gas	47
4136	" " "	Gas	47
552	PRT Makeup Water	Water(4)	52
519	" " "	Water(4)	52
741A	RHR return to RCS	Water(5)	52(3)
	" " " "	Nitrogen(4)	47(3)
888A	RHR to S.I. Pumps	Nitrogen(4)	47
888B	" " " "	Nitrogen(4)	47
958	RHR to Sample System	Nitrogen(4)	47
959	" " " "	Nitrogen(4)	47
990D	" " " "	Nitrogen(4)	47
1870	RHR from RCS	Nitrogen(4)	47
743	" " "	Nitrogen(4)	47
732	" " "	Nitrogen(4)	47(3)
885A	Cont. Sump Recirc. Line	Water(5)	52
885B	" " " "	Water(5)	52
201	Letdown Line (CVCS)	Water(4)	52

Table 4.4-1

Containment Isolation Valves

Valve No.	System[1]	Test Fluid[2]	Minimum Test Pressure (PSIG)
202	" " "	Water[4]	52
205	Charging Line (CVCS)	Water[4]	52
226	Charging Line (CVCS)	Water[4]	52
227	" " "	Water[4]	52
250A	RCP Seal Water (CVCS)	Water[4]	52
4925	" " " "	Water[4]	52
250B	" " " "	Water[4]	52
4926	" " " "	Water[4]	52
250C	" " " "	Water[4]	52
[illegible]7	" " " "	Water[4]	52
250D	" " " "	Water[4]	52
4928	" " " "	Water[4]	52
222	" " " "	Water[4]	52
956E	RCS to Sample System	Water[4]	52
956F	" " " "	Water[4]	52
869A	Cont. Spray System	Water[4]	52
867A	" " "	Gas	47
878A	" " "	Gas	47
869B	" " "	Water[4]	52
867B	" " "	Gas	47
851A	Safety Inj. System	Water[4]	52

Table 4.4-1

Containment Isolation Valves

Valve No.	System[1]	Test Fluid[2]	Minimum Test Pressure (PSIG)
850A	" " "	Water[4]	52
851B	" " "	Water[4]	52
850B	" " "	Water[4]	52
859A	S.I. Test Line	Water[4]	52
859C	S.I. Test Line	Water[4]	52
4312	Acc. & OPS N_2 Supply	Gas	47
863	" " " " "	Gas	47
956G	Acc. to Sample System	Water[4]	52
956H	" " " "	Water[4]	52
[illegible]6	RCDT to Vent Header	Water[4]	52
1787	" " " "	Water[4]	52
3416	RCDT N_2 Supply	Gas	47
3417	" " "	Gas	47
5459	" " "	Gas	47
1616	" " "	Gas	47
1788	RCDT to Gas Analyzer	Water[4]	52
1789	" " " "	Water[4]	52
1702	RCDT to WHT (WDS)	Water[4]	52
1705	" " " "	Water[4]	52
797	RCP Comp. Cooling (CCS)	Water[4]	52
784	" " " "	Water[4]	52

Table 4.4-1

Containment Isolation Valves

Valve No.	System[1]	Test Fluid[2]	Minimum Test Pressure (PSIG)
FCV-625	" " " "	Water[4]	52
791	Excess Letdown Cool. (CCS)	Water[4]	52
798	" " " "	Water[4]	52
796	" " " "	Water[4]	52
793	" " " "	Water[4]	52
1728	Cont. Sump to WHT (WDS)	Water[4]	52
1723	Cont. Sump to WHT (WDS)	Water[4]	52
1234	Cont. Air Sample	Gas[7]	47
1235	" " "	Gas[7]	47
[illegible]6	" " "	Gas[7]	47
1237	" " "	Gas[7]	47
PCV-1229	Air Ejector to Cont.	Gas[7]	47
PCV-1230	" " " "	Gas[7]	47
PCV-1214	S.G. Blowdown/Sample	Water[4]	52
PCV-1214A	" " "	Water[4]	52
PCV-1215	" " "	Water[4]	52
PCV-1215A	" " "	Water[4]	52
PCV-1216	" " "	Water[4]	52
PCV-1216A	" " "	Water[4]	52
PCV-1217	" " "	Water[4]	52
PCV-1217A	" " "	Water[4]	52

Table 4.4-1

Containment Isolation Valves

Valve No.	System[1]	Test Fluid[2]	Minimum Test Pressure (PSIG)
SWN-41-5-A	Cont. Fan Cooler-Ser. Wtr.	Water[6]	52
SWN-41-5-B	" " " " "	Water[6]	52
SWN-43-5	" " " " "	Water[6]	52
SWN-42-5	" " " " "	Water[6]	52
SWN-41-1-A	" " " " "	Water[6]	52
SWN-41-1-B	" " " " "	Water[6]	52
SWN-43-1	" " " " "	Water[6]	52
SWN-42-1	" " " " "	Water[6]	52
SWN-41-2-A	Cont. Fan Cooler-Ser. Wtr.	Water[6]	52
SWN-41-2-B	" " " " "	Water[6]	52
SWN-43-2	" " " " "	Water[6]	52
SWN-42-2	" " " " "	Water[6]	52
SWN-41-3-A	" " " " "	Water[6]	52
SWN-41-3-B	" " " " "	Water[6]	52
SWN-43-3	" " " " "	Water[6]	52
SWN-42-3	" " " " "	Water[6]	52
SWN-41-4-A	" " " " "	Water[6]	52
SWN-41-4-B	" " " " "	Water[6]	52
SWN-43-4	" " " " "	Water[6]	52
SWN-42-4	" " " " "	Water[6]	52
SWN-44-5-A	" " " " "	Water[6]	52

Table 4.4-1

Containment Isolation Valves

Valve No.	System(1)	Test Fluid(2)	Minimum Test Pressure (PSIG)
SWN-44-5-B	" " " " "	Water(6)	52
SWN-51-5	" " " " "	Water(6)	52
SWN-44-1-A	" " " " "	Water(6)	52
SWN-44-1-B	" " " " "	Water(6)	52
SWN-51-1	" " " " "	Water(6)	52
SWN-44-2-A	" " " " "	Water(6)	52
SWN-44-2-B	" " " " "	Water(6)	52
SWN-51-2	" " " " "	Water(6)	52
SWN-44-3-A	" " " " "	Water(6)	52
SWN-44-3-B	" " " " "	Water(6)	52

Table 4.4-1

Containment Isolation Valves

Valve No.	System(1)	Test Fluid(2)	Minimum Test Pressure (PSIG)
SWN-51-3	Cont. Fan Cooler-Ser. Wtr.	Water(6)	52
SWN-44-4-A	" " " " "	Water(6)	52
SWN-44-4-B	" " " " "	Water(6)	52
SWN-51-4	" " " " "	Water(6)	52
SWN-71-5-A	" " " " "	Water(6)	52
SWN-71-5-B	" " " " "	Water(6)	52
SWN-71-1-A	" " " " "	Water(6)	52
SWN-71-1-B	" " " " "	Water(6)	52
N-71-2-A	" " " " "	Water(6)	52
SWN-71-2-B	" " " " "	Water(6)	52
SWN-71-3-A	" " " " "	Water(6)	52
SWN-71-3-B	" " " " "	Water(6)	52
SWN-71-4-A	" " " " "	Water(6)	52
SWN-71-4-B	" " " " "	Water(6)	52
SA-24	Service Air to Cont.	Water(4)	52
SA-24-1 "	" " "	Water(4)	52
580A	Dead Weight Tester	Gas	47
580B	" " "	Gas	47
UH-43	Auxiliary Steam System	Water(4)	52
UH-44	" " "	Water(4)	52
/-17	City Wtr. to Cont.	Water(4)	52

Table 4.4-1

Containment Isolation Valves

Valve No.	System(1)	Test Fluid(2)	Minimum Test Pressure (PSIG)
MW-17-1	" " " "	Water(4)	52
1170	Cont. Purge System	Gas(7)	47
1171	Cont. Purge System	Gas(7)	47
1172	" " "	Gas(7)	47
1173	" " "	Gas(7)	47
1190	Cont. Pressure Relief	Gas(7)	47
1191	" " "	Gas(7)	47
1192	" " "	Gas(7)	47
[illegible]A	Recirc. Pump to Samp. Sys.	Nitrogen(4)	47
990B	" " " " "	Nitrogen(4)	47
956A	Pressurizer to Samp. Sys.	Water(4)	52
956B	" " " "	Water(4)	52
956C	" " " "	Water(4)	52
956D	" " " "	Water(4)	52
1814A	Cont. Pressure Instr.	Gas	47
1814B	" " "	Gas	47
1814C	" " "	Gas	47
5018	Post Acc. Cont. Sampling	Gas	47
5019	" " " "	Gas	47
5020	" " " "	Gas	47
[illegible]1	" " " "	Gas	47

Table 4.4-1

Containment Isolation Valves

Valve No.	System[1]	Test Fluid[2]	Minimum Test Pressure (PSIG)
5022	" " " "	Gas	47
5023	" " " "	Gas	47
5024	" " " "	Gas	47
5025	" " " "	Gas	47
IA-39	Inst. Air to Cont.	Gas	47
PCV-1228	" " " "	Gas	47
E-2	Post Acc. Vent Exh.	Gas[7]	47
E-1	" " " "	Gas[7]	47
[illegible]	" " " "	Gas[7]	47
E-5	" " " "	Gas[7]	47
85A	Personnel Airlock	Gas	47
85B	" "	Gas	47
85C	" "	Gas[7]	47
85D	" "	Gas[7]	47
95A	Equipment Airlock	Gas	47
95B	Equipment Airlock	Gas	47
95C	" "	Gas[7]	47
95D	" "	Gas[7]	47
4399	Sample Return to Cont. Sump.	Water[4]	52
5132	" " "	Water[4]	52

Table 4.4-1

Containment Isolation Valves

Valve No.	System[(1)]	Test Fluid[(2)]	Minimum Test Pressure (PSIG)

Notes:

1. System in which valve is located.
2. Gas test fluid indicates either nitrogen or air as test medium.
3. Testable only when at cold shutdown.
4. Isolation Valve Seal Water System.
5. Sealed by Residual Heat Removal System fluid.
6. Sealed by Service Water System. Either A or B valve(s) may serve as the required containment isolation valve(s) for the SWN-41, SWN-44 and SWN-71 series. Designation of the B valve(s) in the SWN-44 series requires the codesignation of the SWN-51 valve(s) associated with the penetration(s) as an additional required containment isolation valve(s).
7. Sealed by Weld Channel and Penetration Pressurization System.

4.5 ENGINEERED SAFETY FEATURES

Applicability

Applies to testing of the Safety Injection System, the Containment Spray System, the Hydrogen Recombiner System, and the Air Filtration System.

Objective

To verify that the subject systems will respond promptly and perform their design functions, if required.

Specifications

A. SYSTEM TESTS

1. Safety Injection System

a. System tests shall be performed at each reactor Refueling Interval (#). With the Reactor Coolant System pressure less than or equal to 350 psig and temperature less than or equal to 350°F, a test safety injection signal will be applied to initiate operation of the system. The safety injection pumps are made inoperable for this test.

b. The test will be considered satisfactory if control board indication and visual observations indicate that all components have received the safety injection signal in the proper sequence and timing; that is, the appropriate pump breakers shall have opened and closed, and the appropriate valves shall have completed their travel.

c. Conduct a flow test of the high head safety injection system after any modification is made to either its piping and/or valve arrangement.

d. Verify that the mechanical stops on Valves 856 A, C, D and E are set at the position measured and recorded during the most recent ECCS operational flow test or flow tests performed in accordance with (c) above. This surveillance procedure shall be performed following any maintenance on these valves or their associated motor operators and at a convenient outage if the position of the mechanical stops has not been verified in the preceding three months.

B. CONTAINMENT SPRAY SYSTEM

1. System tests shall be performed at each reactor Refueling Interval (#). The tests shall be performed with the isolation valves in the spray supply lines at the containment and the spray additive tank isolation valves blocked closed. Operation of the system is initiated by tripping the normal actuation instrumentation.

2. The spray nozzles shall be tested for proper functioning at least every five years.

3. The test will be considered satisfactory if visual observations indicate all components have operated satisfactorily.

C. HYDROGEN RECOMBINER SYSTEM

1. Visual Inspection of both PARs at each refueling outage(#) shall be done to verify that there is no significant fouling by foreign materials.

2. A sample plate from each PAR shall be removed at each refueling outage and tested to verify response to a hydrogen mixture test gas.

D. CONTAINMENT AIR FILTRATION SYSTEM

Each air filtration unit specified in Specification 3.3.B shall be demonstrated to be operable:

1. At least once per 31 days by initiating, from the control room, flow through the HEPA filters and charcoal adsorbers and verifying that the unit operates for at least 15 minutes.

2. At least once every Refueling Interval (#), or (1) after any structural maintenance on the HEPA filters or charcoal adsorber housings, or (2) at any time painting, fire or chemical releases could alter filter integrity by:

a. verifying a system flow rate at ambient conditions of 65,600 cfm ±10% during filtration unit operation when tested in accordance with ANSI N510-1975. Verify that the flow rate through the charcoal adsorbers is ≥ 8,000 cfm.

b. verifying that the HEPA filters and/or charcoal adsorbers satisfy the in-place testing acceptance criteria and uses the test procedures of Regulatory Positions C.5.a and C.5.c of Regulatory Guide 1.52, Revision 2, March 1978, at ambient conditions and at a flow rate of 65,600 cfm ±10% for the HEPA filters.

c. verifying within 31 days after removal that a laboratory analysis of a representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1978, meets the laboratory testing criteria of Regulatory Position C.6.a (except for Position C.6.a(1)) of Regulatory Guide 1.52, Revision 2, March 1978.

3. After every 720 hours of charcoal adsorber operation, by verifying within 31 days after removal that a laboratory analysis of a representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1978, meets the laboratory testing criteria of Regulatory Position C.6.a (except for Position C.6.a(1)) of Regulatory Guide 1.52, Revision 2, March 1978.

4. At least once every Refueling Interval (#) by:

   a. Verifying that the pressure drop across the moisture separator and HEPA filters is less than 6 inches Water Gauge while operating the filtration unit at ambient conditions and at a flow rate of 65,600 cfm ±10%.

   b. Verifying that the unit starts automatically on a Safety Injection Test Signal.

5. After each complete or partial replacement of a HEPA filter bank, by verifying that the HEPA filter banks remove greater than or equal to 99% of the DOP when they are tested in-place in accordance with ANSI N510-1975 while operating the unit at ambient conditions and at a flow rate of 65,600 cfm ±10%.

6. After each complete or partial replacement of a charcoal adsorber bank, verify that the flow rate through the charcoal adsorbers is $\geq$ 8,000 cfm when the system is operating at ambient conditions and a flow rate of 65,600 cfm ±10% when tested in accordance with ANSI N510-1975.

E. CONTROL ROOM AIR FILTRATION SYSTEM

The control room air filtration system specified in Specification 3.3.H shall be demonstrated to be operable:

1. At least once per 31 days by initiating, from the control room, flow through the HEPA filters and charcoal adsorbers and verifying that the system operates for at least 15 minutes.

2. At least once every Refueling Interval or (1) after any structural maintenance on the HEPA filter or charcoal adsorber housings, or (2) at any time painting, fire or chemical releases could alter filter integrity by:

   a. verifying a system flow rate, at ambient conditions, of 1840 cfm ±10% during system operation when tested in accordance with ANSI N510-1975.

   b. verifying that, with the system operating at ambient conditions and at a flow rate of 1840 CFM ±10% and exhausting through the HEPA filters and charcoal adsorbers, the total bypass flow of the system to the facility vent, including leakage through the system diverting valves, is less than or equal to 1% when the system is tested by admitting cold DOP at the system intake.

   c. verifying that the system satisfies the in-place testing acceptance criteria and uses the test procedures of Regulatory Positions C.5.a, C.5.c and C.5.d of Regulatory Guide 1.52, Revision 2, March 1978, at ambient conditions and at a flow rate of 1840 cfm ±10%.

   d. verifying, within 31 days after removal, that a laboratory analysis of a representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1978, meets the laboratory testing criteria of Regulatory Position C.6.a of Regulatory Guide 1.52, Revision 2, March 1978.

3. After every 720 hours of charcoal adsorber operation, by verifying within 31 days after removal that a laboratory analysis of a representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1973, meets the laboratory testing criteria of Regulatory Position C.6.a of Regulatory Guide 1.52, Revision 2, March 1978.

4. At least once every Refueling Interval by:

   a. verifying that the pressure drop across the combined HEPA filters and charcoal adsorber banks is less than 6 inches water gauge while operating the system at ambient conditions and at a flow rate of 1840 cfm ±10%.

   b. verifying that, on a Safety Injection Test Signal or a high radiation signal in the control room, the system automatically switches into a recirculation mode of operation with flow through the HEPA filters and charcoal adsorber banks. [1]

   c. verifying that the system maintains the control room at a neutral or positive pressure relative to the outside atmosphere during system operation.

5. After each complete or partial replacement of an HEPA filter bank, by verifying that the HEPA filter banks remove greater than or equal to 99% of the DOP when they are tested in-place in accordance with ANSI N510-1975 while operating the system at ambient conditions and at a flow rate of 1840 cfm ±10%.

6. After each complete or partial replacement of a charcoal adsorber bank, by verifying that the charcoal adsorbers remove greater than or equal to 99.95% of a halogenated hydrocarbon refrigerant test gas when they are tested in-place in accordance with ANSI N510-1975 while operating the system at ambient conditions and at a flow rate of 1840 cfm ±10%.

7. Each toxic gas detection system shall be demonstrated operable by performance of a channel check at least once per day, a channel test at least once per 31 days and a channel calibration at least once each Refueling Interval(#).

F. FUEL STORAGE BUILDING AIR FILTRATION SYSTEM

The fuel storage building air filtration system specified in Specification 3.8 shall be demonstrated operable:

1. At least once per 31 days by initiating, from the control room, flow through the HEPA filters and charcoal adsorbers and verifying that the system operates for at least 15 minutes.

2. At each refueling, prior to refueling operations, or (1) after any structural maintainance on the HEPA filter or charcoal adsorber housings, or (2) at any time painting, fire or chemical releases could alter filter integrity by:

   a. verifying a system flow rate at ambient conditions of 20,000 cfm ±10% during system operation when tested in accordance with ANSI N510-1975.

   b. verifying that the system satisfies the in-place testing acceptance criteria and uses the test procedures of Regulatory Positions C.5.a, C.5.c and C.5.d of Regulatory Guide 1.52, Revision 2, March 1978, at ambient conditions and at a flow rate of 20,000 cfm ±10%.

   c. verifying within 31 days after removal that a laboratory analysis of a representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1978, meets the laboratory testing criteria of Regulatory Position C.6.a of Regulatory Guide 1.52, Revision 2, March 1978.

3. Prior to handling spent fuel which has decayed for less than 35 days, verify within 31 days after removal that a laboratory analysis of a representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1978, meets the laboratory testing criteria of Regulatory Position C.6.a of Regulatory Guide 1.52, Revision 2, March 1978. Such an analysis is good for 720 hours of charcoal adsorber operation. After 720 hours of operation, if spent fuel with a decay time of less than 35 days is still being handled, a new sample is required along with a new analysis.

4. At each refueling prior to refueling operations by:

   a. verifying that the pressure drop across the combined HEPA filters and charcoal adsorber banks is less than 6 inches water gauge while operating the system at ambient conditions and at a flow rate of 20,000 cfm ±10%.

   b. verifying that the system maintains the spent fuel storage pool area at a pressure less than that of the outside atmosphere during system operation.

5. After each complete or partial replacement of a HEPA filter bank, by verifying that the HEPA filter banks remove greater than or equal to 99% of the DOP when they are tested in-place in accordance with ANSI N510-1975 while operating the system at ambient conditions and at a flow rate of 20,000 cfm ±10%.

6. After each complete or partial replacement of a charcoal adsorber bank, by verifying that the charcoal adsorbers remove greater than or equal to 99.95% of a halogenated hydrocarbon refrigerant test gas when they are tested in-place in accordance with ANSI N510-1975 while operating the system at ambient conditions and at a flow rate of 20,000 cfm ±10%.

G. <u>POST-ACCIDENT CONTAINMENT VENTING SYSTEM</u>

The post-accident containment venting system shall be demonstrated operable:

1. At least once every Refueling Interval, or (1) after any structural maintenance on the HEPA filter or charcoal adsorber housings, or (2) at any time painting, fire or chemical releases could alter filter integrity by:

   a. verifying no flow blockage by passing flow through the filter system.

   b. verifying that the system satisfies the in-place testing acceptance criteria and uses the test procedures of Regulatory Positions C.5.a, C.5.c and C.5.d of Regulatory Guide 1.52, Revision 2, March 1978, at ambient conditions and at a flow rate of 200 cfm ±10%.

c. at Refueling Intervals (#), verify within 31 days after removal that a laboratory analysis of a representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1978, meets the laboratory testing criteria of Regulatory Position C.6.a of Regulatory Guide 1.52, Revision 2, March 1978.

2. After every 720 hours of charcoal adsorber operation, by verifying within 31 days after removal that a laboratory analysis of a representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1978, meets the laboratory testing criteria of Regulatory Position C.6.a of Regulatory Guide 1.52, Revision 2, March 1978.

3. At least once every Refueling Interval by:

   a. verifying that the pressure drop across the combined HEPA filters and charcoal adsorber banks is less than 6 inches water gauge while operating the system at ambient conditions and at a flow rate of 200 cfm ±10%.

   b. verifying that the system valves can be manually opened.

4. After each complete or partial replacement of a HEPA filter bank, by verifying that the HEPA filter banks remove greater than or equal to 99% of the DOP when they are tested in-place in accordance with ANSI N510-1975 while operating the system at ambient conditions and at a flow rate of 200 cfm ±10%.

5. After each complete or partial replacement of a charcoal adsorber bank, by verifying that the charcoal adsorbers remove greater than or equal to 99.95% of a halogenated hydrocarbon refrigerant test gas when they are tested in-place in accordance with ANSI N510-1975 while operating the system at ambient conditions and at a flow rate of 200 cfm ±10%.

<u>Basis</u>

The Safety Injection System and the Containment Spray System are principal plant safeguards that are normally inoperative during reactor operation. Complete systems tests cannot be performed when the reactor is operating because a safety injection signal causes reactor trip, main feedwater isolation and containment isolation, and a Containment Spray System test requires the system to be temporarily disabled. The method of assuring operability of these systems is, therefore, to combine systems tests to be performed during plant refueling shutdowns, with more frequent component tests, which can be performed during reactor operation.

The refueling systems tests demonstrate proper automatic operation of the Safety Injection and Containment Spray Systems. With the pumps blocked from starting, a test signal is applied to initiate automatic action and verification made that the components receive the safety injection signal in the proper sequence. The test demonstrates the operation of the valves, pump circuit breakers, and automatic circuitry[1].

During reactor operation, the instrumentation which is depended on to initiate safety injection and containment spray is generally checked daily and the initiating circuits are tested monthly (in accordance with Specification 4.1). The testing of the analog channel input is accomplished in the same manner as for the reactor protection system. The engineered safety features logic system is tested by means of test switches to simulate inputs from the analog channels. The test switches interrupt the logic matrix output to the master relay to prevent actuation. Verification that the logic is accomplished is indicated by the matrix test light. Upon completion of the logic checks, verification that the circuit from the logic matrices to the master relay is complete is accomplished by use of an ohm-meter to check continuity.

Other systems that are also important to the emergency cooling function are the accumulators, the Component Cooling System, the Service Water System and the containment fan coolers. The accumulators are a passive safeguard. In accordance with Specification 4.1, the water volume and pressure in the accumulators are checked periodically. The other systems mentioned operate when the reactor is in operation and, by these means, are continuously monitored for satisfactory performance.

For the four flow distribution valves (856 A, C, D and E), verification of the valve mechanical stop adjustments is performed periodically to provide assurance that the high head safety injection flow distribution is in accordance with flow values assumed in the core cooling analysis.

The hydrogen recombiner system is an engineered safety feature which would function following a loss-of-coolant accident to control the hydrogen evolved in the containment. The passive autocatalytic recombiners (PARs) contain no control or support equipment which would require surveillance. No specific degradation mechanism has yet been identified for the catalysts plates in standby service. Periodic visual examination and cleaning if necessary is done to prevent significant gas blockage by dust or debris. Representative plates are periodically removed and their response to a nominal 1% hydrogen gas mixture is evaluated for evidence of unexpected degradation.

The biannual testing of the containment atmosphere sampling system will demonstrate the availability of this system.

The hydrogen recombiner system is an engineered safety feature which would be used only following a loss-of-coolant accident to control the hydrogen evolved in the containment. The system is not expected to be started until approximately 13 days have elapsed following the accident. At this time the hydrogen concentration in the containment will have reached 2% by volume, which is the design concentration for starting the recombiner system. Actual starting of the system will be based upon containment atmosphere sample analysis. The complete functional tests of each unit at refueling shutdown will demonstrate the proper operation of the recombiner system. More frequent tests of the recombiner control system and air-supply blowers will assure operability of the system. The biannual testing of the containment atmosphere sampling system will demonstrate the availability of this system.

The charcoal portion of the in-containment air recirculation system is a passive safeguard which is isolated from the cooling air flow during normal reactor operation. Hence the charcoal should have a long useful lifetime. The filter frames that house the charcoal are stainless steel and should also last indefinitely. However, the required periodic visual inspections will verify that this is the case. The iodine removal efficiency cannot be measured with the filter cells in place. Therefore, at periodic intervals a representative sample of charcoal is to be removed and tested to verify that the efficiency for removal of methyl iodide is obtained(2). Such laboratory charcoal sample testing together with the specified in-place testing of the HEPA filters will provide further assurance that the criteria of 10 CFR 100 continue to be met.

The control room air filtration system is designed to filter the control room atmosphere for intake air and/or for recirculation during control room isolation conditions. The control room air filtration system is designed to automatically start upon control room isolation. High-efficiency particulate absolute (HEPA) filters are installed upstream of the charcoal adsorbers to prevent clogging of these adsorbers. The charcoal adsorbers are installed to reduce the potential intake of radioiodine by control room personnel. The required in-place testing and the laboratory charcoal sample testing of the HEPA filters and charcoal adsorbers will provide assurance that Criterion 19 of the General Design Criteria for Nuclear Power Plants, Appendix A to 10 CFR Part 50 continues to be met.

The fuel storage building air filtration system is designed to filter the discharge of the fuel storage building atmosphere to the plant vent. This air filtration system is designed to start automatically upon a high radiation signal. Upon initiation, isolation dampers in the ventilation system are designed to close to redirect air flow through the air treatment system. HEPA filters and charcoal adsorbers are installed to reduce potential releases of radioactive material to the atmosphere. Nevertheless, as required by Specification 3.8.B.6, the fuel storage building air filtration system must be operating whenever spent fuel is being moved unless the spent fuel has had a continuous 35-day decay period. The required in-place testing and the laboratory charcoal sample testing of the HEPA filters and charcoal adsorbers will provide added assurance that the criteria of 10 CFR 100 continue to be met.

The post-accident containment venting system may be used in lieu of hydrogen recombiners for removal of combustible hydrogen from the containment building atmosphere following a design basis accident. As was the case for hydrogen recombiner use, this system is not expected to be needed until approximately 13 days have elapsed following the accident. Use of the system will be based upon containment atmosphere sample analysis and availability of the hydrogen recombiners. When in use, HEPA filters and charcoal adsorbers will filter the containment atmosphere discharge prior to release to the plant vent. The required in-place testing and laboratory charcoal sample testing will verify operability of this venting system and provide further assurance that releases to the environment will be minimized.

As indicated for all four of the previously mentioned engineered safety feature (ESF) air filtration systems, high-efficiency particulate absolute (HEPA) filters are installed upstream of the charcoal adsorbers to prevent clogging of these adsorbers. The charcoal adsorbers are installed to reduce the potential release of radioiodine to the environment. The laboratory charcoal sample testing periodically verifies that the charcoal meets the iodine removal efficiency requirements of Regulatory Guide 1.52, Revision 2. Should the charcoal of any of these filtration systems fail to satisfy the specified test acceptance criteria, the charcoal will be replaced with new charcoal which satisfies the requirements for new charcoal outlined in Regulatory Guide 1.52, Revision 2.

References

(1) UFSAR Section 6.2
(2) UFSAR Section 6.4

1. In this instance Refueling Interval is defined by R#.

ATTACHMENT B

SAFETY ASSESSMENT

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
INDIAN POINT UNIT NO. 2
DOCKET NO. 50-247
AUGUST, 1996

SECTION I - Description of Changes

This application for amendment to the Consolidated Edison Indian Point Unit No. 2 Technical Specifications seeks to amend Section 3.3.G (Hydrogen Recombiner System and Post-Accident Containment Venting System), the basis for Section 3.3.G), and Section 4.4, Table 4.4-1 (Containment Isolation Valves).

Two changes are being made. First, the existing flame-type hydrogen recombiners, and support equipment, are being replaced with passive autocatalytic recombiners (PARs). Second, the design basis analysis of post-accident hydrogen generation ("DBA hydrogen generation") is being recalculated.

The new combustible gas control system remains in accordance with 10 CFR 50.44.

These changes are being made to allow simplified operation and maintenance of the hydrogen control system and to provide increased allowances for certain hydrogen generation sources. UFSAR changes will be made in accordance with 50.71(e).

The proposed changes are specified in Attachment A to the Application of Amendment enclosed with this letter.

Passive Autocatalytic Recombiners

The two existing recombiners will be replaced with two PAR units manufactured by NIS Ingenieurgesellschaft mbH (NIS). Each recombiner has 88 screened plates containing ceramic pellets with palladium catalyst deposited on the pellet surfaces. The devices have been demonstrated [1] to catalyze the recombination of hydrogen and oxygen over the full range of post accident temperatures. Reaction rates have been measured for the range of 0.25% to greater than 4% hydrogen in an air mixture.

The PAR device consists of a stainless steel enclosure providing both the structure for the device and support for the catalyst material. The enclosure is open on the bottom and top and extends above the catalyst elevation to provide a chimney to yield additional lift to enhance the efficiency and ventilation capability of the device. The catalyst material is constrained within cartridges. The cartridges are mounted vertically within the enclosure with spaces between the cartridges. These spaces serve as ventilation channels for the throughflow. During operation, the air inside the recombiner is heated by the recombination process, causing it to rise by natural convection. As it rises, replacement air is drawn into the recombiner through the bottom of the PAR and heated by the exothermic reaction, forming water vapor, and exhausted through the chimney where the heated gases mix with containment atmosphere. The PARs maintain the containment atmosphere below flammable levels (4% to 6% hydrogen) so there is no risk of ignition from the heated gases.

Table 1 provides a functional comparison of the old and new recombiners.

Hydrogen Generation

Section 6.8.3 of the UFSAR describes the current assumptions for post-accident hydrogen generation. Table 2 of this Safety Assessment provides a comparison of the current and proposed assumptions. Changes arise from use of NRC guidance [2] that was not available when IP2 was licensed and from increased assumptions for corrosive surfaces. NRC guidance also causes a change in the maximum allowed containment hydrogen concentration from the existing 2% to 4%[3].

New hydrogen generation has been calculated using STARGAP[4], a proprietary derivative of the NRC-endorsed[5] COGAP code. PAR effectiveness is also calculated using STARGAP.

Section II - Evaluation of Changes

A DBA hydrogen generation/recombination analysis has been performed[6] for Indian Point Unit No. 2. The nominal results for a single PAR in the IP2 containment are shown in Figure 1. The hydrogen concentration does not exceed the 4% flammability limit.

Sensitivity studies were also performed by varying either the hydrogen generation rate or the PAR effectiveness. The 4% flammability limit was not exceeded either in the case with hydrogen generation approximately twice the nominal value, itself a conservative value, nor in the case of a single PAR with 10% overall effectiveness.

Poisoning of catalytic materials has been examined. Potential poisons from normal operating conditions (fire and fumes, etc.) have not demonstrated significant impact. Periodic surveillance will confirm that unexpected degradation does not go undetected.

Potential poisons from accident conditions have also been considered. The LOCA specified in 10 CFR 50.44 involves less than 5% clad failures. The resulting containment environment will include a limited amount of iodine and other volatile fission products. The NIS PAR was developed for severe accident service and tested for iodine poisoning at those much higher levels. Even severe accident levels of particulates are not expected to affect catalyst significantly due to the diffusion-filter nature of the PARs design. In any event, any decrease in effectiveness is believed to be bounded by the performance margin of the PARs. Assuming only one of the two PARs is available, the hydrogen build up is calculated to be significantly less than the 4% flammability limit.

A significant testing program has been conducted in Germany and France to verify the adequacy of the PARs under various adverse conditions. Many of these tests were intended to envelop a number of related environments such that one test (e.g. fire) may cover several conditions (i.e., heat, smoke, etc.). Table 3 shows examples of some of the tests that have been performed together with the results of those tests. This test program demonstrates the adequacy of the PARs under adverse conditions.

One condition that is to be avoided for proper PAR functioning is submersion in water or direct exposure to containment sprays. For these reasons, the PARs are to be located above the containment flood level and they will be designed with a spray hood to preclude direct contact with the post-accident containment sprays.

Section III - No Significant Hazards Evaluation

Consistent with the requirements of 10 CFR 50.92, the enclosed application involves no significant hazards based on the following information:

1) Does the proposed license amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

Response:

Neither the probability nor the consequences of a post-LOCA combustible gas accident are increased by the change in recombiners or in the change to hydrogen generation analysis. The probability of a 10 CFR 59.44 type LOCA is not affected. The consequences of such an accident are not significantly changed.

Accidents associated with failure of the flame-recombiner flue (hydrogen/oxygen) system as well as with failure of the flame-recombiner containment isolation valves have been eliminated.

No other accident is potentially affected by this change.

2) Does the proposed license amendment create the possibility of a new or different kind of accident from any previously analyzed?

Response:

No new modes of plant operation are being introduced other than elimination of operation of the flame-type recombiners and associated support equipment. Recombiner failure is believed to be far less likely with the PAR design but in any event, the containment vent system is being maintained in its current role as backup to recombiner systems. All other plant systems will perform equally during the response to a potential accident. Therefore, the possibility of a new or different kind of accident than previously analyzed will not be increased.

3) Does the proposed amendment involve a significant reduction in the margin of safety?

Response:

The proposed amendment involves margin in the hydrogen flammability limit, in the hydrogen generation assumptions and in the number of PAR devices assumed. Furthermore, sensitivity analysis on PAR effectiveness indicates that additional margin exists for success even with degraded PAR performance. It has been shown by the analysis that the criteria of 10 CFR 50.44(d) can be met with margin. Therefore, the proposed amendment does not involve a significant reduction in the margin of safety.

SECTION IV - References

1 U. Behrens et at, "Experimental Studie of the Behavior of the Catalyzer Module Developed by NIS Under Various System Conditions and Setups, Report for RWE Corp.", Battelle-Frankfurt, March 1991 (proprietary)

2 USNRC, "Control of Combustible Gas Concentrations in Containment Following a Loss-of-Coolant Accident", Regulatory Guide 1.7, Revision 2, November 1978

3 IBID Table 1

4 Polestar "STARGAP, A Code for Evaluating the Performance of Passive Autocatalytic Recombiners (PARs) to Mitigate Combustible Gas Concentrations in Nuclear Power Plants Containments Following Design Basis Accidents: Code Description and Validation and Verification Report", PSATC108.04, Rev. 0 (Proprietary)

5 USNRC, "Description of COGAP", Appendix A, SRP Section 6.2.5, Rev. 2, July 1981

6 Polestar, "Indian Point 2 DEA Combustible Gas Calculation Project Procedure - Results", Rev. XXX (NOT COMPLETE 7/16/96)

The proposed changes have been reviewed by both the Station Nuclear Safety Committee (SNSC) and the Nuclear Facilities Safety Committee (NFSC). Both Committees concur that the proposed changes do not represent a significant hazards consideration.

Table 1

Recombiner Functional Comparison

	Current System	Proposed PAR System	Notes
Operating Environment - maximum pressure -maximum hydrogen	- 0 to 5 psig - unknown	- greater than any analyzed containment pressure - tested to 10% H_2	Flame-recombiner not designed for use above 5 psig.
Nominal Flow	350 scfm	-400 scfm at 4% H_2	PAR flow is a function of hydrogen concentration
Nominal hydrogen removal rate	1 to 4 lb/hr at 4% H_2	>4 lb/hr at 4% H_2	Current recombiner efficiency 30% to 100%
Recombiner Support Systems	- fuel (hydrogen/oxygen addition) supply - containment isolation	none	
Operating procedure	-manual initiation -repeated cycle	no operator action	

Table 2

Hydrogen Generation Assumption Comparison

	Current Analysis	Proposed Analysis	Notes
Reactor Power	3,216 MWT	3,216 MWt	UFSAR 6.8.3
Reactor Operating Time	830 days	830 days	UFSAR 6.8.3
Zirconium mass	41,994 lbm	41,994 lbm	UFSAR 6.8.3
Zirconium oxidized	2%	5%	5% from 10 CFR 50.44(d)(2) bounds the 5-times-App. K results allowed by 50.44(d)(1).
Hydrogen yield in core	0.44 molecule/100eV	0.5 molecule/100eV	RG 1.7 specifies proposed values.
Hydrogen yield in sump	0.30 molecule/100eV	0.5 molecule/100eV	RG 1.7 specifies proposed values.
Fission product decay energy absorbed by core water	7.4% of gamma energy	10% of gamma energy	RG 1.7 specifies proposed value but notes that it is "thought to be conservative: further analysis may show it should be revised".
"Solid" fission product decay energy absorbed by sump water	1% (of all betas and gammas)	1% (of all betas and gammas)	RG 1.7 specifies proposed values.
Halogen (primarily iodine) energy absorbed by sump water	50%	50%	RG 1.7 specifies proposed values.
Aluminum surfaces	1,508 lbm 20,635 sq-ft	3,758 lbm 21,400 sq-ft	"Contingency" from UFSAR increased by factor of 10.
Aluminum corrosion rate	100 mils/yr. (after 3 hours)	200 mils/yr (after 3 hours)	RG 1.7 specifies proposed value.
Zinc surfaces	considered bounded by aluminum corrosion effects	65 mils 20,000 sq-ft	Added specific allowance for completeness. Not significant source of hydrogen.
Zinc corrosion rate	N/A	20 mils/yr (after 1 hour)	
Hydrogen concentration limit	2%	4%	RG 1.7 specifies proposed value.

Table 3

PAR Test Data

Test	Condition	Results
M	1 % CO injection	No significant impact on startup or performance.
R	Oil fire. Steam atmosphere.	No significant impact on startup or performance.
S	Pre soaked by water spray	No significant impact on startup or performance.
AD	Iodine injection (3 grams)	Slightly slower startup (about 0.5 hour versus "normal" 0.2 hour) and reduced performance (estimated 15%)
AE	Cable fire and silicon oil vapor	No significant impact on startup or performance.
AF through AL	Presoaked by water spray and condensing environment (various pellet configurations)	Startup slowed to as long as two-and-a-half hours for uncoated pellets. No discernible impact on performance once started.
N2	Pre-soaked by water spray	No significant impact on startup or performance.
N15	Cable fire	Slightly slower startup. No discernible impact on performance once started.

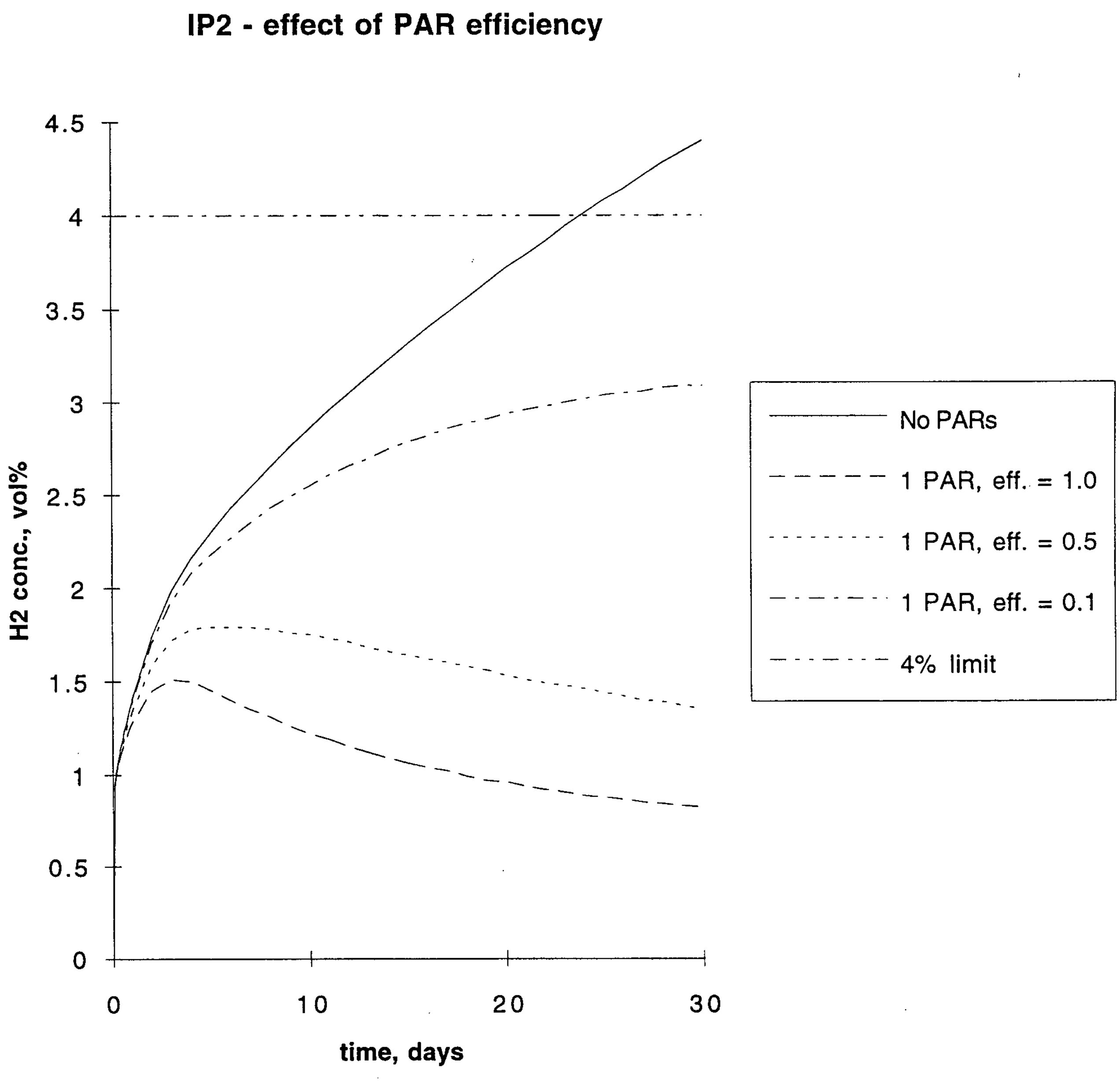
IP2 - effect of PAR efficiency
H2 conc., vol%
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0
10
20
30
time, days
No PARs
1 PAR, eff. = 1.0
1 PAR, eff. = 0.5
1 PAR, eff. = 0.1
4% limit

Figure 1