ATTACHMENT 1

PROPOSED CHANGES TO DPR-29

TECHNICAL SPECIFICATIONS

1202K

G. Jet Pumps

1. Whenever the reactor is in the Startup/Hot Standby or Run modes, all jet pumps shall be intact, and all operating jet pumps shall be operable. If it is determined that a jet pump is inoperable, an orderly shutdown shall be initiated and the reactor shall be in a cold shutdown condition within 24 hours.

2. Flow indication from 19 of the 20 jet pumps shall be verified prior to initiation of reactor startup from a cold shutdown condition.

3. The indicated core flow is the sum of the flow indication from 19 jet pumps plus the flow from Jet Pump number 8 added in a second time to compensate for loss of flow indication from Jet Pump number 7. If flow indication failure occurs for three or more jet pumps, immediate corrective action shall be taken. If flow indication for all but two jet pumps cannot be obtained within 12 hours, an orderly shutdown shall be initiated and the reactor shall be in a cold shutdown condition within 24 hours.

G. Jet Pumps

1. Whenever there is recirculation flow with the reactor in the Startup/Hot Standby or Run modes, jet pump integrity and operability shall be checked daily by verifying that the following two conditions do not occur simultaneously:

   a. The recirculation pump flow differs by more than 10% from the established speed-flow characteristics.

   b. The indicated total core flow is more than 10% greater than the core flow value derived from established power-core flow relationships.

2. Additionally, when operating with one recirculation pump with the equalizer valves closed, the diffuser to lower plenum differential pressure shall be checked daily, and the differential pressure of any jet pump in the idle loop shall not vary by more than 10% from established patterns.

3. The baseline data required to evaluate the conditions in Specifications 4.6.G.1 and 4.6.G.2 will be acquired each operating cycle.

H. Recirculation Pump Flow Mismatch

1. Whenever both recirculation pumps are in operation, pump speeds shall be maintained within 10% of each other when power level is greater than 80% and within 15% of each other when power level is less than 80%.

2. If Specification 3.6.H.1 cannot me met, one recirculation pump shall be tripped.

3. The reactor shall not be operated with one recirculation loop out of service for more than 24 hours. With the reactor operating, if one recirculation loop is out of service the plant shall be placed in a hot shutdown condition

H. Recirculation Pump Flow Mismatch

Recirculation pumps speed shall be checked daily for mismatch.

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G. Jet Pumps

Failure of a jet pump nozzle assembly holddown mechanism, nozzle assembly, and/or riser increases the cross-sectional flow area for blowdown following the postulated design-basis double-ended recirculation line break. Therefore, if a failure occurs, repairs must be made to assure the validity of the calculated consequences.

The following factors form the basis for the surveillance requirements:

1. A break in a jet pump decreases the flow resistance characteristic of the external piping loop causing the recirculation pump to operate at a higher flow condition when compared to previous operation.

2. The change in flow rate of the failed jet pump produces a change in the indicated flow rate of that pump relative to the other pumps in that loop. Comparison of the data with a normal relationship or pattern provides the indication necessary to detect a failed jet pump.

3. The jet pump flow deviation pattern derived from the diffuser to lower plenum differential pressure readings will be used to further evaluate jet pump operability in the event that the jet pumps fail the tests in Sections 4.6.G.1 and 2.

Agreement of indicated core flow with established power-core flow relationships provides the most assurance that recirculation flow is not bypassing the core through inactive or broken jet pumps. This bypass flow is reverse with respect to normal jet flow. The indicated total core flow is a summation of the flow indications from 19 jet pumps plus the flow from Jet Pump number 8 added in a second time to compensate for loss of flow indication from Jet Pump number 7. The total core flow measuring instrumentation sums reverse jet pump flow as though it were forward flow. Thus, the indicated flow is higher than actual core flow by at least twice the normal flow through any backflowing pump. Reactivity inventory is known to a high degree of confidence so that even if a jet pump failure occurred during a shutdown period subsequent power ascension would promptly demonstrate abnormal control rod withdrawal for any power-flow operating map point.

A nozzle-riser system failure could also generate the coincident failure of a jet pump body; however, the converse is not true. The lack of any substantial stress in the jet pump body makes failure impossible without an initial nozzle riser system failure.

H. Recirculation Pump Flow Mismatch

The LPCI loop selection logic is described in the SAR, Section 6.2.4.2.5. For some limited low probability accidents with the recirculation loop operating with large speed differences, it is possible for the logic to select the wrong loop for injection. For these limited conditions, the core spray itself is adequate to prevent fuel temperatures from exceeding allowable limits. However, to limit the probability even further, a procedural limitation has been placed on the allowable variation in speed between the recirculation pumps.

The licensee's analyses indicate that above 80% power the loop select logic could not be expected to function at a speed differential of 15%. Below 80% power, the loop select logic would not be expected to function at a speed differential of 20%. This specification provides a margin of 5% in pump speed differential before a problem could arise. If the reactor is operating on one pump, the loop select logic trips that pump before making the loop selection.

ECCS performance during reactor operation with one recirculation loop out of service has not been analyzed. Therefore, sustained reactor operation under such conditions is not permitted.

ATTACHMENT 2

Safety Evaluation

The proposed Technical Specification Amendments, (1) change from 20 to 19 the number of jet pumps from which flow indication shall be verified prior to Reactor startups from cold conditions on Unit One, and (2) change from 20 to 19 the number of jet pumps used as input to the indicated core flow on Unit One. Subsequent additional flow indication failures will now require immediate corrective action after three instead of two flow indication failures to take into account the existing Jet Pump number 7 loss of flow indication. If the number of flow indication failures cannot be reduced to two (Jet Pump number 7 and one additional loss of flow indication) within 12 hours, then the Reactor shall be in a cold shutdown condition within 24 hours. This maintains the required action levels consistent with the current number of operable jet pump flow instrument lines.

The proposed Technical Specification change does not represent a significant change in acceptance criteria or safety margins. This change is being initiated as a result of considerations that continuing Unit One operation without flow indication from all 20 jet pumps is not within strict compliance of current Technical Specifications.

Unit One has been operated with one jet pump instrument line inoperable since November 17, 1972, when the Jet Pump number 7 DP instrument line failed. Operation in this manner has been satisfactory and both the ability to accurately monitor total core flow and to demonstrate jet pump integrity has been adequately maintained.

Operation in this fashion has not been detrimental to the core measurement system accuracy. The sensing line on Jet Pump number 7 is inoperable but the jet pump itself is completely operable. Jet Pump number 7 receives drive flow from the same riser as Jet Pump number 8. Thus, the two jet pumps should have equivalent flows. Base data taken prior to the sensing line failure shows the ratio of Jet Pump number 7 to number 8 flows to be 1.0057. This demonstrates that the pumps have flows that are equal within the accuracy of the instrumentation. The milliamp flow signal of Jet Pump number 8 has been supplied to the core flow summer to represent Jet

Pump number 7 flow, giving a total core flow based on 20 inputs. It is possible to employ this same method of supplying substitute jet pump flow signals to the core flow summer to have a valid indication of total core flow even in the event of multiple jet pump flow sensing line failures. Hence, the proposed changes to the Technical Specifications are conservative with regards to the impact on the core flow measurement system.

In addition to the surveillance on individual jet pump flows, there are a variety of acceptable means for verifying jet pump integrity. The methods available include the following comparisons:

1. Recirculation pump speed to recirculation loop flow (Technical Specification requirement).
2. Core flow to core power and flow control line (Technical Specification requirement).
3. Core flow to core plate DP.
4. Core flow to recirculation drive flow.
5. Recirculation pump speed to jet pump loop flow.

The ability of these methods to detect jet pump failure has not been jeopardized by the loss of Jet Pump number 7 flow indication since the capability of the core measurement system has been maintained. The proposed Technical Specification neither alters the jet pump integrity surveillance methods used nor their ability to detect jet pump failure.

The Jet Pump number 7 instrument line provides an additional leakage path from the jet pump to the annulus region. The instrument line is a 0.25 inch line and would allow insignificant leakage during the design basis LOCA compared to the capacity of the available core cooling systems. The leakage from the sensing line is also insignificant with respect to the design leakage assumed for jet pumps during normal operations and during LPCI operation. Jet pump flow indication line failures have been observed at other G.E. plant locations and G.E. has not identified any need to address the effect on LOCA analysis when considering operation with loss of a jet pump flow sensing line.

From the above discussion, it is concluded that continued operation of Quad-Cities Unit One with loss of Jet Pump number 7 flow indication is acceptable under the provisions of the proposed change to the Technical Specifications. Core measurement system accuracy is unchanged, the ability to determine jet pump integrity and operability has not been affected, and operation of the plant with a failed jet pump sensing line poses no threat to the health and safety of the public.

ATTACHMENT 3

Significant Hazards Consideration

Commonwealth Edison Company proposes to amend Provisional Operating License DPR-29 to change the number of jet pumps required to have flow indication prior to Reactor startup, and the number of jet pumps used as input to the indicated core flow.

The proposed Technical Specification change does not represent a significant change in acceptance criteria or safety margins. This change is being initiated as a result of considerations that continuing Unit One operation without flow indication from all 20 jet pumps is not within strict compliance of current Technical Specifications.

In addressing Reactor operation with a failed jet pump instrument line, three items of concern are identified. These are the core flow measurement system accuracy, jet pump integrity surveillance capability, and the affect on LOCA analysis.

Quad-Cities Unit One has operated since October 17, 1972, with the DP instrumentation on Jet Pump number 7 inoperable. Based on data taken prior to the instrument line failure of Jet Pump number 7, the jet pump flows of number 7 and number 8 are equal within the accuracy of the instrumentation. During this time period, core flow measurement system accuracy has been maintained by supplying the flow signal of Jet Pump number 8 into the core flow summer to represent Jet Pump number 7 flow giving a total core flow based on 20 inputs. Core flow calculated by this method is within the accuracy achieved by summing the inputs from all 20 jet pumps provided Jet Pump number 7 and number 8 are operating normally.

There are a number of acceptable methods for verifying jet pump integrity during operation in addition to the surveillance on individual jet pump flows. These include the following comparisons:

1. Recirculation pump speed to recirculation loop flow (Technical Specification requirement).

2. Core flow to core power and flow control line (Technical Specification requirement).

3. Core flow to core plate DP.

4. Core flow to recirculation drive flow.

5. Recirculation pump speed to jet pump loop flow.

In considering the effect on LOCA analysis, the broken instrument line provides an additional leakage path from the jet pump to the annulus region. The instrument line is a 0.25 inch line and leakage through this line during the design basis LOCA is insignificant when compared to the available core cooling capacity and design leakage attributed to jet pumps under normal and LOCA conditions. LOCA sensitivity studies have indicated that an increase in leakage on the order of that associated with a failed jet pump instrument line has no effect on LOCA safety limits or their calculations.

Based on the preceding discussion, the Station concludes that the changes incorporated in the proposed amendment will not; (1) involve a significant increase in the probability of occurrence of an accident previously evaluated or; (2) create the possibility for a new or different kind of accident from any accident previously evaluated or; (3) involve a significant reduction in the margin of safety. Therefore, based on the criteria established in 10 CFR 50.92, the proposed changes do not constitute a significant hazards consideration.