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Summary of the Indian Point Unit 2 Special Steam Generator Team Preliminary Red Inspection Finding

On August 31, 2000, the NRC issued its report (Inspection Report No. (IR) 05000247/2000-010) detailing the causes for the February 15, 2000, steam generator tube failure (SGTF) at Con Edison's Indian Point 2 Nuclear Power Station. The NRC conducted a Special Team Inspection between March and July 2000, focused on the causes of the SGTF, using the guidance provided in the revised reactor oversight program (ROP). The SGTF causes were outside the scope of previous NRC inspections concerning the February 15, 2000, event, which included: an Augmented Inspection Team (AIT), to promptly establish the event facts; and an emergency preparedness inspection, and an AIT followup inspection to review Con Edison's short term corrective actions for issues identified during the AIT.

The ROP assesses inspection findings and resulting conditions using the significance determination process (SDP) to quantify the change in the core damage frequency over a reactor year of operation (RY). This is referred to as the delta-CDF. For inspection findings that relate to potential releases of radioactive material, the change in large early release frequency (delta-LERF) can also be determined. The SDP classifies the risk associated with inspection findings into four color categories (green, white, yellow and red; from very low to high risk significance, respectively) by comparing the inspection finding delta-CDF or delta-LERF to risk-ranking criteria. The ROP allows Con Edison the opportunity to provide additional information related to inspection findings and the preliminary risk assessments at a Regulatory Conference. The NRC considers thsi information prior to making the final inspection finding risk determination.

The NRC SG Inspection team determined that following the 1997 refueling outage, Con Edison operated Indian Point 2 for approximately 19-months with SG tubes that contained defects that deteriorated with time to a point that one tube failed on February 15, 2000. The SGTF caused reactor coolant to leak into the secondary side of a SG (primary-to-secondary leakage) at about one-quarter of the design basis steam generator tube rupture (SGTR) flow rate.

The team determined that deficiencies in oversight of the SG inspection program resulted in Con Edison not identifying significant performance issues during the 1997 SG inspection and not ensuring an adequate, integrated technical understanding of the SG conditions; significantly increasing the likelihood of a SGTR during the following operating cycle. Con Edison did not recognize and take appropriate corrective actions for three significant conditions that adversly affected the quality of the1997 SG inspection. Collectively, failure to modify and adjust the inspection based on these conditions decreased the probability of detection of flaws in the SG tubes and increased the probability that detectable flaws would be left in-service. Specifically, (1) the extent of degradation in the SG tube U-bend areas was not assessed after finding and correcting the first flaw in this area; (2) the condition of the upper SG tube support plates was not evaluated based on inspection data, as a precursor to tube U-bend degradation; and (3) the effect of high signal noise on the quality of data used to detect flaws in SG tubes was not understood and compensated for. This finding represents an apparent violation of NRC regulations, which require Con Edison to take timely and appropriate actions to correct significant conditions adverse to quality.

The following discussions place the February 15, 2000, event safety consequence and risk

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associated with the event and the inspection finding in context:

1. **The actual consequence of the event** - There were no actual consequences of the event. No radioactivity above normal background levels was measured off-site. The licensee's staff acted appropriately to protect the health and safety of the public. Specifically, the operators and mitigation systems performed properly.

2. **Risk significance of the event (the probability of core damage at the time of the event)** - This is based on the actual plant conditions during the event and the probability that operators and/or mitigation systems would not perform properly. This is referred to as the Conditional Core Damage Probability (CCDP) and equates to the chance that a core damage accident will happen in a given number of events.

   The initial NRC determination of CCDP was approximately one core damage accident in 10,000 SGTRs. Con Edison's risk assessment reached a similar conclusion, with a CCDP of approximately one core damage accident in 13,000 SGTRs.

   Subsequently Con Edison conducted a more detailed risk analysis, which incorporated corrections for the actual primary to secondary leak rate experience during the event, finding that the CCDP to be approximately one core damage accident in 500,0000 SGTFs with primary-to-secondary leakage of the February 15, 2000, magnitude. Events with CCDP in this range would be considered to have low to moderate risk significance.

3. **Risk significance of the Red inspection finding (based on the inspection finding not the event)** - A SGTR breaches the reactor coolant system boundary and can cause a release of radioactive material to the environment if additional barriers become degraded. Therefore, the SDP conservatively assumes that the delta-CDF and delta-LERF are equivalent (i.e., if there is core damage following a SGTR, there will be a large early release).

   Based on the program deficiencies identified during the inspection (the inspection finding) the preliminary NRC analysis modified the frequency for a SGTR to one per RY, resulting in a delta-CDF/LERF for an SGTR of approximately one in 10,000 RYs. The Indian Point 2 individual plant examination (IPE) assumes a frequency of one SGTR per approximately 80 RYs and a resulting CDF/LERF of one in one million RYs for SGTRs.

   Using the ROP risk criteria, the inspection finding was preliminarily characterized as a red, high risk significant, because the delta-CDF/LERF was higher than the SDP LERF criterion of one in 100,000 RYs.

Con Edison disagreed with the NRC inspection findings, as summarized in the Preliminary Team Findings letter, dated July 27, 2000. A Regulatory Conference is currently scheduled for September 26, 2000, in NRC Region I and will be open for public observation.

Indian Point 2 is an NRC agency-focus plant and Con Edison has in progress a broad-based

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Long Term Improvement Program for the station. In accordance with the NRC letter issued May 23, 2000, (subsequent to the NRC Senior Management Meeting), the NRC will meet with Con Edison to review progress at implemeting this program. This meeting will be held September 11, 2000, at the Indian Point 2 site and will be open for public observation.