INDIAN POINT UNIT 2

Steam Generator Tube Failure February 15, 2000

- Sequence of Events
- Safety Significance
- Root Cause Areas
- Risk Significance

EVENT DESCRIPTION

C/42

- **Initiator: PWSCC of the R2C5 tube of the #24 SG; initial primary to secondary leak rate of approximately 150 gpm.**

- **Complications: Several operator, procedural and equipment problems delayed establishing cold, shutdown conditions.**

- **Results:**
  - **The plant remained in an "Alert" Status ~24 hours**
  - **Minor radiological release.**

SEQUENCE OF EVENTS

February 15, 2000

7:17 p.m. -- Operators Identified Increased SG Leak

7:29 p.m. -- Declared Alert
7:30 p.m. -- Tripped Reactor
7:41 p.m. -- State/County Officials Notified
8:31 p.m. -- Isolated Affected SG
9:02 p.m. -- Operators Initiated Plant Cooldown
9:04 p.m. -- Manually Initiated Safety Injection
11:38 p.m. -- Tube Leak Stopped

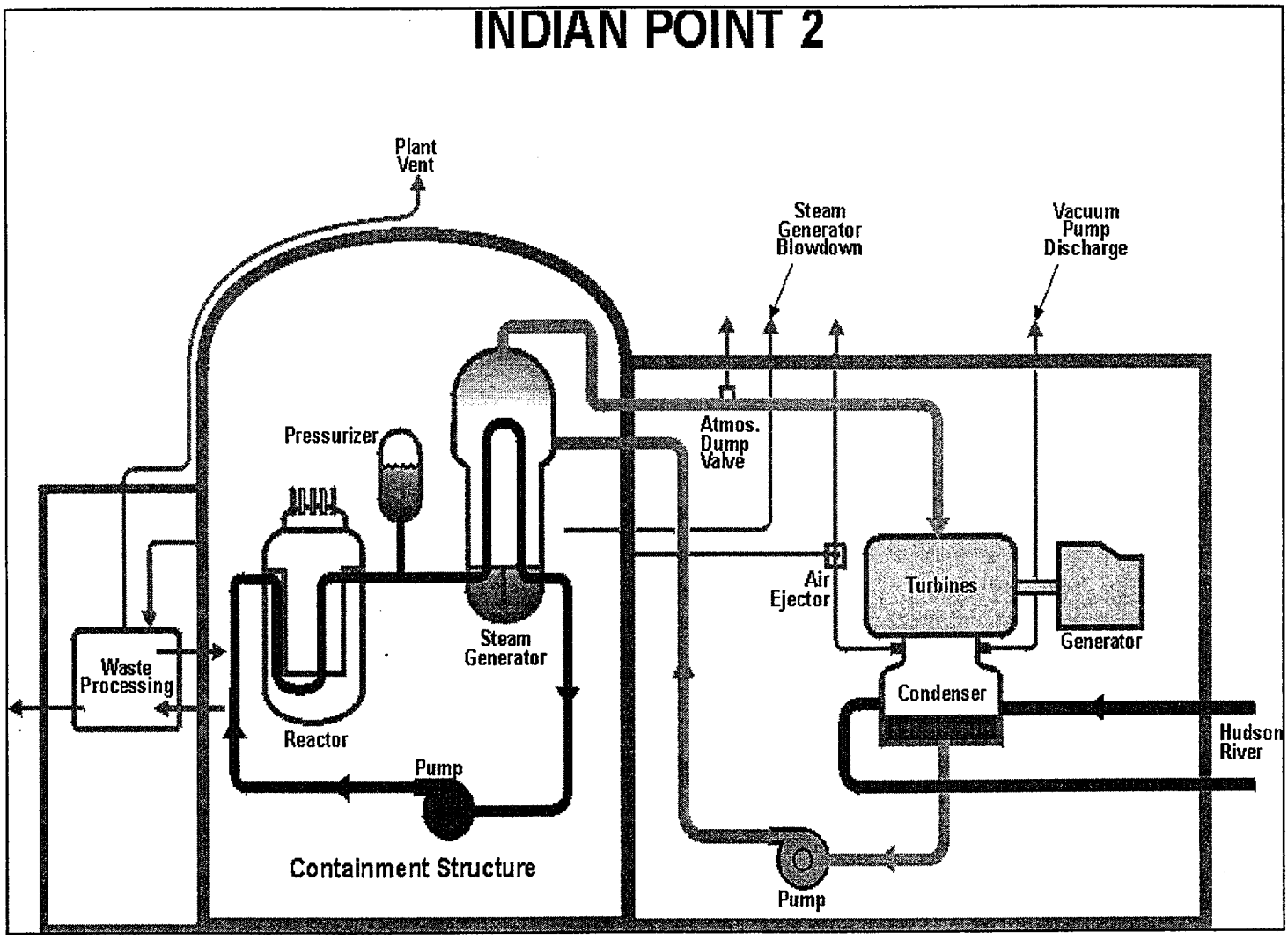
February 16, 2000

12:39 p.m. -- Shutdown Cooling System
4:57 p.m. -- Achieved Cold Shutdown
6:50 p.m. -- Terminated Alert

SAFETY SIGNIFICANCE

- Initial Operator Response Prompt/Appropriate
- Licensee Successful in Achieving Cold Shutdown
- Several Operator Performance/Procedural Issues, and Equipment Issues Identified Which Delayed Achieving Cold Shutdown Conditions

- **Several Emergency Response Problems**
- **No Measurable Offsite Radiological Release Impact (consistent with calculated results)**
- **No Impact on Public Health and Safety**



ROOT CAUSE AREAS

- Operator Performance
- Procedural Adequacy
- Equipment Performance
- Emergency Response

OPERATOR PERFORM ANCE

- Initial Response Prompt and

Appropriate; Procedure Adherence Good Overall

- **Some Deficiencies in the Plant Cooldown Phase**
  - **Initial Cooldown Excessive (led to SI)**
  - **Operator Recognition of Plant Configuration (CCW Valve Configuration, Auxiliary Spray)**

PROCEDURE QUALITY

- Procedures (AOPs/EOPs) to Guide Initial Response were Good
- Several Procedural Deficiencies Challenged Operators During the Plant Cooldown Phase
  - Delayed Placing Shutdown Cooling In-Service
  - System Configuration (CCW Valves, Aux Spray)
  - Shutdown Conditions (RCS Temperature)

EQUIPMENT PERFORMANCE

- Event Mitigation Systems Worked Properly
  - Reactor Protection System
  - Auxiliary Feedwater System
  - Safety Injection System
- Some Pre-existing Equipment Problems Challenged Operators
  - Automatic Condenser Vacuum Control Valve
  - Condenser Mechanical Vacuum Pump
  - Containment Valve Seal Water System Design Problem
  - Pressurizer Power Operated Relief Valve Design Problem

EMERGENCY

RESPONSE

- Emergency Response Protected Health and Safety of Public
- Event Classified Properly/Good Critique of Emergency Response

- Emergency Plan/Implementing Procedure Problems
  - Augmented Emergency Response Facility Staffing Not Timely
  - Accountability Problems
  - Emergency Response Data System (ERDS) not Operable for Several Hours (Pre-Existing Problem)
  - Problems in Implementation of the Media Response Plan
  - Emergency Response Facility Equipment Problems
  - Technical Support Timeliness and Quality Issues

- Supplemental EP Inspection

RISK SIGNIFICANCE

Actual Event Risk:

- **Initial estimated CCDP for a SGTR ~ 1E-4 GEM/SPAR & ~7.7E-5 based IPE**
- **Revised CCDP based on actual leak rate was ~ 2.2E-6**

Key Assumptions:

- **Actual SGT failure leak rate ~ 100gpm - HRA revised accordingly**
- **Charging pumps available for HP makeup**

SDP Conditional Risk Assessment:

- **Delta-CDF is used to determine risk significance of inspection findings**
- **Deficiencies with the 1997 SGT inspection program have a high delta-CDF and are risk significant**

Key Assumptions:

- **SGT failure IE frequency ~ 1/RY**
- **½ tube failures result in ruptures**