# INDIAN POINT UNIT 2
## Steam Generator Tube Failure
## February 15, 2000

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

C/56

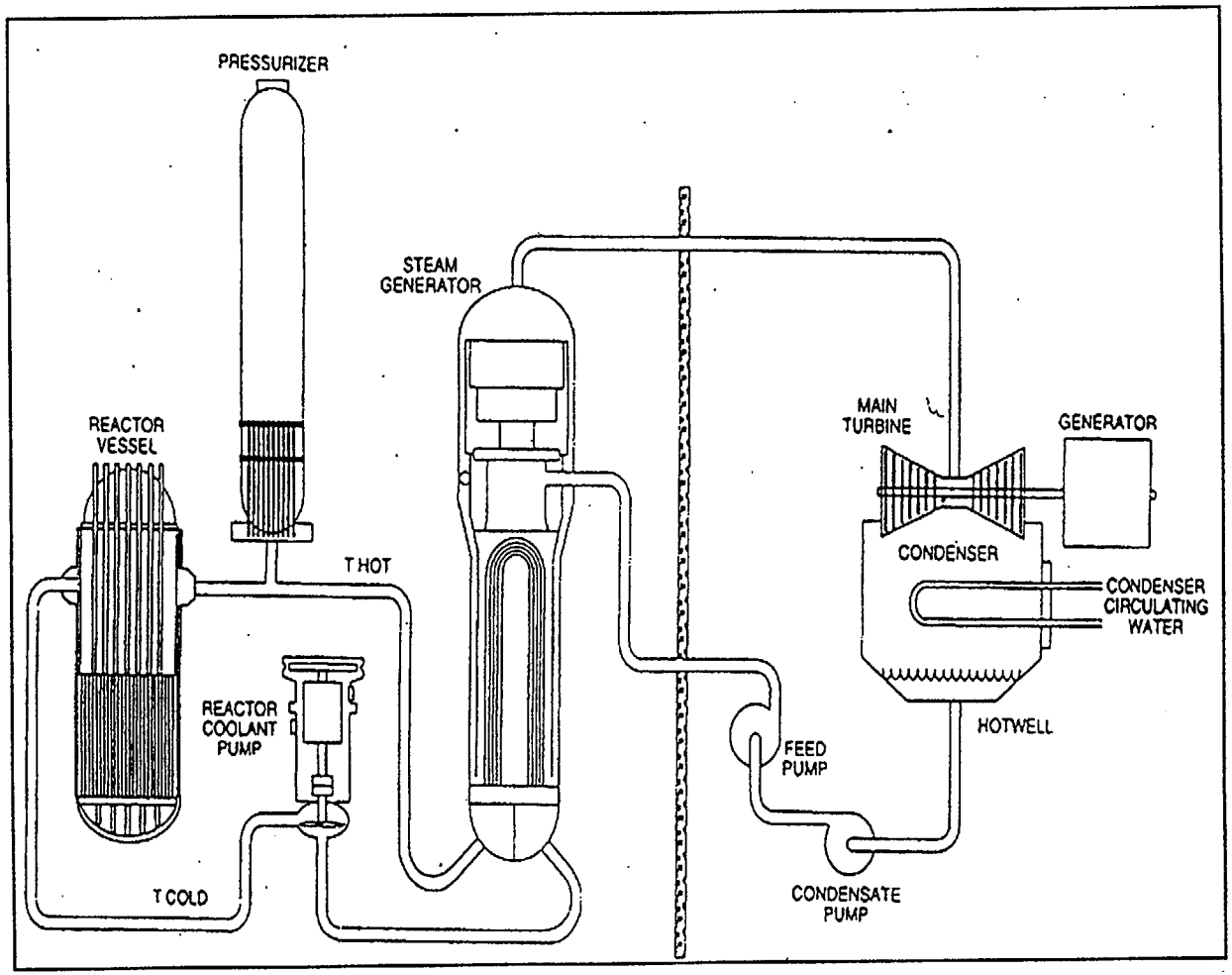
# EVENT DESCRIPTION

- Initiator: PWSCC of the R2C5 tube of the #24 SG; 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 for about 24 hours, and resulted in minor radiological release.

# SYSTEM DIAGRAM



# 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

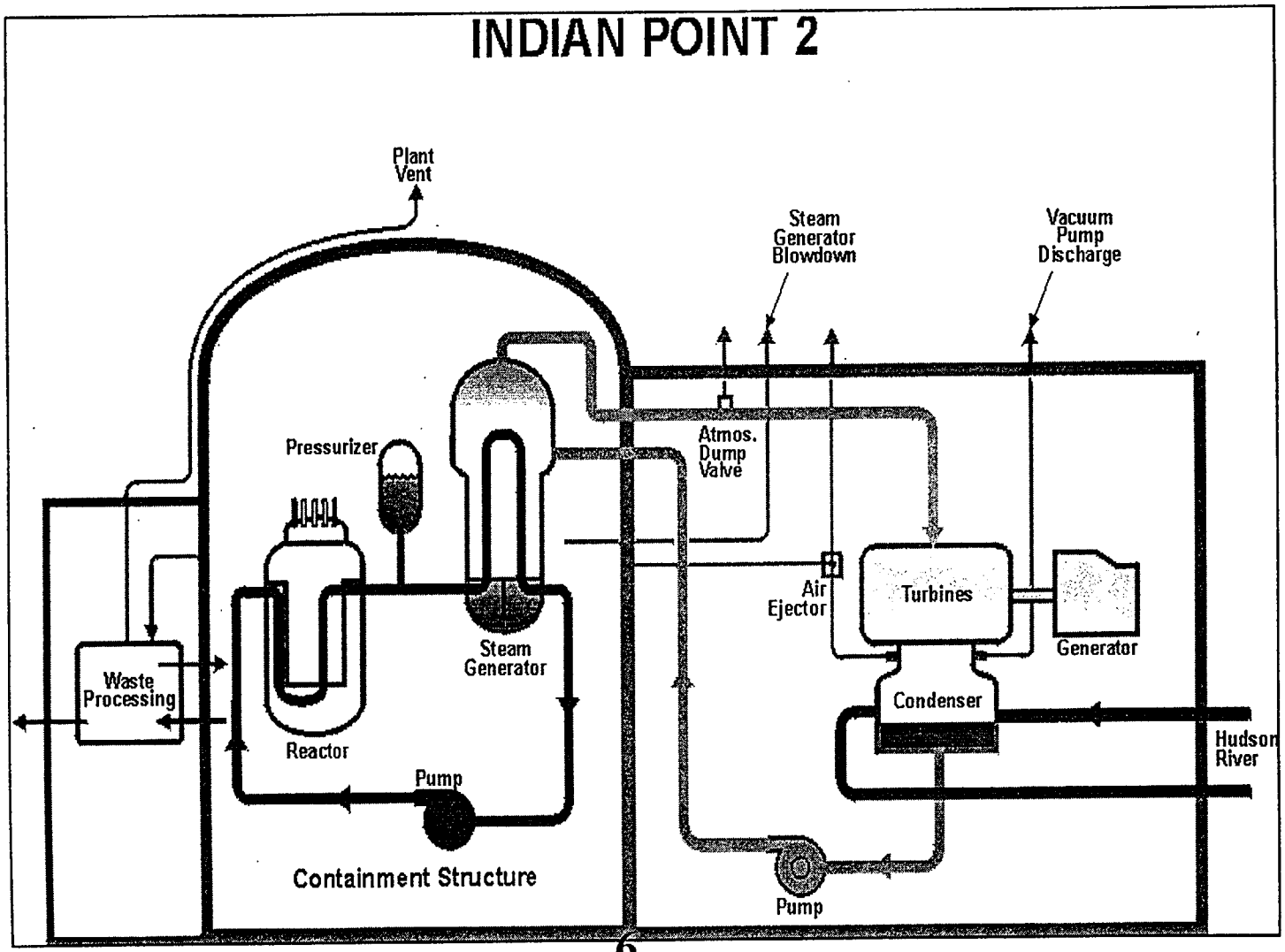
February 16, 2000

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 Impact (consistent with calculated results)
- No Impact on Public Health and Safety

# RADIOLOGICAL RELEASE PATHS



# RISK SIGNIFICANCE

- The CCDP for this event was ~ 2.2E-6.
- Potential deficiencies with the 1997 SGT inspection program are risk significant.
- Dominant sequence - Failure to depressurize RCS & failure to terminate FW flow to ruptured SG.
- Key Assumptions
  - SGTL ~ 100gpm - HRA revised accordingly
  - Charging pumps available for HP makeup

Human Reliability Analyses

# ROOT CAUSE AREAS

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

# OPERATOR PERFORMANCE

- 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 (RHR Initiation)
  - 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

# GENERIC IMPLICATIONS

- NRC Information Notice 2000-09 issued.
- Cause/Analysis for the SG Tube Failure
- Potential Event Complications:
  - Operator Training to cold shutdown
  - Procedure Quality for Event Based Configurations
  - Non-safety equipment problems can complicate response
  - Support by the emergency response organization for operations.