

Lesson Plan: Davis-Besse Loss of Feedwater

Date: 0487

Program: R506P-17

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References:

1. NUREG-1154 Loss of Main and Auxiliary
Feedwater Event at the Davis-Besse
Plant on June 9, 1985
2. Ad Hoc Group Report on Davis-Besse, May 1986
3. Further NRC Actions on Davis-Besse, Sept. 1985

3.0 Presentation

3.1 System Descriptions

3.1.1 Reactor Coolant System

3.1.1.1 Lower Loop Design

3.1.1.2 Pressurizer Higher than
Belleville Design

3.1.1.3 Pressurizer Safety Valves
Discharge directly to
Containment

3.1.1.4 PORV discharges to Quench Tank

3.1.2 Steam and Feedwater Rupture Control System

3.1.2.1 Designed to actuate AFW on low
OTSG level.

3.1.2.2 Isolates affected OTSG on low
pressure.

3.1.2.3 Isolates affected OTSG on
feedline rupture.

(a) delta P across feed
header check valve
measured.

(b) feed pressure 177 psig >
SG press + leak

3.1.3 Feedwater System

3.1.3.1 Deaerator Feed Tanks

(a) storage & deaeration of
feedwater

(b) receives discharge of
hotwell pumps

3.1.3.2 Booster and Main Feed Pumps

- (a) booster pump takes a suction on deareator - discharges to feed pump
- (b) main feed pump - ICS speed controlled - turbine also drives booster pump

3.1.3.3 Main Reg/Startup Valve/MFIV

- (a) main reg & startup valve - ICS controlled
- (b) main reg & startup valve closed by SFRCS signal
- (c) MFIV closed by SFRCS signal

3.1.3.4 Startup Feedwater Pump

- (a) used to supply feedwater to OTSGs during early phases of startup
- (b) SUFP discharge piping not seismic but passes thru AFW pump rooms
- (c) pump isolated at power to prevent line break from affecting AFW pumps
 - pump suction closed
 - pump discharge closed
 - cooling inlet & outlet closed
 - breaker fuses pulled
- (d) non-vital powered

3.1.4 Main Steam

3.1.4.1 Safety valves - normally lift after reactor trip

- (a) 177 FA unit has less steam dump capacity
- (b) history of failures to reset correctly

3.1.4.2 Atmospheric Vents

- (a) ICS controlled
- (b) control header pressure if condenser is not available or MSIVs are closed
- (c) SFRCS close signal

3.1.4.3 Aux Feedwater Pump Turbines

- (a) redundant 100% turbines
- (b) started by SFRCS - normal or associated supply
- (c) supply from opposite OTSG opens when low pressure exists in associated OTSG.

3.1.4.4 MSIVs

- (a) closed by SFRCS - maintains OTSG available to supply AFW pump steam as well as steam break isolation

3.1.5 AFW System

3.1.5.1 Normal Operation

- (a) #1 pump to #1 OTSG, #2 pump to #2 OTSG
- (b) low OTSG #1 pressure
 - 3870 & 608 close
 - 3871 - normally closed
 - 3869 opensboth feedpumps supply #2 OTSG

3.1.6 ECCS Systems

- 3.1.6.1 MU&P not an ECCS system
- 3.1.6.2 HPI pumps relatively low head (~1600 psig)
- 3.1.6.3 LPI pumps ~ 200 psig discharge
- 3.1.6.4 Piggy Back - increase HPI pressure to ~ 1800 psig

3.2 Sequence of Events

3.2.1 Initial Conditions

- 3.2.1.1 90% power
 - (a) RCS flow transmitters replaced in Dec'84
 - refueling - noise - close to $\dot{m}/\Delta\dot{m}$ /flow trip at 100% power
- 3.2.1.2 Main Feedpumps
 - (a) several overspeed trips of pumps (6/2/85)
 - (b) both instrumented - manual should prevent loss of both if control system problem.

- 3.2.1.3 Source Range Inoperable
 - (a) indication at power even with hi voltage deenergized
 - (b) problems since startup (1976)

- 3.2.1.4 SPDS
 - (a) could have been used during transient

3.2.2 Transient

- 3.2.2.1 See attached sequence of events