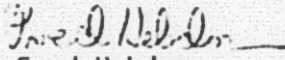




UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

Note to Bill Parler

In an attempt to organize the precursor events that we have identified so far, I have prepared the enclosed chronological summary of the more significant precursor events. It is obvious that many questions remain to be answered.


Fred Hebdon

cc: TMI Task Group 1

8002110 689 P

Davis Besse - September 24, 1977

- initial power 9 percent, core burnup 11EFPD
- initiated by a spurious half-trip of the Steam Feedwater Rupture Control System
- PORV cycled ~9 times and failed to open which caused a depressurization
- Quench tank rupture disk blew out
- operator manual tripped the reactor on high pressurizer level
- some steam formation in primary but no appreciable boiling in the core.
- Steam formation in the primary caused an insurge of water into the pressurizer, level went off scale high. The operator secured one RCS pump in each loop to reduce heat input (T=8 min).
- The operators were heavily involved regaining seal injection flow to the RCS pumps
- The operator secured the HPI pumps when pressurizer level was on its way to recovering (T=53 min).
- Pressure decreased to 930 psig at 533°F in 7½ minutes
- PORV failed due to missing relay
- PORV failure:
 - originally thought it was due to a bent stem
 - during retest the valve stuck again
 - subsequent analysis found
 1. the stem moved too far
 2. clearance between the pilot stem and the nozzle guide was too small
- Heltemes (NRR) had McDermott review available information to determine if deficiencies in the licensee QA or test programs had caused or contributed to the transient. His preliminary report (October 6, 1977) stated that he didn't have enough information and he'd submit a followup report later.

Michelson Report - January 1978

- Michelson's supervisor at TVA was Ebersole who's on the ACRS. Ebersole provided copies of drafts of Michelson's report to Israel (NRR). Israel wrote the "Novak memo" discussed later.
- Michelson's concerns focused primarily on the lack of documented information which confirms that the consequences of breaks presently considered for licensing applications conservatively bound the consequences of very small breaks.

Novak/Israel Memo - January 10, 1978

- Expressed concern that the loop seal in the surge line could cause shrinkage in the RCS without decreasing pressurizer level.
- He notes that this situation already occurred at Davis Besse (September 24, 1977)
- He was concerned that the operator could erroneously shut off makeup flow when significant voids exist in the RCS.
- He recommended that reviewers in his branch attempt to eliminate the loop seal in designs they reviewed.

Rancho Seco - March 20, 1978

- Initiated by an operator dropping a lightbulb which caused a loss of most nonnuclear instrumentation.
- Major concern was the rapid cooldown caused by the main feed pumps feeding the steam generators and safety injection. Could have caused fracture mechanics problems.
- Pressure dropped to >1400 psig. Temperature decreased to 280°F.
- In a memo on March 30, 1978 (Eisenhut to Stello), Eisenhut concludes that

"Although the actual safety implications of this particular transient were minimal, this is only true because it occurred very early in plant life. We strongly recommend that positive steps be taken to prevent transients of this kind, and that generic implications be reviewed promptly."

- Transient lifted the pressurizer code relief valve. The electromatic relief valve was isolated due to leakage problems.

- By memo on April 7, 1978 (Stello to Eisenhut and Grimes), Stello expressed concerns that the Tech Specs did not require prompt shutdown and NRC review following substantial violations of pressure/temperature limits and concern about the susceptibility of nuclear plants to major cooldown transients such as at Rancho Seco. He asked Eisenhut and Grimes to provide inputs within 60 and 180 days respectively.
- On April 25, 1978, IE transferred responsibility for the Rancho Seco instrumentation power supply and auxiliary feedwater initiation events to NRR. One task stated:
 - "NRR will evaluate the susceptibility of B&W plants to other initiating events or failures which could cause similar significant cooldown transients..."

This task was scheduled for completion on October 9, 1978.

- A meeting summary prepared by R. Lobel (RSB, DOR) discusses a meeting on June 10, 1978, with SMUD, NRC, and B&W. The summary notes that a "brainstorming" session concerning other possible mechanisms for causing a severe cooldown transient was part of the meeting. The summary notes, "Depressurization due to a faulty electromatic relief valve or safety valve was the only possibility discussed."

TMI-March 29, 1978

- Deenergizing the Vital Bus 2-IV caused the PORV to fail open. (It was designed to fail open on loss of power)
- The depressurization was terminated after 4 minutes by reenergizing the VITAL Bus
- As a result of this incident
 1. The PROV now fails shut on loss of power
 2. Indication of PORV position (solenoid energized) was added in the control room.

Sternberg memo - March 31, 1978

- Sternberg cites the March 30, 1978 blowdown at TMI-2

- He requested that the adequacy of the design approach (i.e., valve failing open or loss of control power) be reviewed by IE:HQ for all B&W facilities.
- By memo dated May 3, 1978, IE:HQ concluded that additional review was not warranted because, "Failure in this position is covered in Section 7.4.1.1.6 of the FSAR.
- As noted earlier the design was subsequently changed so that the valve fails shut on loss of power.

TMI - April 23, 1978

- Initiated by a reactor trip while at 30 percent power.
- Five main steam relief valves failed to properly reseal.
- Safety valve failure plus overfeeding the steam generator caused a rapid depressurization and cooldown.
- The ICS control of the feedwater valves had not yet been tuned.
- The pressurizer emptied but the bubble did not reach the hot leg. However, B&W concluded that only timely initiation of HPI by the operator prevented this from occurring.

Grier Memo - November 1, 1978

- Grier (IE:Region 1) wrote a memo to Moseley (IE:HQ) responding to a request from Moseley that Grier, "Provide your analysis as to why the performance of Three Mile Island appears to stand apart from other licensees." Grier concluded that the operating history ~~does~~ not indicate any particular difficulties and the licensee performance had been above average. This matter appears to be related to the Licensee Performance Evaluation System.

Creswell memo - January 8, 1979

- Creswell had several concerns that he felt should be brought to the attention of licensing boards.
- His concern that relates to TMI is based on an incident (loss of offsite power resulted in a reactor trip) during which pressurizer level indication went off-scale low. He concluded that sizing of the pressurizers may require further review.

- The matters raised by Creswell were reviewed by NRR. With respect to the pressurizer level problem it was concluded that "no unreviewed safety question exists." The analysis provided by NRR seems to support this conclusion.