B. Jones

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

July 22, 1981

MEMORANDUM FOR: Robert J. Bosnak, Chief
Mechanical Engineering Branch
Division of Engineering

FROM: Frank C. Cherny, Section Leader
Mechanical Engineering Branch
Division of Engineering

SUBJECT: JULY 17, 1981 MEETING WITH EPRI AND PWR UTILITIES TO DISCUSS STATUS OF EPRI/PWR SAFETY AND RELIEF VALVE PROGRAM AND PORV BLOCK VALVE QUALIFICATION PROGRAM DEVELOPMENT PURSUANT TO ITEM II.D.1, NUREG-0737

SUMMARY

Three main points were discussed: (1) the status and schedule for the PORV testing, (2) the status and schedule for the safety valve testing, and (3) the need for further testing of PORV block valves. With respect to the PORV's, five of the ten test specimens have been fully tested and have shown generally satisfactory performance. The PORV testing is expected to take until October 31, 1981 to complete.

The testing of safety valves were started later than expected because of construction of a new facility and the testing itself is proceeding slowly. Two safety valve types have been partially tested. Depending upon the testing experience, the testing of safety valves is expected to require 4 to 8 months beyond the NUREG-0737 completion date of July 1, 1981. Part of this is attributable to a more ambitious testing program.

The PWR Owners Group stated that with respect to testing of the PORV block valves, (required by July 1, 1982 per NUREG-0737), the testing to date plus operational experience is sufficient to assure their operability. A report will be submitted to the staff to justify this position.

During the discussion, it was made clear that any tests which showed potential safety problems would be immediately brought to the attention of the NRC.

POWER OPERATED RELIEF VALVE TESTING

The meeting opened with a presentation by Mr. J. Carey, the EPRI Safety and Relief Valve Program Manager. The first item discussed was the status and results of the Power Operated Relief Valve (PORV) Testing performed to date. Five of ten PORV's have been fully tested. The PORV's that have been completely tested are:

Crosby HPV-SN
Dresser 31533VX-30
Tarket Rock 80X-006
Control Components 3" Drag
Masoneilon 20000

Generally, the PORV's tested to date have performed well on all the test fluid media i.e. steam, sub-cooled and saturated water and steam to water transition. The only significant anomaly observed in the PORV testing occurred in the Dresser and Target Rock tests. These two PORV's did not close immediately on demand after exposure to a simulated transition temperature loop seal. This test consists of opening the valve on water at about 2500 psi and 100 F. The pressure is held constant and the water, flowing, rapidly changes temperature to about 650 F at which time the valve is then signaled to close. The Dresser and Target Rock valves did close but only after some delay. The delay times were 70 seconds and .12 seconds after receipt of closure signal for the Dresser and Target Rock valves respectively.

Although originally scheduled to be completed by the NUREG-0737 specified date of July 1, 1981, due to anomalous test results and longer than anticipated valve disassembly and inspection times, the PORV testing may take as long as October 31, 1981 to complete.

SAFETY VALVE TESTING

The next item discussed was the status of the safety valve testing to date. All safety valve testing is being performed at Combustion Engineering in Windsor, Connecticut. As of the meeting date, some steam tests had been performed on two Dresser safety valves.

A Dresser 31709NA valve was tested on steam with a long loop seal inlet piping configuration with the loop seal drained. Valve performance during the approximately two minute steam blowdown was characterized by excessive valve chatter i.e. the valve continuously cycled open and closed throughout the test. Also, upon disassembly and inspection after the test it was noted that there was severe galling on the valve stem and considerable damage i.e. deformation on valve disk and seat. The cause of the poor valve performance is not completely understood but it is postulated the fast opening characteristics of the test valve make it unsuitable for installation on an inlet piping configuration of the dimensions of those tested. EPRI and their PWR Utility Advisory Group believe that dynamic pressure waves were set up in the inlet piping during test. Because of the rapid response characteristics of the valve, it was able to oscillate open and close at the frequency of the oscillating pressure waves. EPRI has obtained a replacement valve of this type for additional tests later in the program.

Subsequently, a Dresser 31739A valve was also tested on steam but with short straight inlet piping configuration. Performance of this valve was considerably better. However, the valve is fitted with three so called adjusting rings. Several tests with different settings of these rings were performed before the valve opened, experienced full lift, and closed within the tolerances of the EPRI test screening criteria.

Because of the problems experienced during testing of the first two Dresser valves, the PWR Utilities have requested that EPRI expand the number of safety valve tests above that which was originally proposed. Originally a matrix of 60 tests were proposed. The Utilities are of the opinion that additional tests should be added to gain a better understanding of the effects of different inlet piping configurations and of varying adjusting ring settings. It is now felt that a minimum of 90 tests to a possible maximum of 140 or so tests may be required. Additionally, some changes will be made in the order in which the

tests are performed. This is discussed in the slides from the meeting attached to these minutes. A delay of 4 to 8 months from the NUREG-0737 specified completion date of July 1, 1981 is estimated for completion of the safety valve tests.

The attached slides also discuss the PWR Owners Group best current estimates of documentation submittal dates both from EPRI to Utilities and from PWR Utility Advisory Group to NRC.

EPRI noted that they would continue to keep NRC routinely informed of both PORV and EPRI test results by continuing to provide NRC each week with a copy of the weekly test activities summary report.

R. Mattson, for the staff, emphasized that NRC would expect utility action to resolve safety related deficiencies found during the testing on a more expeditious schedule than is proposed in the meeting slides for final documentation submittal.

D. Hoffman of Consumers Power Co., PWR Utility Subcommittee Chairman of the EPRI Safety and Relief Valve Program in response to staff questioning, emphasized that the utilities have the primary responsibility to review the safety significance for their specific plant of test results where valves of the type installed or representative of the valves on their plant "fail" one or more of the EPRI test screening criteria.

BLOCK VALVE PROGRAM

The last item discussed was the PWR Owners Group "final" position relative to establishment of a generic PORV block valve qualification program. This relates to the requirement in NUREG-0737 that, "By July 1, 1982, each PWR licensee, for plants so equipped, should provide evidence supported by test that the block or isolation valves . . . can be operated, closed, and opened for all fluid conditions expected under operating and accident conditions."

The position of the Owners Group on this issue was explained by D. Hoffman. For a variety of reasons the Owners Group does not feel that further testing of block valves should be conducted by EPRI. Mr. Hoffman noted that the PORV's will be fully qualified within a couple of months for all possible fluid conditions. Additionally, no credit is taken for PORV's or block valves in any PWR safety analyses, and the plants are analyzed to show they can be safely shut even if all PORV's and block valves stick open.

The Owners Group has asked EPRI to assemble in a report all of the test data generated during the testing of the seven block valves that were tested at the Marshall facility. Additionally, this report would contain a complete listing of all the block valves and valve operators in service on operating PWR's or proposed for use on a PWR under construction. The report will also include technical justification as to why the steam flow conditions under which the seven valves were tested would be representative of the most severe conditions that a PWR block valve might experience during plant operation, in terms of valve opening and closing force requirements. EPRI and the Owners Group stated that there are about 15 different valve models being used or proposed for use as PORV block valves. They believe that the seven valves that were tested are representative of the majority of these valves, all of

which are of the motor operated gate type. They feel that sufficient data was gathered in the Marshall tests as to the relationship of valve operator torque requirement, versus closure capability, versus valve type so that most PWR utilities will be able to determine what their block valve operator torque setting should be to assure valve open and closure capability under all possible fluid conditions. D. Hoffman stated that this report would be provided to the utilities and NRC in about three months. He further noted that there may be a few utilities with block valve types that may not be "enveloped" by the information in the report and who may have to take additional action to verify block valve closure capability such as replacing their valves with those of a type covered by the report or performing additional testing on a plant specific basis.

The meeting ended with the staff noting that apparently what the Owner's Group was "appealing" was the need to perform further tests to verify valve open and closure capability and that the NRC would review the adequacy of the data and additional information in the report when submitted to assure that it is sufficient to enable utilities to comply with the NUREG-0737 requirement.

Frank Cherny
Section Leader, MEB

cc: w/attachment
See next page.

cc: w/Attachment: Meeting Attendees
NRC PDR
ACRS (16)
TERA
I&E (5)
TIC
MEB Reading
H. Denton
E. Case
H. Thompson
H. Berkow
D. Eisenhut
R. Purple
T. Novak
S. Varga
T. Ippolito
R. Clark
R. Reid
R. Tedesco
B. Youngblood
A. Schwencer
F. Miraglia
J. Miller
G. Lainas
D. Crutchfield
W. Russell
J. Olshinski
J. Knight
W. Anderson
J. Richardson
Z. Rosztoczy
R. Capra
P. Check
O. Parr
F. Rosa
T. Speis
B. Sheron
V. Panciera
G. Mazetis
W. Kreger

Central Files
L. Rubenstein
W. Butler
W. Johnston
J. Stolz
S. Hanauer
T. Murley
K. Kniel
D. Skovholt
G. Knighton
M. Ernst
R. Baer
E. Adensam
A. Thadani
R. Kiessel
E. Brown

MEETING ATTENDEES

Frank Cherny	NRC/DE/MEB
Edward M. Burns	Westinghouse
E.R. Smith, Jr.	VEPCO
David P. Hoffman	Consumers Power
Jim Scott	PSE&G
John Carey	Electric Power Research Institute
Gus Lainas	NRC/DL
Roger Mattson	NRR/DSI
R. H. Vollmer	NRR/DE
W. V. Johnston	NRR/DE
R. LaGrange	NRC/NRR/DE
Harold I. Gregg	NRC/RES
E. Hemminger	MEB/NRC
Wayne Hodges	NRC/RSB
L. B. Marsh	NRR/OCM
G. Bagchi	NRC/EQB
M. D. Stolzenberg	NRC/EQB
ED Chow	NRR/DST
J. N. Dondrew	NRR/DL
C. Nelson	NRR/ORB3
Gary Shears	EDS Nuclear, Long Island, N.Y.
Vincent S. Noonan	EDS Nuclear (New York)
R. L. Tedesco	NRR/DL
R. C. Youngdahl	Consumers Power Co.

PROPOSED TESTING APPROACH/BASIS

(COMBUSTION ENGINEERING)

- TEST CONDITION REVIEW
- ORIGINAL TEST SEQUENCE
  - PHILOSOPHY
  - SEQUENCE
- NEW TEST PARAMETERS
- PROPOSED TEST SEQUENCE
  - PHILOSOPHY
  - SEQUENCE

TEST CONDITION REVIEW

SUMMARY

- TYPES OF TESTS TO BE PERFORMED IN THE PROPOSED TEST METRIX ARE UNCHANGED

- BOTH SHORT AND LONG INLET CONFIGURATIONS WILL BE TESTED FOR THE FULL RANGE OF FLUID CONDITIONS.

- INITIALLY - VALVE PERFORMANCE ON LONG INLET CONFIGURATION WOULD COVER VALVE PERFORMANCE ON SHORT CONFIGURATION. REDUCED NUMBER OF TESTS AT SHORT CONFIGURATION TO DEMONSTRATE ABOVE AND TO PERMIT EXTRAPOLATION TO LONGER INLET CONFIGURATIONS (SPECIFICALLY CROSBY)

- PROPOSED - START WITH SHORT INLET CONFIGURATION. DEMONSTRATE VALVE PERFORMANCE ON SHORT CONFIGURATION PRIOR TO PROCEEDING WITH LONGER INLET CONFIGURATIONS

ORIGINAL TEST SEQUENCE

SEQUENCE

THE ORIGINAL TEST SEQUENCE CALLED FOR TESTING THE SAFETY VALVES AND INLET CONFIGURATIONS IN THE FOLLOWING ORDER:

VALVE	INLET CONFIGURATION SHORT	LONG
1. TARGET ROCK (69C)		✓ (1)
2. DRESSER (31739A)		✓
3. CROSBY (3K6) LSI (2)		✓
4. DRESSER (31709NA)		✓
5. CROSBY (6N8) LSI		✓
6. CROSBY (6M6) LSI		✓
7. CROSBY (3K6) SI (3)	✓	
8. CROSBY (6M6) SI	✓	
9. CROSBY (6N8) SI	✓	

(1) SINGLE PLANT UNIQUE INLET
(2) LOOP SEAL INTERNALS
(3) STEAM INTERNALS

PROPOSED TEST SEQUENCE

SEQUENCE

TO GENERATE DATA ON ALL VALVES IN A REALISTIC TIME PERIOD, THE FOLLOWING ORDER OF VALVES TO BE TESTED AS OF JULY 10, 1981 HAS BEEN ESTABLISHED

CROSBY	(3K6)
CROSBY	(6M6)
DRESSER	(31709NA)
CROSBY	(6N8)
TARGET ROCK	(69C)
DRESSER	(31739A)*

CONSISTENT WITH THE PRECEDING PHILOSOPHY, EACH VALVE WILL BE TESTED UNDER STEAM CONDITIONS ON SHORT INLET PIPE CONFIGURATIONS FIRST PRIOR TO PROCEEDING WITH TRANSITION AND WATER CONDITIONS AND SUBSEQUENTLY INTERMEDIATE OR LONG INLET PIPE LENGTHS

THE ACTUAL TEST SEQUENCE (DECISION PROCESS) FOR CONTINUED TESTING ON A GIVEN VALVE DESIGN IS DETAILED IN THE FOLLOWING

* TEST DATA GENERATED PREVIOUSLY ON THIS VALVE WILL BE USED

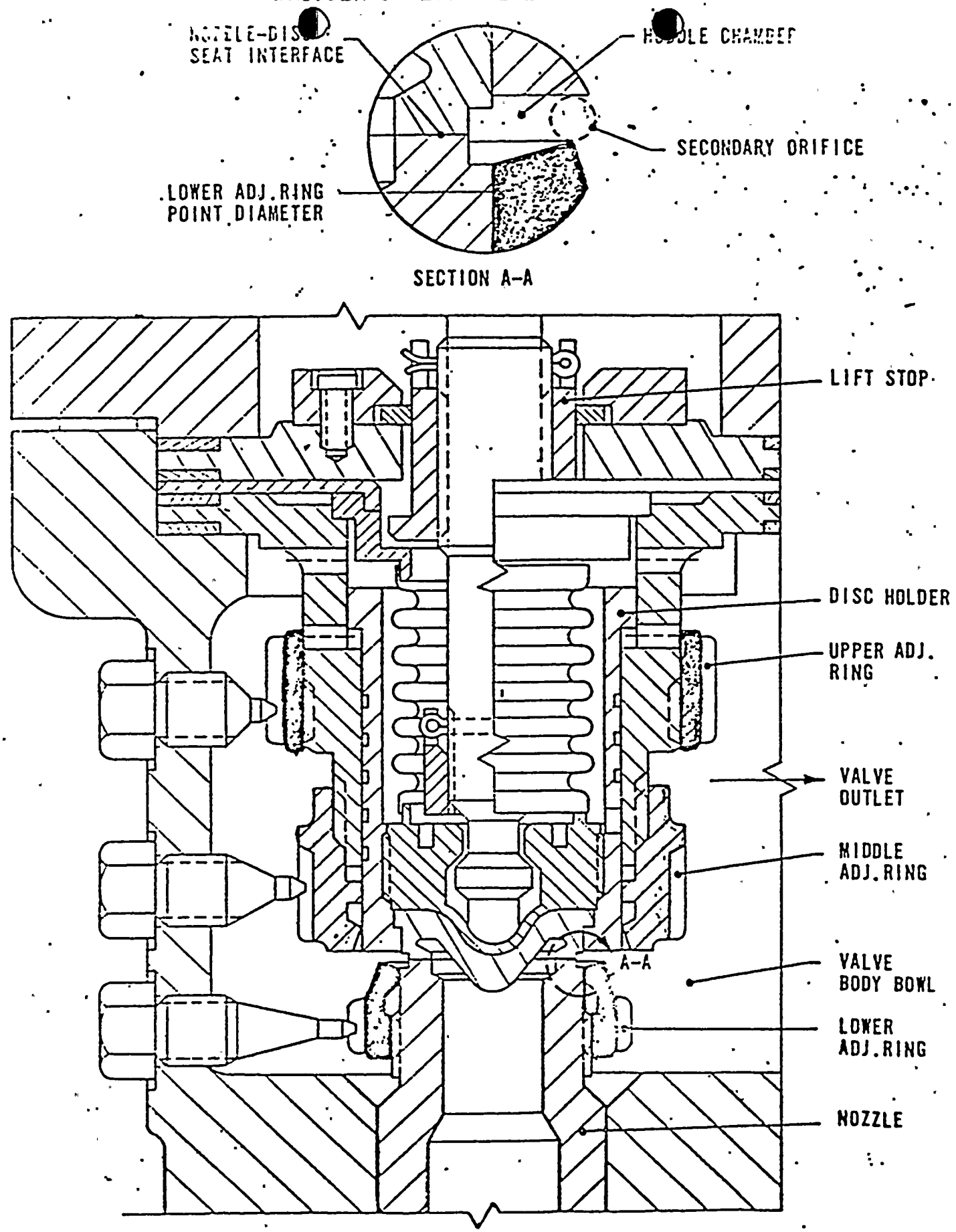


FIGURE 4
VALVE OPENING

PROPOSED TEST SEQUENCE

PHILOSOPHY

- THE FIRST TEST ON ALL CROSBY AND DRESSER SAFETY VALVES FOR ALL INLET PIPING CONFIGURATIONS SHOULD BE STEAM
- THE EFFECT OF BACKPRESSURE ON VALVE PERFORMANCE SHOULD BE CONSIDERED IN TEST SEQUENCE FORMULATION
- SHORT INLET PIPING SHOULD BE TESTED PRIOR TO LONG INLET PIPING
- AN INTERMEDIATE INLET PIPE LENGTH SHOULD BE CONSIDERED IN THE EVENT OF CALCULATED OR OBSERVED POOR PERFORMANCE FOR LONG INLET PIPING CONFIGURATION
- A NUMBER OF RING ADJUSTMENT TESTS SHOULD BE CONSIDERED IN MATRIX PLANNING
- ACCEPTABLE VALVE PERFORMANCE ON STEAM SHOULD BE OBTAINED PRIOR TO WATER TESTING. VALVES THAT DO NOT EXHIBIT ACCEPTABLE PERFORMANCE WILL BE REMOVED FROM THE TEST STAND, INSPECTED, AND DATA EVALUATED
- CRITERIA FOR PROCEEDING WITH THE NEXT WATER TEST SHOULD BE BASED ON NO OBSERVED VALVE DAMAGE
- ONE VALVE SHOULD NOT REMAIN ON THE TEST STAND FOR AN EXTENDED PERIOD OF TIME. MATRIX SHOULD BE SET UP TO GENERATE DATA ON ALL VALVES IN A REALISTIC TIME PERIOD

EPRI PWR SAFETY AND RELIEF VALVE TEST PROGRAM
PRINCIPAL PROGRAM OUTPUT SCHEDULE

ITEM	DRAFT TO UTILTIES FOR REVIEW AND COMMENT	FINAL REPORT TO UTILITIES	UTILITY ADVISORY GROUP SUBMITTAL TO NRC
I. RELIEF AND SAFETY VALVE TESTS			
A. PORV SCREENING CRITERIA	AUGUST, 1980	AUGUST, 1980	--
B. SAFETY VALVE SCREENING CRITERIA	APRIL, 1981	MAY, 1981	--
C. DATA SUMMARY SHEETS	WITHIN 15 WORKING DAYS AFTER COMPLETION OF EACH VALVE TEST		--
D. INTERIM DATA REPORT*	JUNE 15, 1981	JUNE 26, 1981	JULY 1, 1981
E. FINAL DATA REPORT **	DECEMBER 18, 1981	DECEMBER 31, 1981	DECEMBER 31, 1981
F. MARSHALL TEST REPORT	AUGUST 21, 1981	OCTOBER 2, 1981	--

*CONTAINS DATA SUMMARY SHEETS FOR ALL RELIEF AND SAFETY VALVE TESTS PERFORMED BY JUNE 19, 1981.

**BASED ON ANTICIPATED COMPLETION OF ALL REQUIRED SAFETY VALVE TESTS BY NOVEMBER 30, 1981.

EPRI PWR SAFETY AND RELIEF VALVE TEST PROGRAM
PRINCIPAL PROGRAM OUTPUT SCHEDULE

ITEM	DRAFT TO UTILITIES FOR REVIEW & COMMENT	FINAL REPORT TO UTILITIES	UTILITY ADVISORY GROUP SUBMITTAL TO NRC
G. WYLE TEST REPORT			
PHASE 1 & 2	AUGUST 21, 1981	OCTOBER 2, 1981	--
PHASE 3	NOVEMBER 13, 1981	DECEMBER 18, 1981	
H. CE TEST REPORT.	JANUARY 29, 1982	MARCH 12, 1982	--
I. PIPING LOAD DATA PACKAGE			
PRELIMINARY	SEPTEMBER 4, 1981	OCTOBER 16, 1981	--
FINAL	DECEMBER 18, 1981	JANUARY 29, 1982	--

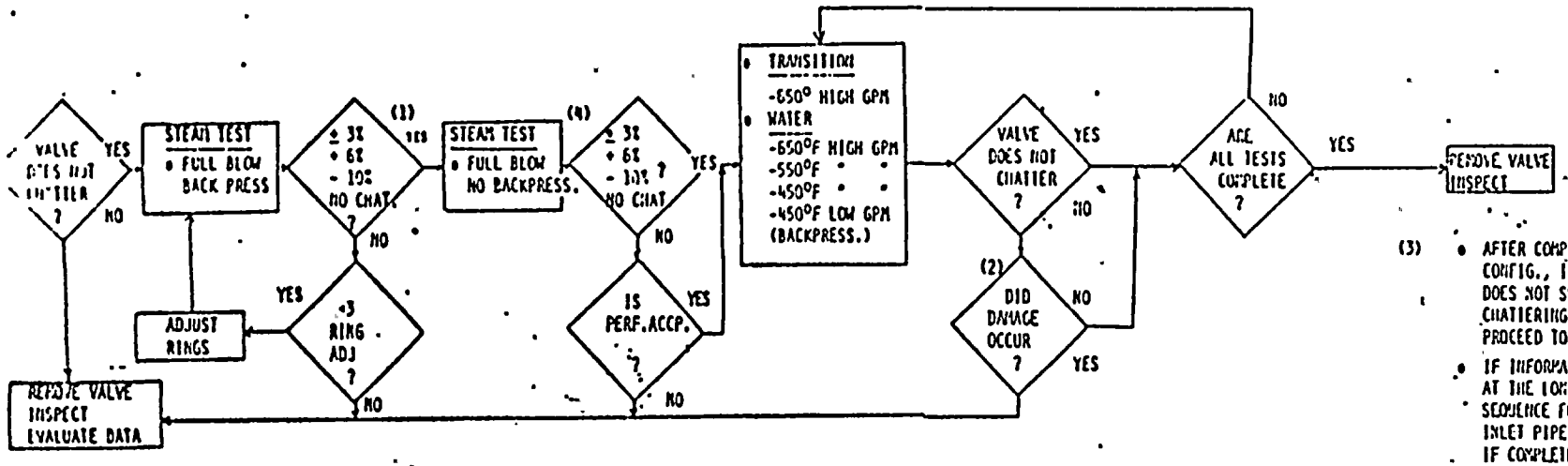
EPRI PWR SAFETY AND RELIEF VALVE TEST PROGRAM
PRINCIPAL PROGRAM OUTPUT SCHEDULE

ITEM	DRAFT TO UTILITIES FOR REVIEW AND COMMENT	FINAL REPORT TO UTILITIES	UTILITY ADVISORY GROUP SUBMITTAL TO NRC
2. RELIEF AND SAFETY VALVE SELECTION/JUSTIFICATION REPORT			
FINAL REPORT	AUGUST 30, 1981	SEPTEMRER 25, 1981	OCT. 1, 1981
3. TEST CONDITION JUSTIFICATION REPORTS			
A. WESTINGHOUSE REPORT	OCTOBER 9, 1981	NOVEMBER 11, 1981	APRIL 1, 1982
CE REPORT	OCTOBER 9, 1981	NOVEMBER 11, 1981	APRIL 1, 1982
B & W REPORT	OCTOBER 9, 1981	NOVEMBER 11, 1981	APRIL 1, 1982
B. EPRI TEST CONDITION JUSTIFICATION REPORT:			
FINAL REPORT	OCTOBER 30, 1981	NOVEMBER 30, 1981	APRIL 1, 1982

EPRI PWR SAFETY AND RELIEF VALVE TEST PROGRAM
PRINCIPAL PROGRAM OUTPUT SCHEDULE

ITEM	DRAFT TO UTILITIES FOR REVIEW & COMMENT	FINAL REPORT TO UTILITIES	UTILITY ADVISORY GROUP SUBMITTAL TO NRC.
4. DISCHARGE PIPING LOAD MODEL			
A. PRELIMINARY PIPING LOAD MODEL VERIFICATION	DECEMBER 4, 1981	JANUARY 15, 1982	--
B. FINAL PIPING LOAD MODEL VERIFICATION REPORT	FEBRUARY 19, 1982	MARCH 19, 1982	--

SAFETY VALVE TEST SEQUENCE
SHORT/INTERMEDIATE INLET CONFIG.
2-DRESSER VALVES, 3-CROSBY VALVES (STEAM INTERNALS)



(3) • AFTER COMPLETED ON THE SHORT INT CONFIG., IF DATA AND/OR ANALYSIS DOES NOT SUGGEST THE OCCURRENCE CHATTERING ON THE LONG INLET, PROCEED TO LONG INLET.
• IF INFORMATION SUGGESTS CHATTER AT THE LONG INLET, REPEAT THIS SEQUENCE FOR THE INTERMEDIATE INLET PIPE LENGTH CONFIGURATION. IF COMPLETED, CONTINUE WITH LONG INLET PIPE CONFIGURATION.

(4) • DETERMINES LOW BACKPRESSURE EFFE ON PERFORMANCE

[illegible] PERFORMANCE ± 1%/+ 3%/ - 5%
[illegible] ADJUSTMENT REQUIRED?