

S. Hanauer

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

DEC 7 1979

Mr. Robert E. Tiller, Director  
Reactor Operations and  
Programs Division  
U.S. Department of Energy  
550 Second Street  
Idaho Falls, Idaho 83401

Dear Mr. Tiller: *Bob*

The Nuclear Regulatory Commission is developing a program to obtain additional information on the behavior of pressurizer safety and relief valves under transient and accident conditions. I am writing this letter to call your attention to this program and to determine if INEL is interested in being the systems integrator for the program.

Enclosed is a draft workscope which describes in general terms what NRC is interested in. Basically, we see the need to:

1. technically monitor and analyze the planned EPRI/industry valve testing program, and collect and evaluate foreign information;
2. develop or improve available flow discharge model(s), using the above information; and
3. determine the need for a valve testing program for NRC with the main focus to be on subcooled and two-phase discharge and on determining operability.

Included in this effort will be an assessment of the fluid/structural interactions with the valve and piping.

The systems integrator for this effort should have demonstrated capabilities to:

1. operate system codes (e.g., RELAP, TRAC) and structural codes;
2. develop models for flow through valves;
3. technically monitor and evaluate valve research; and
4. manage a reasonably extensive testing program on full-scale valves, if this should prove to be needed.

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If INEL is interested in this program we would appreciate receiving a draft program and budget proposal along with a discussion of the interest and resources available at INEL to assist NRC in this activity. A written response by January 2, 1980 would be appreciated.

Please feel free to call Milt Stolzenberg or me (both on FTS 427-4272; commercial (301/427-4272) if you require additional information.

Sincerely,

Original Signed by  
Gary L. Bennett

Gary L. Bennett, Chief  
Research Support Branch  
Division of Reactor Safety Research

Enclosure: Draft Workslope

cc w/encl:

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RECORD NOTE: The proposed workslope has been reviewed with NRR and will be formally documented in a Research Request from NRR. Similar letters to R. E. Tiller. DOE; F. R. Mynatt, ORNL; W. Kato, BNL; J. Bates, Energy Technology Engineering Center; G. C. werth, LLL; G. R. Otey, Sandia; N. E. Carter, PNL; and J. A. Kyger, ANL.

OFFICE ▶	RSR:W:RS	RSR:W:SE	RSR:W:AD	RSR:W:RST	RSR:W:JW
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DATE ▶	12/3/79	12/3/79	12/3/79	12/3/79	12/5/79
					TE Murley

DRAFT WORKSCOPE ON CONFIRMATORY RESEARCH  
RELATED TO THE BEHAVIOR OF SAFETY AND RELIEF VALVES

Information Needs

1. Data are still needed to confirm the current procedure for estimating valve flow characteristics under subcooled or two-phase flow conditions. (0.9 x Homogeneous Equilibrium Model).
2. In addition, data are required to permit confirmation of the following:
  - a. The valve operating characteristics for full opening, chatter, closing pressure.
  - b. The effects of back pressure on valve capacity.
  - c. Procedures for calculating valve reaction forces.
3. It will be necessary to review and monitor the industry tests of functionality of safety and relief valves and associated piping systems. This is necessary to ensure that:
  - a. Testing performed is adequate to qualify systems and valves.
  - b. Data obtained can contribute to information needs of Item 1 and 2 above.
  - c. Extrapolation of representative tests are adequate to qualify systems and valves not tested.

Foreign research information on valves should be obtained and evaluated.

4. The following phenomena and parameters should be evaluated based on test results, extrapolation of test results and on appropriate models:

- a. Flow Rate - cover full range of anticipated flow rates

1. Fluid

- . saturated steam
- . two-phase
- . saturated water
- . subcooled water

2. Conditions

Pressure (psi)

Temperature °F

500-600  
2300-2800  
2800-3800

100 (PORV only)  
~ 400-600  
600-700

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3. Effect of Piping Configuration on Flow

- b. Failure Mechanism

1. Effects of Intermittent Water on Two-Phase Slugs; Effect of Sudden Change in Density of the Fluid Reaching the Valve
2. Effect of Upstream and Downstream Piping Configuration and Supports (Constraints)

### Schedule

NRC/NRR intends to proceed with ATWS rulemaking in early 1980.

A description of the industry test program and schedule of testing will be submitted by January 1, 1980.

Sufficient data must be available by December 1981 to allow NRC to assess with reasonable confidence the adequacy of the proposed ATWS fixes.

We believe that by March 1980 there should be sufficient information from the industry test program as to what can be expected from this program. At that time, planning for NRC-sponsored testing should begin if necessary.

Monitoring of industry programs plus evaluation of data will continue until the testing is complete, data has been evaluated, other plant configurations have been evaluated relative to the test data and models developed are confirmed. This could be 6 months after the completion of testing.

### Program Requirements

The research program should fulfill the above information needs. This program should include the following:

1. Identify the model(s) that could be used to describe the flow through safety and relief valves as affected by the dynamics of valve disc motion. This should include steam, two-phase, and subcooled water discharge conditions.
2. Compare calculations with experimental data from the tests in U.S. and abroad.
3. Identify the error band of the present models, through comparison with test data, and improve the selected model if error band found to be too large.
4. Verify the hydraulic load calculations in the valve associated piping and supports for both steady-state and transient tests.
5. Classify potential valve failure modes associated with valve operation.
6. Monitor industry test programs to comply with TMI Lessons Learned Short-Term Recommendations. This should include the following:
  - a. Review proposed test programs to ensure testing will provide information to qualify safety and relief valves and associated piping systems.
  - b. Determine whether additional test data could be obtained from industry tests to permit verification of calculations of (2) and (3) above.
  - c. Monitor and evaluate testing and collection of data.
  - d. Monitor and evaluate application of test data to existing valves and systems other than specific application tested.

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7. Monitor and evaluate test data from foreign facilities for application to information needs.
8. Determine need for additional testing depending upon projected results of U.S. and foreign tests.
9. Identify corrective measures if failure modes associated with valve operation are discovered.

Use of Results

Models developed and confirmed by test data generated by the industry (and supplemented by additional testing if necessary) are required by the NRC to judge the adequacy and behavior of pressure relief valves and associated piping systems on PWR and perhaps BWR nuclear power plants.