

1 UNITED STATES OF AMERICA
2 NUCLEAR REGULATORY COMMISSION

3 BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

4 In the Matter of §
5 HOUSTON LIGHTING & POWER COMPANY § Docket No. 50-466
6 (Allens Creek Nuclear Generating §
7 Station, Unit 1) §

8 DIRECT TESTIMONY OF STEVE P. CONGDON
9 REGARDING DOHERTY CONTENTION NO. 15 - WIGLE CODE

10 Q. Would you please state your name, and your position,
11 and describe your educational and professional background?

12 A. My name is Steve P. Congdon. I am employed at
13 General Electric Company as a Nuclear engineer. My educational
14 and professional background is described in Attachment SPC-1.

15 Q. Doherty Contention No. 15 alleges that the computer
16 code used by the General Electric Company to predict SCRAM
17 reactivity following a Power Excursion Accident (PEA) is not
18 conservative, because GE's code produces results comparable
19 to the WIGLE Code. Is there any basis for such a contention?

20 A. No. As Mr. Holtzclaw and Dr. Williams have already
21 testified the PEA referred to here is a rod drop accident.
22 This accident is not analyzed by the GE equivalent to the
23 WIGLE Code.

24 Q. Mr. Doherty cites as a basis for this contention
the Special Power Excursion Tests (SPERT) performed by the

1 Idaho Nuclear Experimental Laboratories (in particular those
2 test results reported as No. IN-1370. Do these tests show, as
3 he alleges, that the GE code is not conservative in calculat-
4 ing SCRAM reactivity?

5 A. Mr. Doherty apparently does not understand the
6 concept of SCRAM reactivity. SCRAM reactivity is a measure
7 of the amount of negative reactivity produced by rapidly
8 inserting the control rods, which shuts down the reactor,
9 and is used as an input to the analysis of abnormal transients
10 such as turbine trip, generator load rejection, and main
11 steam isolation valve closure. General Electric uses a one-
12 dimensional time/space code (ODYN) to predict the value of
13 SCRAM reactivity for various abnormal transients over core
14 life. The code models neutronic and thermal hydraulic changes
15 in the core which occur throughout the transient. A one-
16 dimensional model has been shown to be appropriate by detailed
17 reactor transient tests performed at Peach Bottom 2, an
18 operating BWR where the data from the heavily instrumented
19 core revealed the flux response to be one-dimensional.^{1/} This
20 code which is used to calculate SCRAM reactivity in the core
21 as a function of time following the initiation of the abnormal
22 transient, was used to successfully calculate the Peach
23 Bottom reactor test data.^{2/}

23 General Electric has been very conservative in its
24 evaluation of SCRAM reactivity. The values used for SCRAM

1 reactivity in calculating the severity of the abnormal
2 transient are at least 20 percent less than those calculated
3 by the one-dimensional space/time code. In addition, the
4 control rods are assumed to move at their technical specifica-
5 tion speeds, whereas plant measurements have demonstrated
6 the actual performance to be much faster. The overall
7 conservatism employed in the transient calculations is
8 demonstrated by comparisons with actual plant data generated
9 in numerous plant start-ups, as reported in "Analytical Methods
10 of Plant Transient Evaluation for the GE BWR," NEDO-10802,
11 Vols. 1 and 2 (April, 1973).

11 Q. Is Mr. Doherty correct in relying on IN-1370 as
12 a basis for disputing the conservatism in GE's one-dimensional
13 time/space code?

14 A. No. The SPERT project referred to in the contention
15 tested the ability of the WIGLE code to calculate the time
16 behavior of a pulse of neutrons deposited in a long thin
17 multiplying assembly. The experiment, performed in a test
18 reactor which bears no resemblance to a BWR core, showed
19 that the WIGLE code underpredicted the response to a positive
20 insertion of reactivity. No control rods were inserted, so
21 the test did not measure the effects of SCRAM reactivity.
22 One could argue that since it underpredicted the response to
23 positive reactivity insertion, it would also underpredict the
24 negative reactivity response caused by control rod insertion,

1 tms indicating the WIGLE code to be conservative for SCRAM
2 reactivity. However, it is my assessment that the SPERT
3 experiment is so far removed from prototypical BWR SCRAM
4 conditions that it cannot be used for the assessment of the
5 conservatism of the WIGLE code or General Electric's one-
6 dimensional code for SCRAM calculations.

7 In summary, although General Electric's one-
8 dimensional code may in some circumstances--for the specific
9 purpose of predicting SCRAM reactivity--produce results
10 similar to results obtained from the WIGLE code, the criteria
11 contained in the SPERT report (IN-1370) are irrelevant to
12 SCRAM reactivity calculations, whether performed by WIGLE or
13 General Electric's model.

References

1/ L. A. Carmichael and R. O. Niemi, "Transient and Stability Tests at Peach Bottom Atomic Power Station Unit No. 2 at End of Cycle 2," EPRI NP-564 (June, 1978).

2/ "Qualification of the One Dimensional Core Transient Model for BWR's, NEDO-24154, October 1978 (Vol. 2).

STEVEN P. CONGDON

Steven P. Congdon obtained a B.S. in physics from Valparaiso University in 1962 and a PhD in Nuclear Engineering from Pennsylvania State University in 1966. From 1966 to 1976 he was employed at Knolls Atomic Power Laboratory in Schenectady, New York where he developed improved methods for calculating nuclear cross sections and power distributions in Naval Reactors. In 1976, he transferred to the Systems Dynamics Methods group at GE-San Jose where he supervised the development of a one-dimensional nuclear-thermal hydraulic transient model for Boiling Water reactors. This work included development of the basic equations, coding the computer model and qualification of the model against data obtained from tests performed at operating BWR's. Descriptions of this work appear in four papers delivered at technical society meetings and in a number of reports submitted to the Nuclear Regulatory Commission. Since 1980, Dr. Congdon has held the position of Manager, Nuclear Methods and has the responsibility for GE's steady state nuclear design technology for BWR's.