TVA

Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381-2000

DEC 2 7 2005

10 CFR 50.4

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Gentlemen:

In the Matter of) Docket No. 50-390
Tennessee Valley authority)

WATTS BAR NUCLEAR PLANT (WBN) - NRC INSPECTION REPORT NO. 05000390/2005013; PRELIMINARY GREATER THAN GREEN FINDING; ADDITIONAL INFORMATION REGARDING CONSERVATISMS IN PRESSURE-TEMPERATURE CURVES

In the regulatory conference concerning the subject inspection report on October 25, 2005, TVA presented information crediting secondary plant cooling. Attached for NRC use in evaluating TVA's presentation is information provided by TVA's NSSS vendor regarding the conservatisms included in WBN's pressure - temperature limit curves.

There are no commitments in this submittal. Should there be any questions on this information please contact me at 423 365-1824.

Sincerely,

S. D. Hudson for

P. L. Pace
Manager, Site Licensing
and Industry Affairs

Enclosure
cc: See Page 2

IE01
D030

DEC 27 2005

Enclosure
cc (Enclosure):

NRC Resident Inspector
Watts Bar Nuclear Plant
1260 Nuclear Plant Road
Spring City, Tennessee 37381

Mr. D. V. Pickett, Project Manager
U.S. Nuclear Regulatory Commission
MS 08G9a
One White Flint North
11555 Rockville Pike
Rockville, Maryland 20852-2738

U.S. Nuclear Regulatory Commission
Region II
Sam Nunn Atlanta Federal Center
61 Forsyth St., SW, Suite 23T85
Atlanta, Georgia 30303

Enclosure

Conservatisms in P-T Limit Curves

There are significant conservatisms in the ASME P-T limit curve development process, and this technical note will describe them in summary form. First there are three key safety margins built into the process:

- Assumption of a large flaw (25% of the RV wall thickness)
- Application of a safety factor of 2 on the primary, or pressure stresses
- Use of a lower bound fracture toughness

An illustration of the impacts of these margins was given some years ago in a paper by Chirigos and Meyers, as shown below. Here we have a typical P-T curve, shown at the bottom of the figure, and then a series of curves above it with the various margins removed. We will pay special attention to the lower portion of the curve, which allows 400 psi at room temperature. This curve was generated using the same margins as the Watts Bar curves.

Removing the safety factor on pressure obviously doubles the allowable pressure to 800 psi in the low temperature range. Next, using a realistic lower bound toughness, Kic, instead of the code-required Kia at the time, improves the allowable to about 1000 psi. The next step, using a postulated flaw that is still very large (I inch, not 25% of the thickness) raises the allowable to 1425 psi. Changing the postulated flaw to 0.5 inches deep brings us to nearly full pressure (2200 psi) at room temperature. The paper goes on to illustrate other margins, which add up to a factor of approximately nine in the low temperature range. Therefore, it can be clearly seen that the P-T curve process is very, very conservative.

It is worthy of note that the Code was changed recently, as a result of a Westinghouse action, to allow the use of the more realistic toughness, Kic, instead of Kia. This alone would add about 200 psi to the allowable pressure, so there is additional margin over and above your existing curves, which were generated using the old rules.

Therefore there should be no concern with respect to the structural integrity of the reactor vessel, as a result of the recent event at WBN. In fact, the event demonstrates the usefulness of the overpressure mitigation system, which has reduced the probability of a violation of the P-T curve significantly.

During a recent simulation conducted on the Watts Bar simulator, the worst case that occurred was a pressure of 841 psi, which occurred at a steady state condition, and a temperature of 126F. This condition was the result of a relatively low probability event, but it will be instructive to assume that it happened at the plant.

The P-T curve for the Watts Bar plant is provided in figure 2, shown below. As described above, there are three clearly specified margins inherent in these P-T curves: a large postulated flaw(25% of the vessel wall, or 2.15 inches deep), use of a lower bound fracture toughness, and a factor of two on the pressure. If we keep the first two margins, and eliminate the third one, the allowable pressure for Watts Bar in this scenario is 1180 psi. This seems to be a reasonable assumption, given that the initiating event is a low probability to start with. Therefore there was clearly no concern about the integrity of the reactor vessel in this case, even though the allowable P-T curve was postulate to be exceeded.

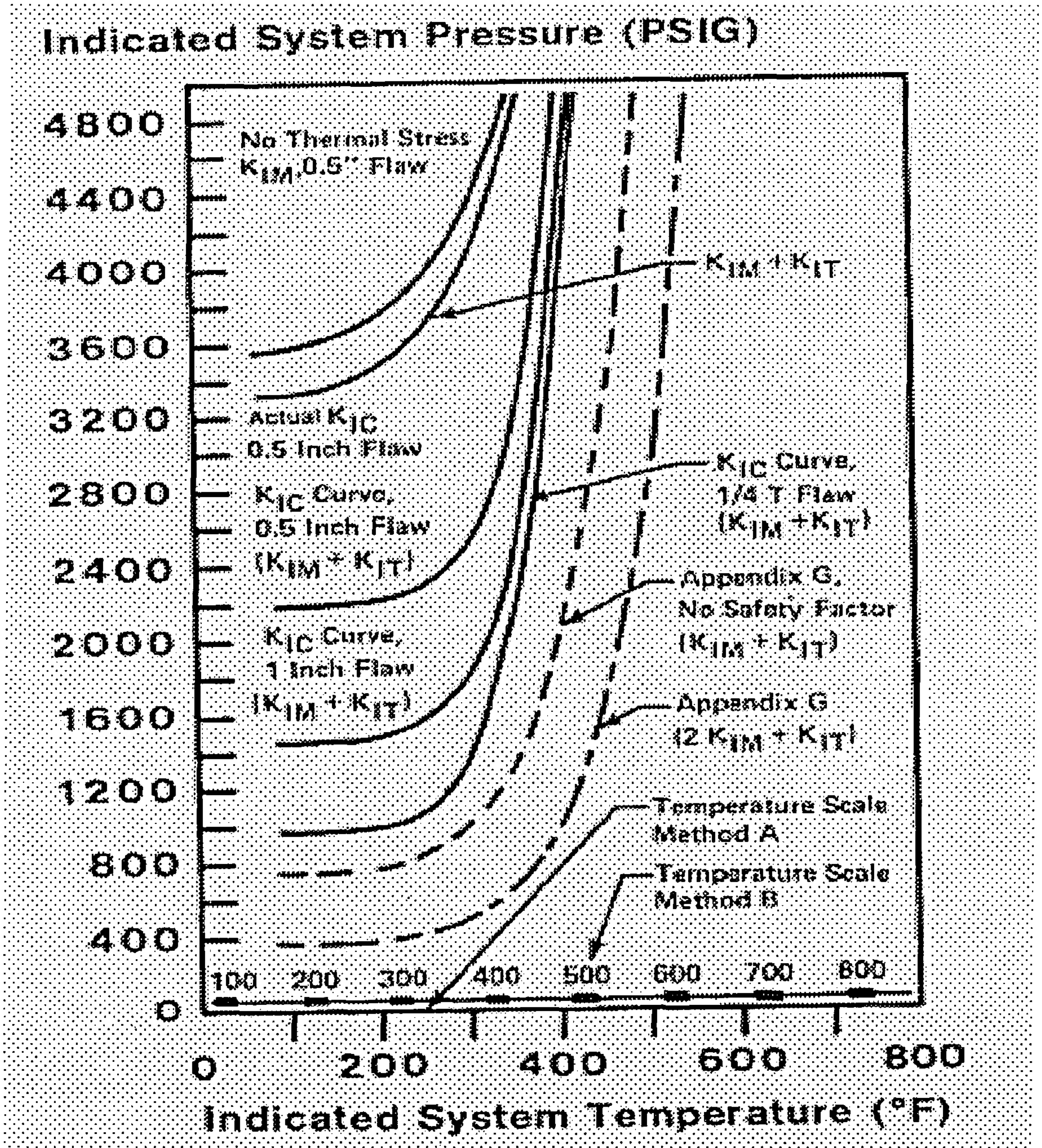

FIG. 5—*Reactor vessel cool-down limit curves.* $\Delta T/\Delta t$, *maximum 33°C/h (60°F/h) [1 psig = 6.9 kPa; 1 in. = 25.4 mm; °C = (°F − 32)/1.8].*

Reference: Chirigos, J.N., and Meyer, T.A., "Influence of Material Property Variations on the Assessment of Structural Integrity of Nuclear Components", Journal of Testing and Evaluation, Vol.6, No. 5, Sept. 1978, pp. 289-295.

Title: REACTOR COOLANT SYSTEM	N3-68-4001

Pressure Temperature Limits Report

<u>MATERIAL PROPERTY BASIS</u>
LIMITING MATERIAL: INTERMEDIATE SHELL FORGING 05
INITIAL RT_{NDT} = 47 °F
LIMITING ART AT 16 EFPY: 1/4-T, 191.7 °F
3/4-T, 156.3 °F

Composite 10% Relaxation Cool Down Curves for Intermediate Shell Forging 05

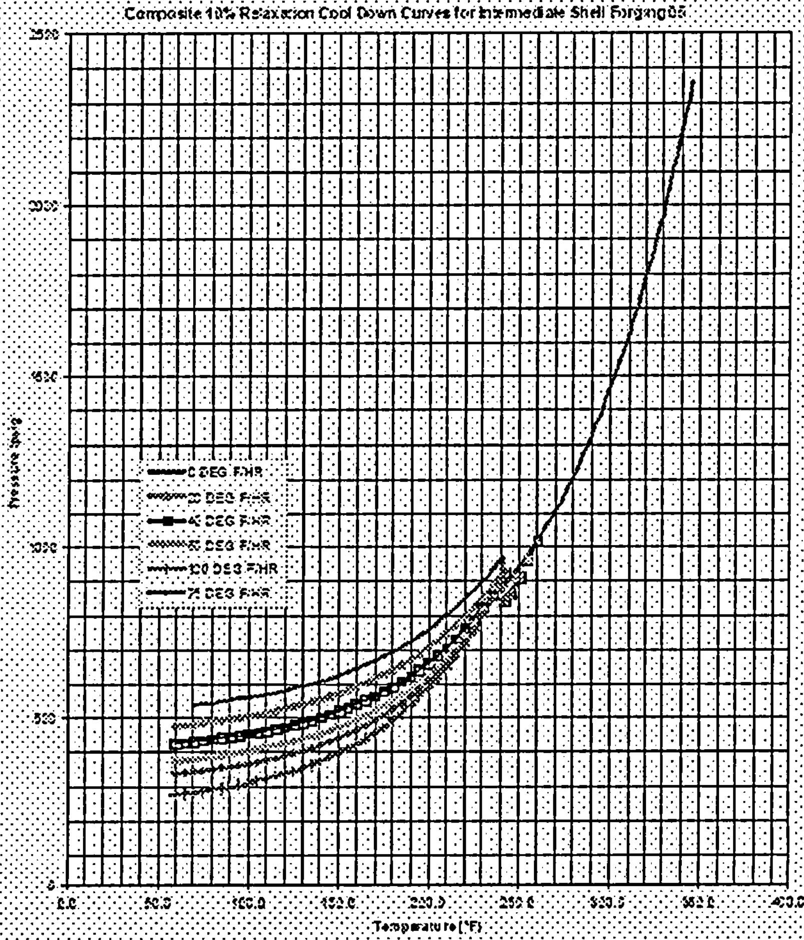

Figure 2: P-T Limits for Watts Bar Unit 1 [WBN Reactor Coolant System Description, N3-68-4001, Revision 24, 4/7/2005]