

72-1014



555 LINCOLN DRIVE WEST / HOLTEC CENTER / MARLTON, NJ 08053
PHONE: (856) 797-0900 / FAX: (856) 797-0909

Date: 7/26/01

To: Chris Jackson Fax No.: 301-415-8555

From Brian Gutherman

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NimssDI Public

To: Chris Jackson (NRC)

7/26/01

From: Indresh Rampall (Holtec) *IR*

Subject: Fuel Cladding Temperature Function Clarification

We are providing a table of fuel cladding temperature as a function of time in dry storage in Attachment 1. The pertinent details of the problem considered are:

Initial Age of Fuel = 6 yrs
Fuel Type = PWR fuel

The MATHCAD calculations for the Peak Cladding Temperature limit for this case are documented in Appendix H (pages H-13 to H-16), Holtec Report HI-2002407. In this memo, additional details to clarify the use of Cladding Attenuation Function (CAF) are provided. The CAF (from Appendix H referenced above) is defined as:

$$T(Q) = 40 + 15Q + 0.0733333Q^2$$

Where T is the Peak Cladding Temperature (PCT) in Deg. C as a function of MPC heat load Q in kW. The heat load Q (which is a function of time in dry storage) is computed as the product of initial heat load Q₀ (at the start of dry storage) and a dimensionless heat load attenuation function designated as "ORG" in the MATHCAD calculations. The start of dry storage temperature, designated as TL in MATHCAD, is 358°C. This number is iteratively determined in MATHCAD to limit the accumulated creep in dry storage to 1%. Therefore this is adopted as the PCT limit for 6 year old high burnup PWR fuel.

Employing the T(Q) function provided above, Q₀ is analytically computed as 24.021 kW. A table illustrating the steps to compute T as a function of time in dry storage is provided in Attachment 1. The first column lists 11 time instants in dry storage from 0 to 40 years. The second column gives the MATHCAD computed "ORG" function values. The time dependent heat loads, Q, (product of ORG and Q₀) are computed in the third column. T is computed in the fourth column from the T(Q) function.

We hope this will help the reviewer follow the MATHCAD calculations.

File: 5014

ATTACHMENT 1: CLADDING TEMPERATURE AS A FUNCTION OF
TIME IN DRY STORAGE

Time in dry storage (yrs)	ORG Function	Heat Load Q	T(Deg. C)
0	1	24.021	358.00
1	0.907	21.78705	332.00
2	0.845	20.29775	314.25
3	0.797	19.14474	300.29
5	0.731	17.55935	280.78
7	0.685	16.45439	266.96
10	0.634	15.22931	251.43
15	0.565	13.57187	230.07
20	0.51	12.25071	212.75
30	0.421	10.11284	184.19
40	0.351	8.431371	161.26