Northeast
Utilities System

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October 23, 1996

Docket No. 50-423
B15949
Re: 10CFR50.90

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Millstone Nuclear Power Station Unit 3
Request for Additional Information to Support
Proposed Revision to Technical Specification
Table 3.3-1 (PTSCR 3-6-96)

Northeast Nuclear Energy Company (NNECO), in a letter dated June 3, 1996[1] proposed an amendment to Operating License NPF-49. The NRC Staff has requested that NNECO provide additional information to support this amendment request.

Attached to this letter is the information that was requested.

Should you need additional information, please contact Mr. J.M. Peschel at (860) 437-5840.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

FOR:
T. C. Feigenbaum
Executive Vice President and
Chief Nuclear Officer

BY: _____
T.L. Harpster
Director, Nuclear Licensing

A001
1/1

[1] Letter F.C. Rothen to U.S. Nuclear Regulatory Commission, "Millstone Nuclear Power Station Unit 3, Proposed Revision to Technical Specification Table 3.3-1 (PTSCR 3-6-96), dated June 3, 1996.

cc: H. J. Miller, Region I Administrator
A. C. Cerne, Senior Resident Inspector, Millstone Unit No. 3
V. L. Rooney, NRC Project Manager, Millstone Unit No. 3

Mr. Kevin T.A. McCarthy, Director
Bureau of Air Management
Monitoring and Radiation Division
Department of Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

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Attachment 1

Millstone Nuclear Power Station Unit 3
Request for Additional Information to Support
Proposed Revision to Technical Specification
Table 3.3-1 (PTSCR 3-6-96)

October 1996

Millstone Nuclear Power Station Unit 3
Request for Additional Information to Support
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Table 3.3-1 (PTSCR 3-6-96)

Question

What is the Isothermal Temperature Coeffficient for Millstone Unit 3?

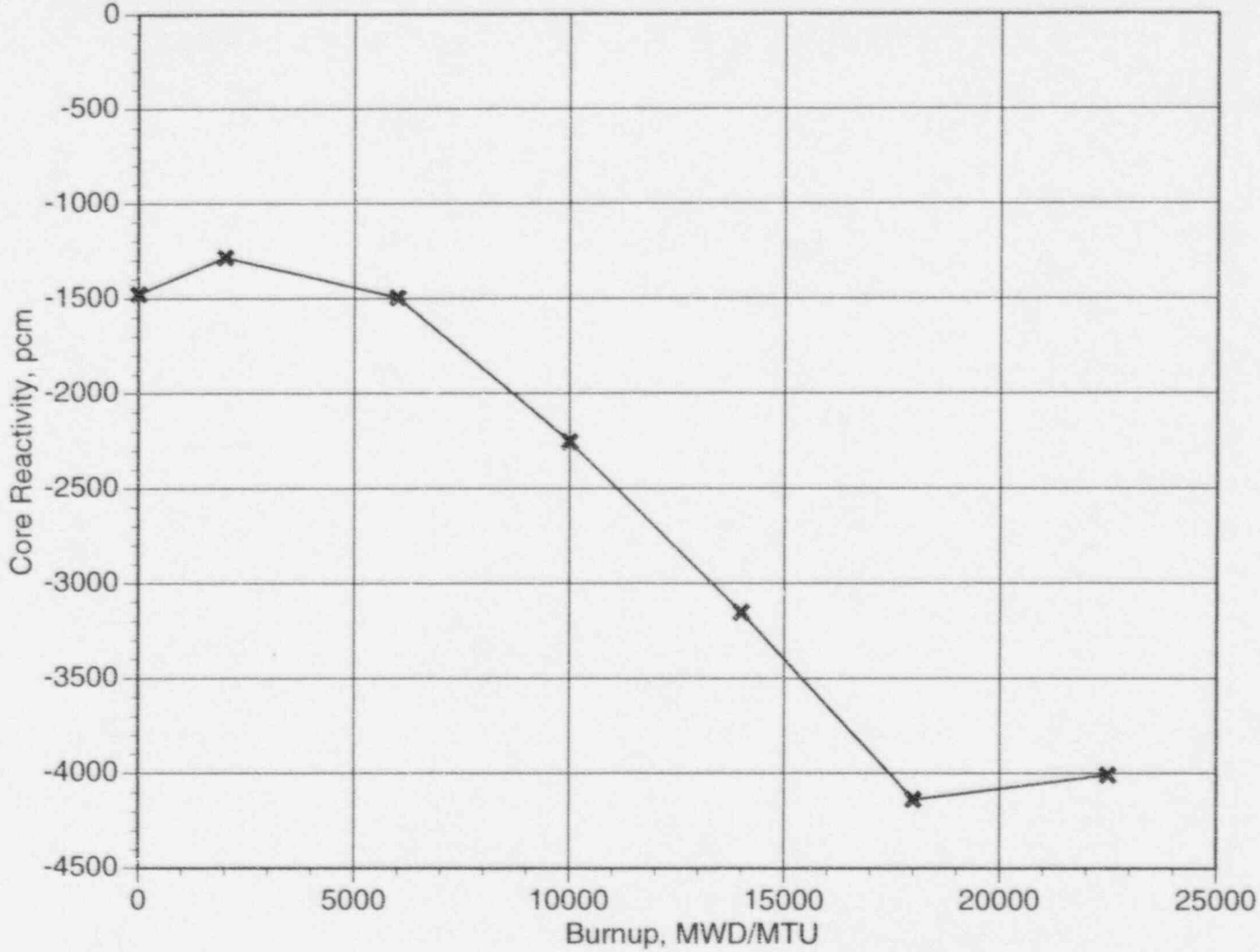
Answer

The Isothermal Temperature Coefficient (ITC) for Millstone 3 is negative in the temperature range from cold shutdown (68 degrees F) to no load hot (557 degrees F) temperature conditions in a critical rodded configuration. The ITC is the sum of both the moderator temperature coefficient and the fuel Doppler temperature coefficient. For operating conditions where the core is uniformly heated or cooled the associated reactivity change is due to the combined or isothermal effect of both the change in fuel temperature and the moderator temperature. Over reactor core life the ITC becomes more negative with core age primarily due to the reduction in Reactor Coolant System (RCS) boron. The net reactivity change due to a heatup from 68 degrees F to 557 degrees F varies from a low of approximately -1300 pcm at beginning of core life to a high of approximately -4100 pcm at the end of core life. The attached figures illustrate the net change in reactivity of the core on a plant heatup over core life , and the change in reactivity during a heatup for the Millstone 3 plant near its present burnup. The data used to prepare the two figures is contained on the table.

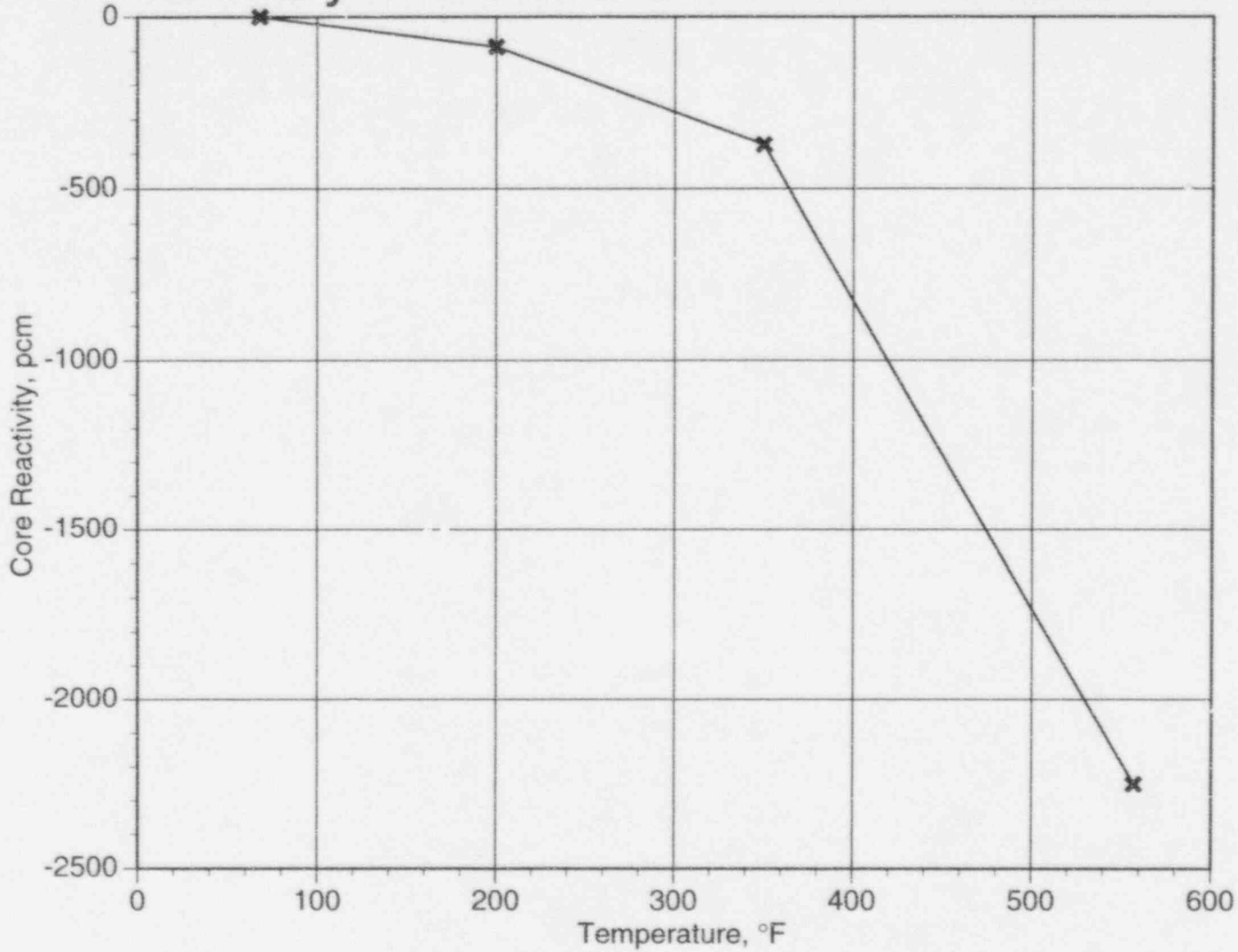
The information provided in the attachments is taken from the Millstone 3 cycle 6 core design report. The information is typical for reactor cores being designed for Millstone 3. The data provided are critical boron concentrations for All Rods Inserted (ARI) less the most reactive rod which is assumed to be in a fully withdrawn (N-1) stuck condition. The ITC is derived from the critical boron concentrations provided by multiplying the change in critical boron concentration over temperature by a conservatively low differential boron worth also taken from the nuclear design report. The data provided is for a just critical condition in a ARI N-1 rodded condition. This data is selected as it is the area of interest for protection from a boron dilution event. The Shutdown Margin Monitor (SMM) is intended to monitor for a unplanned dilution that can take the reactor critical. The rodded critical data is provided for the area where the SMM is intended to provide an alarm function for the operator. As RCS boron is increased to a point where the core is shutdown in excess of 4 and 5% reactivity, at temperatures below 200 degrees F, the core can become overmoderated. Under these conditions there may be incremental temperature spans where a slight positive ITC can be envisioned. However, the overall reactivity defect from 68 degrees F to no load operating temperatures at 557 degrees remains negative.

Example: At 0 MWD/MTU core burnup between 68 degrees F and 557 degrees F the reactor must be diluted 238 ppm to maintain a just critical condition with a ARI N-1 rodded configuration while heating up. By multiplying the differential boron worth of -6.2 pcm/ppm times the change in boron the total negative reactivity addition of -1476 is calculated as the reactor is heated up from 68 degrees F to 557 degrees F.

Change in Core Reactivity as Temperature is Raised Isothermally from 68 to 557 °F at Several Points in Life



Reactivity Effect of Increasing Temperature Isothermally from 68 to 557 °F @ 10000 MWD/MTU



Isothermal Temperature Coeffficient Data

0 MWD/MTU				
Temp (F)	Crit. ppm ARI-1	DBW (pcm/ppm)	Δppm	ρ (pcm T-557)
68	1465	-6.2	238	-1476
200	1451		224	-1389
350	1421		194	-1203
557	1227		0	0
2000 MWD/MTU				
Temp (F)	Crit. ppm ARI-1	DBW (ppm/pcm)		
68	1519	-6.3	204	-1285
200	1512		197	-1241
350	1492		177	-1115
557	1315		0	0
6000 MWD/MTU				
Temp (F)	Crit. ppm ARI-1	DBW (ppm/pcm)		
68	1501	-6.5	230	-1495
200	1497		226	-1469
350	1475		204	-1326
557	1271		0	0
10000 MWD/MTU				
Temp (F)	Crit. ppm ARI-1	DBW (ppm/pcm)		
68	1310	-6.8	331	-2251
200	1297		318	-2162
350	1255		276	-1877
557	979		0	0
14000 MWD/MTU				
Temp (F)	Crit. ppm ARI-1	DBW (ppm/pcm)		
68	1054	-7.2	438	-3154
200	1030		414	-2981
350	967		351	-2527
557	616		0	0
18000 MWD/MTU				
Temp (F)	Crit. ppm ARI-1	DBW (ppm/pcm)		
68	772	-7.7	537	-4135
200	739		504	-3881
350	655		420	-3234
557	235		0	0
22500 MWD/MTU				
Temp (F)	Crit. ppm ARI-1	DBW (ppm/pcm)		
68	451	-8.3	483	-4009
200	408		440	-3652
350	304		336	-2789
557	-32		0	0