Mr. Charles M. Dugger
Vice President Operations
Entergy Operations, Inc.
P. O. Box B
Killona, LA 70066

February 11, 1998

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING THE SPENT FUEL POOL RERACKING AT WATERFORD STEAM ELECTRIC STATION, UNIT 3 (TAC NO. M98325)

Dear Mr. Dugger:

The Nuclear Regulatory Commission (NRC) staff is reviewing your letter dated March 27, 1997, as supplemented by letters dated April 3, October 23, and December 12, 1997, and January 21, 1998, requesting to increase the spent fuel storage capacity at the Waterford Steam Electric Station, Unit 3. As discussed in the enclosure, additional information is required from Entergy Operations, Inc., in order for the staff to complete its review regarding the adequacy of spent fuel pool cooling capability.

We need your response to this request as soon as practical for the NRC staff to complete its review. If you have any questions, please call me.

Sincerely,
ORIGINAL SIGNED BY:
Chandu P. Patel, Project Manager
Project Directorate IV-1
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

Docket No. 50-382

Enclosure: Request for Additional Information

cc w/encl: See next page

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

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Chandu P. Patel

Chandu P. Patel, Project Manager
Project Directorate IV-1
Division of Reactor Projects III/IV
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cc:

Administrator
Louisiana Radiation Protection Division
Post Office Box 82135
Baton Rouge, LA 70884-2135

Vice President, Operations
Support
Entergy Operations, Inc.
P. O. Box 31995
Jackson, MS 39286

Director
Nuclear Safety & Regulatory Affairs
Entergy Operations, Inc.
P. O. Box B
Killona, LA 70066

Wise, Carter, Child & Caraway
P. O. Box 651
Jackson, MS 39205

General Manager Plant Operations
Entergy Operations, Inc.
P. O. Box B
Killona, LA 70066

Licensing Manager
Entergy Operations, Inc.
P. O. Box B
Killona, LA 70066

Winston & Strawn
1400 L Street, N.W.
Washington, DC 20005-3502

Regional Administrator, Region IV
U.S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 1000
Arlington, TX 76011

Resident Inspector/Waterford NPS
Post Office Box 822
Killona, LA 70066

Parish President Council
St. Charles Parish
P. O. Box 302
Hahnville, LA 70057

Executive Vice-President
and Chief Operating Officer
Entergy Operations, Inc.
P. O. Box 31995
Jackson, MS 39286-1995

Chairman
Louisiana Public Service Commission
One American Place, Suite 1630
Baton Rouge, LA 70825-1697

REQUEST FOR ADDITIONAL INFORMATION
CONCERNING SPENT FUEL POOL CAPACITY EXPANSION
WATERFORD STEAM ELECTRIC STATION, UNIT 3
DOCKET NO. 50-382

1.0 HOLTEC performed an analysis using a computer code, "Computational Fluid Dynamics, (CFD)" to demonstrate that adequate cooling is provided by natural circulation in the cask pit area. Although the detailed mathematical modeling in CFD has not been provided, it is apparent that the analytical solution is developed by considering the conservation equations of mass, momentum and energy, and the equation of state, together with the control volume (nodalization) technique for simulating spatial variation. Provide the following information:

a. Provide schematic drawing showing the nodalization (number of control volumes) used in the analysis. The nodal volume, initial temperature, heat source and interconnecting flow path areas for each node should also be indicated on the drawing.

b. Describe the nodalization sensitivity studies performed to determine the minimum number of nodes required to predict the water flow: from the refueling canal into the fuel cask pit; and from the fuel cask pit to the spent fuel pool (SFP). The nodalization sensitivity studies should include consideration of spatial temperature variation; i.e. temperature variations circumferentially, axially and radially within each node.

c. Provide and justify preferably by comparison with experimental data the equation or correlation used to calculate the temperature and flow between two volumes.

d. Describe in detail how the velocity vectors and temperature gradients in the gateways between the refueling canal and the fuel cask pit, and between the fuel cask pit and the SFP will be verified.

2.0 Please provide the average exchange flow rate across the area of the opening between the cask storage pit and the SFP. Also, provide the average exchange flow rate across the area of the opening between the cask storage pit and the refueling canal. Describe in detail how these exchange flow rates were derived and how these flow rates will be verified.

3.0 In your December 12, 1997 submittal, EOI indicated that the decay heat generated from 294 previously discharged spent fuel assemblies (SFAs) proposed to be stored in the refueling canal is approximately 1.8×10^6 Btu/hr. How long these 294 SFAs are required to be stored in SFP prior to be transferred to the refueling canal? Will this time requirement be included in the TS? If not, describe how this requirement will be assured.

4.0 Since 294 previously discharged SFAs would be stored in the refueling canal, discuss how the SFAs from the last fuel cycle would be discharged to the SFP.

5.0 A backup fuel pool heat exchanger with a low design heat removal capacity (15.4×10^6 Btu/hr) is used when the SFP heat exchanger is out of service. Discuss what provisions

ENCLOSURE

have been established in the plant operating procedures to ensure that the SFP heat exchanger will not be taken out of service whenever the SFP heat load is higher than the backup heat exchanger design heat removal capacity of 15.4×10^6 Btu/hr.

6.0 Table 9.1-3 of the UFSAR indicates that the SFP cooling system would be able to maintain the SFP temperature at 155°F with a SFP heat load of 47.0×10^6 Btu/hr. Since the previously calculated SFP heat load for a full core off-load is 55.7×10^6 Btu/hr, what is the corresponding calculated SFP temperature for this previously calculated SFP heat load? Does it exceed the design basis of 155°F as stated in the UFSAR?

7.0 In your March 27, 1997 submittal, EOI stated that the SFP cooling system heat load for a full core off-load is 50.4×10^6 Btu/hr, however, Figure 5.8.4 of the submittal and Attachments 8A and 8C of December 12, 1997 submittal indicate that the SFP cooling system heat load for a full core off-load is 52.65×10^6 Btu/hr. Discuss the differences in these values.

8.0 In your March 27, 1997 submittal, EOI stated that the maximum SFP cooling system heat load for a full core off-load is 50.4×10^6 Btu/hr which is lower than the previously calculated value of 55.7×10^6 Btu/hr as indicated in Table 9.1-3 of the UFSAR. The difference is because in the previous analysis the entire core is discharged instantaneously 72 hours after reactor shutdown. However, for the routine refueling it is not clear why the maximum SFP cooling system heat load is much higher (33.7×10^6 Btu/hr vs. 22.2×10^6 Btu/hr) than the previously calculated value. Discuss these differences.

9.0 Discuss how spent fuel will be loaded into casks when the cask srorage pit is filled with spent fuels.