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SUBJECT: Forwards supplemental response to NRC RAI 5.4.1-5 to provide addl info on Oconee thermal fatigue mgt program & topics discussed in 990318 telcon.

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March 29, 1999

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U. S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: License Renewal
Response to Requests for Additional Information
Oconee Nuclear Station
Docket Nos. 50-269, -270, -287

By letter dated July 6, 1998, Duke Energy Corporation submitted an Application for Renewed Operating Licenses for Oconee Nuclear Station, Units 1, 2, and 3 (Application). Exhibit A of the Application contains the technical information required by 10 CFR Part 54. The NRC staff is reviewing the information provided by Duke Energy in the Application and by several letters identified areas where additional information is needed to complete its review.

By letter dated February 17, 1999, Duke Energy provided responses to several requests for additional information (RAIs) including a response to RAI 5.4.1-5, which concerns the Oconee Thermal Fatigue Management Program. On March 18, 1999, a telephone conference call was conducted with the staff to provide additional information concerning the Duke Energy response to this RAI. The staff had provided specific topics in advance that were addressed during the telephone call. As a result of this telephone call, Duke Energy committed to supplement the response to RAI 5.4.1-5 to address these topics and to provide additional information on the Oconee Thermal Fatigue Management Program. Accordingly, Attachment 1 provides additional information, which supplements the response to RAI 5.4.1-5 previously provided. For convenience of the reader, the staff topics discussed during the telephone call on March 18, 1999 are also provided in this attachment.

If there are any questions, please contact Bob Gill at 704-382-3339.

Very truly yours,

M. S. Tuckman

M. S. Tuckman

A037

M. S. Tuckman, being duly sworn, states that he is Executive Vice President, Nuclear Generation Department, Duke Energy Corporation, that he is authorized on the part of said Company to sign and file with the U. S. Nuclear Regulatory Commission these responses to NRC requests for additional information concerning the Application to Renew the Facility Operating Licenses of Oconee Nuclear Station submitted by letter dated July 6, 1998; and that all statements and matters set forth herein are true and correct to the best of his knowledge and belief. To the extent that these statements are not based on his personal knowledge, they are based on information provided by Duke employees and/or consultants. Such information has been reviewed in accordance with Duke Energy Corporation practice and is believed to be reliable.

M. S. Tuckman

M. S. Tuckman, Executive Vice president
Duke Energy Corporation

Subscribed and sworn to before me this 26th day of March 1999.

Mary P. Nelms

Notary Public

My Commission Expires:

JAN 22, 2001

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Attachment 1

Oconee Nuclear Station
Application for Renewed Operating Licenses
Revised Responses to NRC Requests for Additional Information

March 29, 1999

Duke Energy response to NRC 3/12/99 questions regarding RAI 5.4.1-5.

Statement 1: The RAIs involve TLAAs that are not completed. Duke indicates it complies with 54.21(c)(1)(iii)

Response 1: The reviewer's statement should read: "The RAIs involve TLAAs that are either completed or will be completed well before the period of extended operation. In addition, Duke indicates that it complies with 54.21(c)(1)(iii)."

Statement 2: Duke should summarize exactly what is counted and how is it counted.

Response 2: Table 1 lists the transients that Duke Power currently logs. This list is based on Tables 5-2 and 5-23 of the Oconee UFSAR and except for minor editing, is taken from the work place procedure for Documentation of Allowable Operating Transient Cycles (AOTC). Transients not logged were eliminated based on only one cycle being allowed, a large number of cycles being allowed which will not be approached during the life of the plant, or a determination that the fatigue contribution by that event is negligible. Transients thus excluded are shown in Table 2, along with the reason for the exclusion. This determination of inclusion/exclusion may be adjusted from time to time as Engineering determines that new conditions should be tracked, or that existing ones may be excused based on reasons similar to those just given.

For each transient to be logged, the AOTC instructions include a definition to clarify whether a transient event is severe enough to be counted. The information to be recorded with each logged AOTC is also specified.

For illustrative purposes, the discussion for transient 1A , Heatup, is provided here:

> "If the total temperature change (ΔT) for an RCS heatup is 100°F or greater, a transient 1A is to be logged. Maximum heatup rate sub-categories will be logged as follows:
>
> Between 0-35°F/hr, record under 35°F/hr.
>
> Between 36-60°F/hr, record under 60°F/hr.
> (For heatup at this rate where the first RCP is started at 70°F or below, a note "Without decay heat" is to be added. The allowed number of cycles under these conditions is 40.)
>
> Between 61-100°F/hr, record under 100°F/hr."

Similar discussions are provided for the other transients that are logged. The AOTC Engineer is given the discretion to excuse specific

occurrences of any events which obviously cause negligible fatigue, such as those with minimal temperature change or those occurring at low temperatures.

From time to time Engineering may also determine that the specific instructions regarding a particular transient should be adjusted based on revisions to plant operations or analysis of Reactor Coolant System (RCS) components. In this manner the AOTC instructions are kept updated to provide assurance through the detection and logging of events that the RCS is operated within the bounds of analysis.

Statement 3: The response does not describe the corrective actions required if the cycle count is exceeded. The response indicates that limiting components will be evaluated. Duke should specify which components are limiting or describe the criteria used to determine those components that require an evaluation.

Response 3: In the following response to RAI 5.3.1-1(b), Duke described the process that was used to predict that the projected number of cycles for transient 1A, Heatup, will be less than the original 360 cycle design limit through 60 years of operation,

> "...Actual plant operating thermal transient cycle count data were used to determine where the Reactor Coolant System was in its fatigue lifetime for the trackable transients. From there, a conservative cycle accumulation rate was used to project when plant operating thermal transient cycles would exceed the number of design cycles. The projected number of cycles for each Oconee unit through 60 years of operation was compared to the design cycle limit and found to be less than the 360 cycles design limit."

All Table 1 transients were thus extrapolated and the projected occurrences were determined to stay within allowable limits for 60 years. (Allowable limits are discussed in more detail below.)

As previously stated in the response to RAI 5.4.1-5(e),

> "The responsible engineer on a continual basis documents transient cycles. Actual cycles are logged following discovery of each plant transient that is required to be tracked and managed."

And in the response to RAI 5.4.1-5(f),

> "The engineer responsible for maintaining the AOTC log reviews data available from sources such as the plant Operator Aid Computer, Control Room logs, and plant schedules to determine if a unit has experienced a transient that requires logging. For those events that

are considered fatigue significant [and are logged], the document specifies appropriate parameters such as minimum/maximum temperature limits and rates of temperature change that are assumed in the analysis. The logging process captures these values and reviews them to verify that the parameters do not exceed values used in the analysis.

The numbers of cycles logged for each significant transient is compared to the number of cycles evaluated in the fatigue analysis. If it [sic] the projected number of cycles for a particular transient indicates that the number evaluated will be exceeded, measures are taken to reevaluate or replace the limiting components so that the number of logged cycles will not exceed the number of analyzed cycles."

When the engineer determines which transients have occurred since the previous assessment, two evaluations are performed to determine if corrective actions are needed. The first evaluation, as described above, compares the observed values for those parameters applicable to each transient to the limits described in the AOTC instructions (e.g. a maximum or minimum temperature limit). If a limit is exceeded, corrective actions are initiated. The Duke Problem Identification Program (PIP) is used to record the problem, determine appropriate case by case specific corrective actions, and track completion of those actions.

The second evaluation is a comparison to the allowable number of occurrences. The allowable number of occurrences for each event is the lower bound of the quantity *actually evaluated* for that event for all RCS components.

(The number of evaluated occurrences are themselves constrained by the requirement that each component be limited to both a cumulative usage factor (CUF) of 1.00, and, if applicable, either a predicted end of life crack size or calculated K_I as permitted by ASME Section XI. As items such as analyzed conditions, operational practices, or ISI results are updated, the number of allowed cycles in the AOTC document table may become outdated. The need for making these revisions in this and/or other affected documents are captured via the above described PIP process. In this manner, the AOTC Engineer is kept apprised of the allowable limits. The AOTC document is periodically updated to incorporate outstanding revisions.)

To perform the comparison of occurrences evaluation, the procedure quoted in the response to RAI 5.3.1-1(b) is repeated for each transient. That is, a conservative cycle accumulation rate is used to project when

plant operating thermal transient cycles would exceed the allowable occurrences. Then, as stated in the response to RAI 5.4.1-5(b),

> "Corrective actions are taken if the number of events is expected to exceed the limits of design within a manageable time period. A manageable time period is the time needed to complete actions to ensure the affected components stay within acceptable limits."

In this manner, *the actual cycle count is kept always within the allowable cycle count.*

For either the condition of specific event parameter limit exceedance, or the projected occurrences exceeding the allowable occurrence limit, all of the RCS components for which the particular transient event was included in the fatigue analysis are equally limiting in that all would typically have been evaluated to the same number of occurrences of that event or the same parameter value. *All must be re-evaluated.* All will be in the scope of corrective actions and managed by the above described PIP program.

(If one component has a significantly lower number of evaluated occurrences, which is thus the controlling lower bound, then only that one component may need re-evaluation. Similarly for a single limiting parameter. Such is not typically the case. Exceptions would be transients which affect only a few components, such as HPI test).

As stated in the response to RAI 5.4.1-5(b), corrective actions may include such options as component re-analysis (to a higher number of occurrences or a higher severity), transient re-classification (logging one event as a more conservative one), more sophisticated monitoring (e.g., FatiguePro™ Stress Based Fatigue), repair, or replacement. All such limiting components will be evaluated for the best engineering solution to the limit exceedance on a case by case basis. Of course, those components having the highest design CUF would be expected to present the greatest challenge for resolution.

This discussion describes the present status of the Duke Energy Fatigue Management Program. Duke is committed to a continuous improvement strategy in this effort and may revise this Program in the future to increase its effectiveness or efficiency.

Table 1
Oconee Nuclear Station
Transient Cycles to be Logged

Transient Number	Transient Classification	Allowable Number of Cycles
1A	Heatup & Cooldown	
	Heatup from 70°F to 8% FP	
	@ 35°F/hr	30
	@ 60°F/hr	
	with decay heat	270
	with no decay heat	40
	@ 100°F/hr	20
	Total	360
1AP4	(1A for Pressurizer Surge Line)	
	Heatup from 120°F to 8% FP (assumes with decay heat)	220
1AP5	(1A for Pressurizer Surge Line)	
	Heatup from 70°F to 8% FP (assumes no decay heat)	43
	- such as after a refueling outage	
	Total	263
1B	Cooldown from 8% FP	
	@ 60°F/hr	170
	@ 100°F/hr	190
	Total	360
1BP1	(1B for Pressurizer Surge Line)	
	Cooldown with pressurizer temperature vs RCS (hot-leg) temperature difference ≥ 250°F.	54
1BP2	Cooldown with pressurizer temperature vs RCS (hot-leg) temperature difference < 250°F.	306
	Total	360
	Power Change	
2A	0 to 15% FP	1,440
2B	15 to 0% FP	1,440
	Step Load Reduction (100 to 8% FP)	
7A	Resulting from turbine trip	160
7B	Resulting from electrical load rejection	150
	Total	310
	Reactor Trip	
8A	Type A - Loss of RC Flow	
	Trip and return to power	30
	Trip and cooldown	10
8B	Type B - Turbine trip without control system action	
	Trip and return to power	130
	Trip and cooldown	30
8C	Type C - Loss of main feedwater flow	

Transient Number	Transient Classification	Allowable Number of Cycles
	Trip and return to power	72
	Trip and cooldown	18
8D	Type D - Other trips including those in transients 11, 15, 16, 17, and 21	122
	Total	412
8E	Manual Actuation of High Pressure Injection System after Reactor Trip	70
9	Rapid Depressurization	40
10	Change of Reactor Coolant Flow	412
11	Rod Withdrawal Accident	
	Trip and return to power	30
	Trip and cooldown	10
	Total	40
14	Control Rod Drop	60
15	Loss of Station Power	40
17A	Steam Generator Dryout	
	Loss of Feedwater to One Steam Generator	
	Total (OTSG "A" + OTSG "B")	30
17B	Stuck Open Turbine Bypass Valve	
	Total (OTSG "A" + OTSG "B")	10
22A	High Pressure Injection System Test	40
22PD-1	High Pressure Injection System Test (for Pressurizer Surge Line effects)	40

Table 2
Oconee Nuclear Station
UFSAR Transient Cycles Excluded from Logging

Transient Designation	Transient Classification	REASON FOR NOT COUNTING
1A1	Heatup from 70° F to 8% power, PSL condition A1	applies to past only
1A2	Heatup from 70° F to 8% power, PSL condition A2	applies to past only
1A3	Heatup from 70° F to 8% power, PSL condition A3	applies to past only
1B 25% life 60° F/hr	Cooldown from 8% power to 70° F, @ 60° F/hr, first 25% life	applies to first 25% of life only, which is past
1B 25% life 100° F/hr	Cooldown from 8% power to 70° F, @ 100° F/hr, first 25% life	applies to first 25% of life only, which is past
3	Power loading 8-100%	large allowable
4	Power unloading 100-8%	large allowable
5	10% power increase	large allowable
6	10% power decrease	large allowable
12A	Hydrotests RCS	no longer performed
12B	Hydrotests Secondary	causes no RCS fatigue
13	Steady-state power variations	large allowable
16	Steam line failure	occurs once, faulted, not included in CUF
18	Loss of feedwater heater	minimal RCS fatigue
19	Feed and bleed operations	large allowable
20A	Makeup Cycling, case 1	large allowable
20B	Pressurizer Spray Cycling	large allowable
20C	Makeup Cycling, case 2	large allowable
20D1	Pzr Boron Equilibration (on/off valve)	large allowable
20D2	Pzr Boron Equilibration (modulating valve)	large allowable
21	Loss of coolant	occurs once, faulted, not included in CUF
22B1	HPI test	counted with 22A
22C1	HPI test	counted with 22A
22D1	HPI test	counted with 22A
22B2	HPI check valve test	counted with 22PD-1
22C2	HPI check valve test	counted with 22PD-1
22D2	HPI check valve test	counted with 22PD-1
22B	Core flood check valve test	minimal RCS fatigue

Transient Designation	Transient Classification	REASON FOR NOT COUNTING
23	SG secondary side filling, draining, flushing, cleaning	causes no RCS fatigue
24	Hot functional test	no longer performed