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OFFICE OF SECRETARY  
RULEMAKINGS AND  
ADJUDICATIONS STAFF

October 14, 2008

Via U.S. Mail and E-mail

The Honorable Dale E. Klein  
Chairman  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

Re: In the Matter of AmerGen Energy Co., LLC (License Renewal for Oyster Creek Nuclear  
Generating Station) Docket No. 50-219-LR

Dear Chairman Klein:

On behalf of Nuclear Information and Resource Service ("NIRS"), Jersey Shore Nuclear Watch, Inc., Grandmothers, Mothers and More for Energy Safety, New Jersey Public Interest Research Group, New Jersey Sierra Club, and New Jersey Environmental Federation (collectively "Citizens") I am writing to provide the opinion of Dr. Joram Hopfenfeld, our expert on metal fatigue, regarding the Safety Evaluation Report ("SER") Supplement that was transmitted by Staff on September 19, 2008.

We are submitting these comments to show that even though AmerGen's calculations contain a critical error, the Staff accepted them. The Commission may therefore wish to consider whether to exercise supervisory authority over the Staff in regard to the adequacy of the SER Supplement. In addition, these comments confirm that the proposed contention raises a material dispute about the adequacy of the aging management program for the recirculation outlet nozzle, contrary to the findings of the licensing board. They also illustrate that the licensing board's finding of mootness was premature contradicting the assertions of the NRC Staff and AmerGen on appeal.

Copies of this letter and the comments are being served on all the parties to the Oyster Creek proceeding. Thank you for your consideration.

Yours sincerely,

Richard Webster

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## COMMENTS ON NRC SER SUPPLEMENT 1, SEPTEMBER 2008

By: Dr. Joram Hopenfeld

The SER Supplement 1 ("Supp. 1") states that the NRC Staff found that:

1. The applicant's derivation of the Fen values is in accordance with NUREG/CR-6583
2. The confirmatory analysis is in accordance with the rules and requirements of the ASME Code, Section 111, Subarticle NB-3200

My evaluation of the SER shows that the NRC Staff is incorrect with regard to Item 1 and provided no information to support its conclusion in Item 2. The NRC Staff also erred in allowing AmerGen to use an RAI response as a means to modify the original LRA by removing certain conservatism from the fatigue analysis. The Staff should have required AmerGen to submit the modification as an amendment to the LRA and not as a response to the April 29 2008 RAI. The RAI was limited to questions regarding Green's function; it did not require changes to the LRA.

The SER Supplement merely restated AmerGen's erroneous conclusions without questioning their validity. As discussed below, the NRC Staff is wrong in accepting AmerGen's results from their new fatigue analysis. The methods used to derive these results do not comply with the ASME Code. If methods that were compliant with the ASME code had been used, the results would have shown that the metal fatigue of the Recirculation Outlet ("RO") nozzle would exceed 1.0, the amount allowed by the ASME code, during any period of extended operation. Therefore, AmerGen must develop an aging management plan before entering the extended period of operation as specified in 10 C.F.R. § 54.21(c)(1)(iii).

### DISCUSSION

#### **A. Why the Fen values as calculated by AmerGen are not in accordance with NUREG/CR-6583**

NUREG 6583 (p 78) and NUREG 6909 (p A5) specify that in calculating the Fen for low alloy steel the value of the dissolved oxygen concentration (DO) should be taken at the highest oxygen level during the transient. Disregarding this important specification of how to use the Fen equations the SER Supplement stated that the DO both in the original analysis and the confirmatory analysis was evaluated at the maximum transient temperature. Supp. 1 at 4-3. **This procedure is incorrect because the maximum oxygen concentration does not occur at the maximum temperature.** In fact, this maximum occurs at the minimum temperature because the oxygen has a negative

solubility. Confirming this view, experimental data show that during reactor shutdowns and startups the DO increases as the temperature decreases.

Because the  $F_{en}$  increases exponentially with the DO the evaluation of the DO at the maximum temperature instead of at the minimum temperature results in a very non conservative  $F_{en}$  value. When properly evaluated, as specified in NUREGS 6587 and 6909, the correct environmentally assisted fatigue cumulative usage factor (“EAF CUF”) for the limited RO nozzle corner location is approximately 1.55 and not 0.1366 as was stated in the SER Supplement and AmerGen’s summary of its reanalysis.

### **B. Why the confirmatory analysis may not be in accordance with the rules of the ASME Code**

Having discovered that, even using minimum DO levels, strict adherence to the RAI would yield an EAF CUF larger than one ( $6.60/5.34 \times 0.978$ ), AmerGen excluded the stainless steel cladding from the fatigue analysis and extracted the stresses from the base metal instead. The underlying assumption in the ASME rule that allows the exclusion of the cladding is that the base metal contains no cracks. The ASME and the NUREG 6583 fatigue design curves are based on laboratory data from specimen with a perfectly smooth surface. When the clad contains cracks, they become sites for the formation of corrosion which would accelerate crack propagation in the cladding and into the base metal under cycling loading. The difference in the thermal expansion of the stainless steel cladding and the base metal has resulted in the cracking of nozzles at many BWR plants. Before AmerGen can justify the exclusion of the cladding from the fatigue analysis it must demonstrate that the cladding of the RO nozzle will be free of cracks at the beginning of the extended period of operation. The issue of cracks in the cladding propagating into the base metal is discussed in NUREG 6260.

### **C. Why the NRC should have rejected AmerGen modification of the LRA as part of their response to the NRC April 29 2008 RAI**

The technology for calculating the EAF CUF is not yet fully developed, it is still to some extent a work in progress. Consequently such calculations must be based on conservative assumptions. Here, the SER Supplement provides no assurance that sufficient conservatism was incorporated into the fatigue calculations. Instead, the NRC Staff simply repeats the applicant’s words almost verbatim. Even though the Staff approved the use of Green’s function in fatigue calculations for many plants, the Staff discovered during the course of litigation of the Vermont Yankee plant that the cost saving Green’s function was not conservative as claimed by the applicant and consequently issued an RAI to revisit this issue at other plants. The issue raised by the Staff relates to using a single stress component in the simplified Green’s function analysis vs. the use of six stress component in the detailed analysis (confirmatory analysis).

After finding that indeed the use of the Green’s function was not conservative and the use of the detailed analysis would result in an EAF CUF which would exceed unity (and

therefore be above the ASME code allowable amount), AmerGen unilaterally changed the intent of the RAI by substituting the original mathematical model with a considerably less conservative model that excluded the cladding. Even after correcting the EAF CUF to account for the requirement that the Fen must be evaluated at the maximum oxygen concentration during the transient, the removal of the conservative assumption of extracting stresses from the cladding still results in a non-conservative corrected value for the EAF CUF of 1.55. Further examination of the many unstated assumptions that AmerGen introduced into their analysis (such as heat transfer and surface condition) could increase the EAF CUF above 1.55.

## **CONCLUSIONS**

The NRC Staff erred in allowing AmerGen to enter through the backdoor and make changes to the LRA through the RAI instead of amending the original LRA. The NRC Staff should have not approved a value of 0.1366 for the EAF CUF. The only way that AmerGen was able to obtain such a low value was by ignoring the NUREG 6583 instructions of how to input oxygen concentrations during the transient and by excluding the cladding from the analysis without sufficient justification. As discussed above, even if the cladding has not cracked, the lowest reasonable value for the EAF CUF is 1.55. Because this value exceeds unity, AmerGen must develop an aging management plan before entering the life extension period as required by 10 C.F.R. § 54.21(c)(1)(iii).

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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

In the Matter of	)	
	)	Docket No. 50-0219-LR
AMERGEN ENERGY COMPANY, LLC	)	
	)	
(License Renewal for the Oyster Creek	)	
Nuclear Generating Station)	)	October 21, 2008
	)	

CERTIFICATE OF SERVICE

I, Richard Webster, of full age, certify as follows:

I hereby certify that on October 14, 2008, I caused Citizens' Letter and attached expert comments regarding the SER supplement to be served via email and U.S. Postal Service (as indicated) on the following:

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Signed: /s  
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Richard Webster

Dated: October 21, 2008