November 13, 2003

Mr. James Mallay
Director, Regulatory Affairs
Framatome ANP
3315 Old Forest Road
P.O. Box 10935
Lynchburg, VA 24506-0935

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION CONCERNING BAW-10238(P), REVISION 1, "MOX FUEL DESIGN REPORT" (TAC NO. MB7550)

Dear Mr. Mallay:

By letter dated May 30, 2003, Framatome ANP submitted for staff review Topical Report (TR) BAW-10238(P), Revision 1, "MOX Fuel Design Report." The staff has completed its preliminary review of the TR and has identified a number of items for which additional information is needed to continue its review. Please provide the requested information so that the review can be completed in a timely manner. Partial submittals would be welcomed to minimize delays. During a phone call with Ms. Gayle Elliott of your staff on this subject, she indicated that we would receive a response within thirty days from the receipt of this letter.

Pursuant to 10 CFR 2.790, we have determined that the enclosed RAI does not contain proprietary information. However, we will delay placing the RAI in the public document room for a period of ten (10) working days from the date of this letter to provide you with the opportunity to comment on the proprietary aspects only. If you believe that any information in the enclosure is proprietary, please identify such information line by line and define the basis pursuant to the criteria of 10 CFR 2.790.

If you have any questions, please call me at (301) 415-1436.

Sincerely,

/RA/

Drew Holland, Project Manager, Section 2
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Project No. 728

Enclosure: Request for Additional Information

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REQUEST FOR ADDITIONAL INFORMATION

TOPICAL REPORT BAW-10238(P), REVISION 1, "MOX FUEL DESIGN REPORT"

FRAMATOME ANP

PROJECT NO. 728

1. On page 1-2, it mentions that Framatome will perform plant-specific evaluations of the performance of the Mark-BW/MOX lead assemblies in the mission reactors, but does not specify which evaluations are being referred too. Please specify which plant-specific evaluations are being referred to and provide any results that have been obtained from these evaluations.

2. On page 1-2, it mentions that the evaluation process described in this topical report (TR) may be used to justify small changes without specific NRC approval. Please list every small change that this statement is referring to.

3. Page 1-2 states that the fuel rod contains MOX pellets based on the rod design and pellet specification used for European MOX fuel. Please provide these European specifications.

4. Please provide references 6, 13, 25, 24, 27, 28, 29, 30, 31, 33, 35, 36, 37, and 38.

5. On page 2-3, second paragraph, it states that control of the agglomerate process sequence is verified through examination of a representative number of samples from each batch of pellets. Please define what a representative number is.

6. In the first paragraph of Section 2.4, two types of mixed cores are defined and the TR states that both types of mixed cores have been considered and there are approved methods for handling them. Please provide the references to these approved methods.

7. In Section 3.2.3, the first bullet states that the scanning electron microscopy (SEM)/microprobe examination of the fuel and cladding revealed no abnormal behavior. Please define abnormal behavior. Additionally, the third bullet refers to the gallium measurement uncertainty limit. Please state the uncertainty limit.

8. In Section 6.0, the last sentence of the first paragraph states, "Future analysis updates to incorporate design modifications or input changes will use the same methods and criteria." This appears to indicate that changes to the fuel assembly design are anticipated. Please indicate precisely what process is anticipated for use when making changes and where the request for approval for using the process with MOX fuel is made.

9. In Section 6.0, the third paragraph states that "COPERNIC is also used to provide pressures, oxide thicknesses, and strains for mechanical analyses that use approved methods from other sources." Please specify which approved methods are being referred to and the other sources.
10. Fuel assembly stress is discussed in Section 6.1.1.1 and the section includes a listing of

the fuel assembly components evaluated. For each of the components listed, please provide the actual calculated stress value and the margin between the value and the limit.

11. In Section 6.1.1.2, it states that, "the cladding was shown to have an acceptable margin to the pressure that would cause buckling." Please provide for the worst cases, the pressure calculated and the margin between the value and the limit.

12. In Section 6.1.2, it discusses transients that induce a 1 percent cladding strain. Please specify which transients induce a 1 percent cladding strain and provide a discussion to quantify the difference between the 1 percent inducing transient and the maximum transient that the fuel rod is expected to experience.

13. In Section 6.1.5, it states that the hydrogen pickup is controlled by the corrosion limit. Please explain how the hydrogen pickup is controlled by the corrosion limit.

14. In Section 6.1.7, it states that the Mark-BW/MOX1 axial gap between the top nozzle and reactor internals was analyzed to show that sufficient margin exists to accommodate the fuel assembly growth for the design burnup (Reference 1). However, Reference 1 was analyzed for uranium fuels. Please explain this discrepancy. Also, since this section refers to Reference 1, please explain why the shoulder gap is analyzed differently from what was used in Reference 1 and provide a reference for where the direct modeling of the shoulder gap using the described method is approved for use.

15. In Section 6.1.8, what was the calculated fuel rod end-of-life pressure and what was the margin between the calculated value and the limit?

16. Section 6.1.9 states that conservative values for fast fluence on the holddown spring arising from the specific MOX fuel neutron spectrum are used to establish the holddown spring relaxation characteristics.

    a. What were the conservative values used?

    b. It later states that the liftoff will be minimal and the holddown spring deflection will be less than the worst-case normal operating condition. Please provide a numeric definition for minimal and define the worst-case normal operating cold-shutdown condition.

    c. Please provide the margin between the calculated value and the limit for all operating conditions.

17. In Section 6.2.1, what is the European fill gas specification for MOX fuel? How does it compare to the proposed 15 ppm limit on total hydrogen in the pressurization gas?

18. Section 7.2.3 refers to extended cycle designs. Please define extended cycle designs.

19. The end of Section 7.2.3 discusses current MOX fuel experience in German reactors. However, it only discusses the loading of fuel assemblies and projected burnups.

Please provide any results and data obtained from these experience sets.

20. In Section 7.2.5.1, hot cell examinations of MOX fuel from French reactors is outlined. Please provide a listing of all hot cell examinations performed and the results obtained from them. Also, please define similarly as it relates to the waterside corrosion and rod dimensional effects behavior of MOX versus low enriched uranium (LEU) fuel.

21. Section 7.2.5.1 provides the poolside oxide thickness measurement for the MOX German fuel. Please provide the oxide thickness measurement for the similar burnup LEU German fuel.

22. Please provide the data used to support the discussion of Section 7.2.5.2.

23. Section 7.2.5.4 discusses short segment ramp tests from which fission gas release measurements were obtained. Please provide the data that supports this discussion.

24. Why would the lead test assemblies (LTAs) only be confirmatory and not required, including the hot cell examinations, prior to batch loading given that Section 4.2 of the Standard Review Plan explicitly states that any time a fuel change is made, LTAs should be used and tested prior to batch loading?

25. In Section 8.0, it states that the core fraction will be increased with the maximum core fraction (approximately 40 percent) being achieved with the insertion of the third batch at each reactor. Please define precisely how many fuel assemblies will be in the core at the proposed equilibrium core? Also, please provide the data and discussion to support loading the core to approximately 40 percent given that the French have lower core fraction limits.

26. In Section 8.3.1.1, the plutonium feed material is discussed. Please specify the important chemical and physical properties of the PuO2 powder and define the range of acceptability for each property.

27. In Section 8.5.2, it states that the extended post irradiation exam (PIE) may occur after reactor restart. Please specify exactly which tests will be performed in the extended PIE, describe the test methods planned and the acceptance criteria for each test.