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Docket 72-2
Project M-37

MEMORANDUM FOR: Leland C. Rouse, Chief
Advanced Fuel and Spent Fuel Licensing Branch
Division of Fuel Cycle and Material Safety

FROM: John P. Roberts
Advanced Fuel and Spent Fuel Licensing Branch
Division of Fuel Cycle and Material Safety

SUBJECT: MEETING WITH VIRGINIA ELECTRIC AND POWER COMPANY (VEPCO) AND GENERAL NUCLEAR SYSTEMS, INC. (GNSI)

DATE AND TIME: February 24, 1986; 9:00 a.m.

LOCATION: 8th Floor Conference Room, Willste Building, Silver Spring, Maryland

ATTENDEES: See enclosure 1

PURPOSE: To discuss resolution of questions concerning the CASTOR V/21 cask basket originally raised in October 1985 during a Department of Energy spent fuel storage demonstration using a CASTOR V/21 cask at the Idaho National Engineering Laboratory.

SUMMARY:

The discussion centered on the first six points of the December 20, 1985, letter to GNSI on the CASTOR V/21 cask basket matter (see enclosure 2). After discussion of these points and of new data that GNSI is obtaining by tests and analyses (see enclosure 3, a figure illustrating one weld test), a set of comments was drawn up to document how the points might be addressed to aid in their resolution. This set of comments was discussed, and a final version of it agreed on before the meeting concluded (see enclosure 4).

Gesellschaft fur Nuklear Service mbh, the West German partner in GNSI, which has used borated stainless steel baskets in transportation casks in West Germany without weld cracks being observed, submitted a brief description of their experience (see enclosure 5).

VEPCO was present at the meeting with GNSI. VEPCO announced that it would be submitting in a day or so a revision to Chapter 10 of its Safety Analysis Report as part of its Surry dry spent fuel storage application.

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It was proposed by VEPCO that, as an alternative to assure that VEPCO's license review would not be held up by resolution of the borated stainless steel basket matter, VEPCO could use for near-term storage, if needed, a basket made of unborated stainless steel. This would eliminate basket structural concerns. A criticality analysis could be submitted by GNSI for its topical report for a lower initial fuel enrichment, and this could be reviewed by NRC. There was no objection to this approach by NRC staff. Resolution of the borated stainless steel basket matter would continue to proceed concurrently with submittals by GNSI.

ORIGINAL SIGNED BY:

John P. Roberts
Advanced Fuel and Spent Fuel
Licensing Branch
Division of Fuel Cycle and
Material Safety, NMSS

Enclosures:
1. Attendee List
2. December 20, 1985 Letter
3. Test Figure
4. Comments on CASTOR V Basket Analysis
5. Experience with CASTOR Baskets

OFC: FCAB	:FCAE	:	:	:	:	:
NAME:JRoberts:kd	:LCRouse	:	:	:	:	:
DATE:02/26/86	:02/27/86	:	:	:	:	:

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Enclosure 1

ATTENDEE LIST

John P. Roberts	NRC
Jim Schneider	NRC
Fritz Sturz	NRC
Robert L. Hails	Bechtel
Stephen D. Routh	Bechtal
Heinz Geiser	GNS
Dieter Rittscher	GNS
Robert T. Anderson	GNSI
Alberto B. Bonifacio	GNSI
Paul Highberger	GNSI
Juergen Migenda	GNSI
Monika Witte	LLNL
Martin W. Schwartz	LLNL
Joseph D. Hegner	VEPCO
H. S. McKay	VEPCO
Robert E. Nickell	VEPCO
Marvin Smith	VEPCO
Tom Snow	VEPCO

Encl 2

DEC 2 0 1985

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General Nuclear Systems, Inc.
ATTN: Mr. Victor J. Barnhart
Vice President
135 Darling Drive
Avon, Connecticut 06001

Gentlemen:

Our meeting on December 13, 1985, was, we believe, productive in resolving uncertainties, which were raised with respect to the CASTOR V/21 cask basket by the basket weld crack incident during the unlicensed cask demonstration at Idaho National Engineering Laboratory (INEL) and which were subsequently addressed in your preliminary report of November 1985 to us. In order, however, to be clear with respect to the determinations reached in our meeting, I am outlining the main items which were covered therein and to which GNSI is responding in its next communication to us. These follow:

1. With respect to resolving causes of the weld area failures, these should be related to strain mechanisms. Thus potential mechanisms for these failures should be explained and assessed with respect to INEL demonstration conditions and the CASTOR V/21 cask used. This assessment should be made with reference to the thermal analysis provided in the TSAR. Furthermore, the thermal stress analysis should be revised to include the effect of gusset plates and correct material properties and also should be revised to include reporting the stresses at all points of the structure.

2. Measures with respect to basket fabrication and/or design, which will be taken to assure that such weld failures could not occur both under normal and accident design conditions, should be provided. Tolerances should be shown that control the maximum and minimum gap dimensions.

3. Additional detailed basket drawings at different axial positions to include and exclude gusset plates should be provided with the basket welding plan. Non-structural welds which are not related to basket structural integrity, i.e., which are without a safety function, should be identified and distinguished from welds which are relied upon to maintain basket structural integrity.

4. A detailed structural analysis of the cask basket under both normal and accident design conditions alluded to in Section 4.0 of your preliminary report should be provided to demonstrate the structural integrity of the basket. It is assumed by us that this analysis will not take any credit for non-structural welds, i.e., joint welds, including, but not limited to, those welds which show evidence of failure in the INEL demonstration. If such should not be assumed in this analysis, this should be made clear. If measures referred to in item 2 above are taken, it should also be made clear whether this

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analysis assumes these are implemented. If such measures are taken, they will be reflected in the supplied drawings referred to in item 3 and in cask fabrication procedures and documentation.

5. Material properties which reflect actual testing done on these materials should be included and their use carefully explained in terms of analyses supplied to us and design commitments for materials with respect to the Topical Report for the CASTOR V/21 cask, for example, values for Radionox (boronated stainless steel). Particular attention should be directed toward demonstrating that either brittle fracture is not a failure mode or if it is, then safety margins against brittle fracture are adequate under dynamic loading conditions.

6. Data on weld tests performed should be supplied distinguishing between welds which have a safety function, that is, which are relied upon to maintain the structural integrity of the basket and non-structural welds.

7. As discussed in our meeting, based on INEL measurements and your analysis, explain why there is no effect observed due to sub-critical multiplication with respect to dose calculations (Reference: Correction 7.3.2 in our letter of approval for the CASTOR V/21 Topical Report). In relation to this explanation, provide drawings with changes related to cask borehole length shortening and the addition of steel plugs at the bottom of boreholes to provide additional reduction of gamma dose rates at positions near the cask wall top and bottom. Also provide an explanation of this improvement to cask shielding design. These changes are to be reflected in cask fabrication procedures and documentation.

I believe the above list summarizes the agreements reached in our meeting. If you have any questions on these points, please call me.

Sincerely,

Original Signed By

John P. Roberts
Advanced Fuel and Spent Fuel
Licensing Branch
Division of Fuel Cycle and
Material Safety

cc:
Marvin Smith

OFC: FCAF	:FCAF	:	:	:	:	:
NAME:JRoberts:kd:LCRouse		:	:	:	:	:
DATE:12/19/85	:12/20/85	:	:	:	:	:

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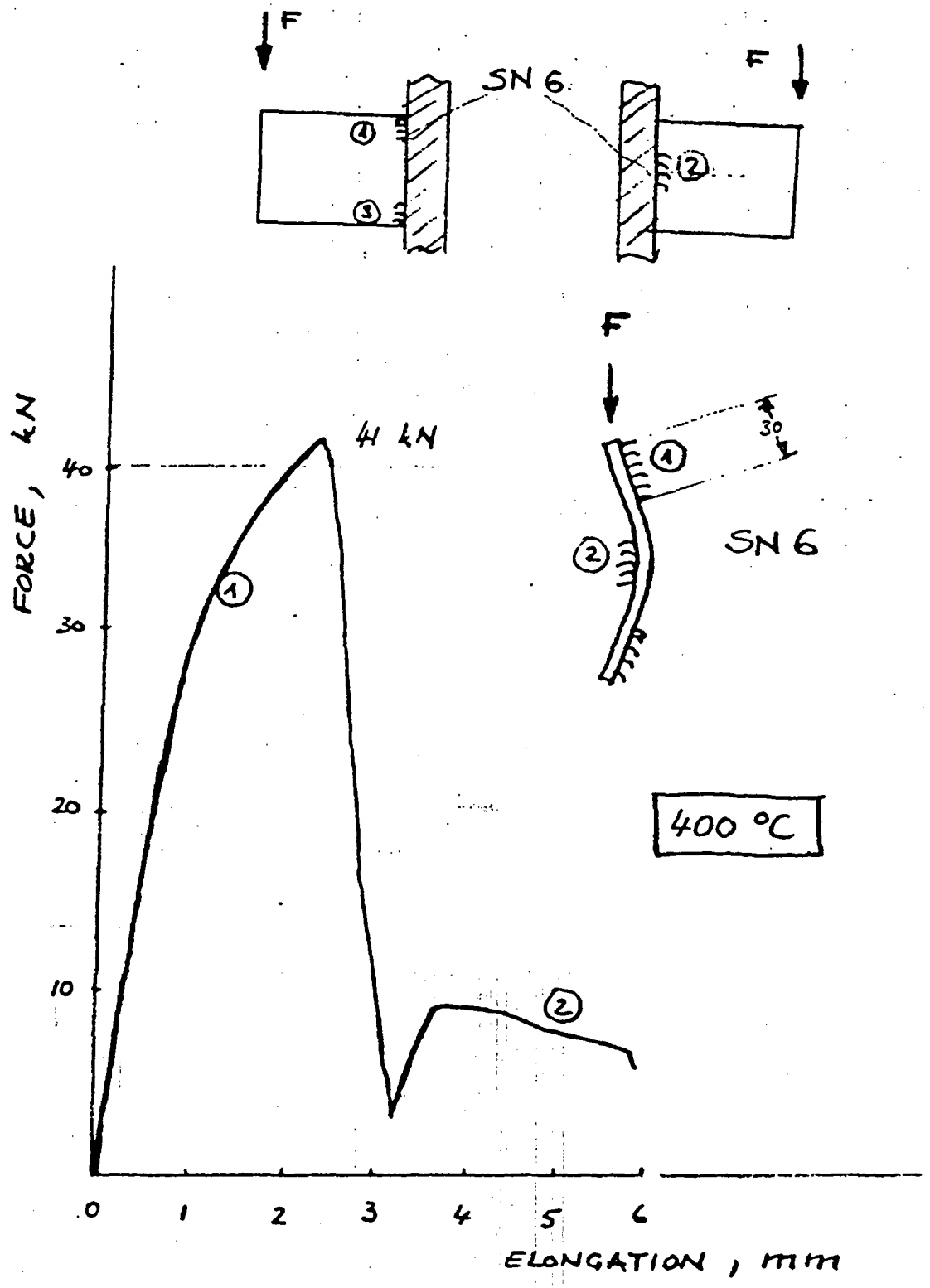
Encl 3



GNS	Test of Basket Welding SN 6	Fig. 1

COMMENTS ON CASTOR V BASKET ANALYSIS

Ref: Letter Roberts, NRC, to Barnhart, GNSI, dated 12/20/85.

Pt. 1

(a) TSAR Thermal Analysis

The documents should show the details of the ANSYS finite element model both with and without gusset plates.

(b) TSAR Themal Analysis

For the joints, a description/drawing of the ANSYS finite element model should be included. If no detailed (2D) analysis was made, discuss how the stresses at the joints were calculated.

(c) TSAR Thermal Analysis

Discuss for the joints how the beam model - to plate model interface was made.

(d) TSAR Thermal Analysis

Tabulate and locate stresses for all joints, highest stresses in plates, and highest stresses in ring.

(e) TSAR Thermal Analysis

Include gusset plate temperature distribution.

(f) TSAR Thermal Analysis

Present and define the acceptance criteria based on strain. Show that all calculated stresses meet the acceptance criteria. Will probably be in the table noted in item (d).

(g) INEL Report

Develop failure analyses and criteria based on strain or displacement for J1, J2 and show how failure is related to acceptance criteria. Acceptance criteria includes ASME code case for low ductility austenitic steels.

Pt. 2

(a) TSAR Thermal Analysis

Present discussion on how the G1, G2 gaps are assured by measurement and note tolerances.

(b) TSAR Thermal Analysis

Present data on basket ring and cask cavity diametrical measurements.

(c) TSAR Thermal Analysis

Present analysis to show the effect of non-centered basket.

Pt. 3

(a) TSAR General (Send ASAP) - Submit to NRC

The final design drawing detailing how the basket will be built. Note the weld lengths and location for SN-8, and all welds, gussets, spacers.

(b) TSAR General

Correct Figure 1 in Appendix 1.

Pt. 4

(a) TSAR General

Include the statement that no welds fail during any TSAR conditions.

(b) TSAR Dynamic Drop

Correct the space between welds in TSAR due to error (see SER comments).

(c) TSAR Dynamic Drop

Detailed structural analysis of the cask basket under both normal and accident design conditions alluded to in Section 4.0 of your preliminary report should be provided to demonstrate the structural integrity of the basket. If measures referred to in point 2 above are taken, it should also be made clear whether this analysis assumes they are implemented.

Pt. 5

(a) TSAR Material Report Addendum

GNS will report on results of compact tension fracture toughness tests (per ASTM E-399). Tests will be performed with 20 mm plate at 350°C looking at base material, weld material, and heat affected zone. Number of tests is 3.

(b) TSAR Material Specification

Radionox material specification will define Charpy-V notch values at 350°C. The lowest of 3 samples will equal or exceed 15 ft.-lbs. Reference will be made to the DIN standard 50115 and 50122.

(c) TSAR Material Specification

Material specification will delineate minimum elongations at 350°C. as follows:

Base Material - 15%
Weld Material - 10%

Reference will be made to the DIN standard 50145 and 50120.

(d) TSAR Dynamic Drop

A discussion of the applicability of the basket material should be made, with particular attention directed toward demonstrating that either brittle fracture is not a failure mode or if it is, that safety margins against brittle fracture are adequate under dynamic loading conditions.

(e) TSAR Material Report Addendum

A report will be prepared defining the results of tests performed to date including C_v, yield tests, and elongations. The report will include relevant details on such factors as how specimens were prepared, extensometer readings, etc. Information will be on both base metal and weld metal.

(f) TSAR Material Spec

The following material properties will be defined as function of the temperature range (20-400°C).

- Young's Modulus
- Expansion Coeff
- Yield Strength
- Ultimate Strength
- Poisson Ratio - (only at room temp.)

All references will be provided.

Pt.6

Questions in this area were covered in Pts. 1-5. preceding.

Gesellschaft für Nuklear-Service mbH

Dr.G/ki/1574
21.2.1986

Experience with CASTOR baskets under Transport Conditions

CASTOR casks are used for commercial shipment of spent fuel. Since 1984 12 shipments from the Stade NPP to the WAK reprocessing facility in Karlsruhe took place. The shipments are done by rail or truck over a distance of 8oo km (5oo miles).

1. CASTOR Ib

Transport conditions:	cask in horizontal position, dry F/A in helium environment
Heat load:	4 x 4.5 = 18 kW
Hottest basket temperature (calculated):	339°C
Total cool down time:	2.5 hours
Phase 1:	Flooding/rinsing with water during first hour. Vapour temperatures 11o°C
Phase 2:	Flushing with water during next 1.5 hour: water temperature cools down from 1oo°C to 6o°C

Basket Behaviour

After each shipment visual inspections of the CASTOR Ib basket are carried out. No indication of any crack has been observed untill now

After the 5th shipment with CASTOR Ib its basket was taken out of the cask cavity and replaced by an optimized basket version. The old basket was completly decontaminated and examined by GNS QA and BAM. No indication of a crack has been observed.

2. CASTOR IIb

Transport conditions:	cask in horizontal position, dry F/A in helium environment
Heat load:	8 x 3.8 kW = 3o.4 kW
Hottest basket temperature (calculated):	394°C
Total cool down time:	4 hours
Phase 1:	Flooding/rinsing with water during first 1.5 hour. Vapour temperatures 11o°C
Phase 2:	Flushing with water during next 2.5 hour: water temperature cools down from 1oo°C to 6o°C

Basket Behaviour

After each shipment visual inspections of the CASTOR IIb basket are carried out. No indication of any crack has been observed untill now

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Other _____

PDR yes

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