

**MONTHLY LETTER STATUS REPORT**  
For February 2003

Project Title: Spent Fuel Review Assistance  
Period of Performance: February 3, 1997 – December 31, 2003  
JCN: J5167  
PNNL Project Manager: M. A. Khaleel (509-375-2438)  
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Richland, WA 99352  
Facsimile: 509-375-6605 *Lori 509-375-6786*  
NRC Project Manager: P. Kinney (301-415-7805)  
NRC Technical Monitor: C. Bajwa (301-415-1237)

Project Objective: The objective of this project is to conduct safety and environmental reviews and development of regulatory guidance related to Independent Spent Fuel Storage Installations and Dry Cask Storage facilities.

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**Task Orders 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 & 11    COMPLETED**

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**Task #12**

Title: Development and Analysis of Spent Fuel and Radioactive Material Cask Models for Casework Evaluations

JCN: J5167

PNNL Task Manager: T. E. Michener (509-375-2162)  
NRC Technical Monitor: C. Bajwa (301-415-1237)

PERIOD OF PERFORMANCE: 4/4/02 – 12/31/03

**OBJECTIVE**

The objective of this task order is to provide package analyses in support of ongoing casework using the ANSYS, ANSYS LS-DYNA FEA, COBRA-SFS, and Star-CD packages.

**PROGRESS DURING REPORTING PERIOD**

In February PNNL staff performed the following:

- Performed further calculations with the COBRA-SFS model of NUHOMS 24 cask for the vacuum drying transient with high burn-up fuel. It was determined that even in the steady-state scenario, the peak clad temperature does not exceed the limit of 400 C. Revised the NUHOMS 32-PT cask model to accommodate 17 x17 fuel (instead of 15 x15 fuel) and performed steady-state calculations with a helium backfill. (This produced peak clad temperatures consistent with the results obtained assuming the cask was loaded with 15 x15 fuel.) Currently working on calculations of the vacuum drying transient for the NUHOMS 32-PT cask with 17 x17 fuel assemblies.

*A/S*

- Completed the 2D Baltimore Tunnel Fire (BTF) analysis using a revised 30 hour fire boundary condition data provided by NIST. The purpose of this task was to obtain and contribute additional information concerning the ramping and cool-down nature of the SNF after cessation of the fire. Final results as well as input decks have been provided to the technical monitor for review future use.

#### TRAVEL

Harold Adkins, Tom Michener, and Brian Koeppel traveled to NRC HQ on March 2-6, 2003 to consult on all ongoing efforts with NRC staff and to provide program updates on all tasks.

#### REPORT, PAPERS, AND PUBLICATIONS

None.

#### ANTICIPATED AND ENCOUNTERED PROBLEM AREAS

None.

#### PLANS FOR NEXT REPORTING PERIOD

PNNL staff plan to begin building up BTF evaluation models of the NAC LWT and TransNuclear TN-68 casks at the request of the NRC technical lead. PNNL staff will also perform a 10CFR, part 71.73 fully engulfing fire evaluation of the Holtec Hi-Star 100 to establish a comparison basis for the recent BTF results involving the Hi-Star 100.

#### FINANCIAL STATUS AND VARIANCE ANALYSIS

See attached financial status report. The cost and funding information reported on the Cost Status by Element Table includes the necessary adjustments to account for the DOE Adder. All other cost information reflects only the Pacific Northwest National Laboratory costs and does not include the DOE Adder.

#### PROPERTY AND SOFTWARE

None.

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### Task #13

Title: Dynamic Structural Analyses in Support of Risk-Informing 10 CFR Part 71

JCN: J5167

PNNL Task Manager: H. E. Adkins (509-372-6629)  
NRC Technical Monitor: D. T. Huang (301-415-3381)

PERIOD OF PERFORMANCE: 7/11/02 – 12/31/03

#### OBJECTIVE

The objectives of this task are to: 1) compare the structural analyses results of NUREG-6672 using the ANSYS LS-DYNA FEA packages with selected spent fuel transportation packages currently certified by the NRC; 2) determine the deformed geometry and cladding integrity of three selected pressurized water reactors (PWR) high burn-up (50, 60, and 75 GWD/MTU) spent nuclear fuel assemblies suitable for transport in the systems identified; 3) train selected NRC staff members in the use of ANSYS LS-DYNA in cask analyses; 4) provide continued support on high burn-up material and thermal issues.

#### PROGRESS DURING REPORTING PERIOD

In February PNNL staff performed the following:

- Continued development of explicit SNF LS-DYNA subcomponents to be used in the explicit modeling of the two SNF transport systems to be modeled.
- Support was provided on the topic of moderator exclusion. The Technical Monitor requested that PNNL staff assemble bids for scope and modeling/approach modifications to perform an intensive investigation of extended cask accident scenarios.

#### TRAVEL

Harold Adkins, Tom Michener, and Brian Koeppel traveled to NRC HQ on March 2-6, 2003 to consult on all ongoing efforts with NRC staff and to provide program updates on all tasks.

#### REPORT, PAPERS, AND PUBLICATIONS

None.

#### ANTICIPATED AND ENCOUNTERED PROBLEM AREAS

None.

#### PLANS FOR NEXT REPORTING PERIOD

PNNL staff plan to continue model construction of the first of two identified SNF transport systems. Continuing support on CSED will be provided if needed. Further support will be provided on the topic of moderator exclusion if necessary.

## FINANCIAL STATUS AND VARIANCE ANALYSIS

See attached financial status report. The cost and funding information reported on the Cost Status by Element Table includes the necessary adjustments to account for the DOE Adder. All other cost information reflects only the Pacific Northwest National Laboratory costs and does not include the DOE Adder.

## PROPERTY AND SOFTWARE

None.

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### **Task #14**

Title: Inelastic Buckling Capacity of High Burn-up Fuel Subject to End Impact Loads

JCN: J5167

PNNL Task Manager:	H. E. Adkins	(509-372-6629)
NRC Technical Monitor:	D. T. Tang	(301-415-8535)

PERIOD OF PERFORMANCE: 10/17/02 – 3/31/03

## OBJECTIVE

The objectives of this task are to: 1) Compute inelastic buckling capacity and corresponding strain ductility demands for selected PWR spent fuel clads under simulated cask handling or drop accidents, using the ANSYS computer code; 2) Train selected NRC staff members in the use of ANSYS for fuel clad inelastic buckling analyses.

## PROGRESS DURING REPORTING PERIOD

In February PNNL staff performed the following:

- Results stemming from preliminary sensitivity studies involving the 3D explicit LS-DYNA pin model were presented and discussed with the Technical Monitor. Concerns of unrealistic pin cross-section ovalization and abnormally high ductility demands, associated with the preliminary results, were presented and discussed. Both PNNL staff and the Technical Monitor agreed that including the influence of the fuel stiffness would alleviate the problem. The Technical Monitor requested that PNNL staff assemble a bid for enhancing the model. However that was put on hold until decisions regarding future direction could be made by NRC Staff. PNNL has placed the task on hold as requested and has provided menial technical support in the way of answering questions regarding current and future modeling approach, provided a few model enhancement bid modifications, and discussed possible paths forward with the NRC Technical Monitor.
- All reporting has been postponed until further direction is provided by the NRC Technical Monitor.

### TRAVEL

Harold Adkins, Tom Michener, and Brian Koeppel traveled to NRC HQ on March 2-6, 2003 to consult on all ongoing efforts with NRC staff and to provide program updates on all tasks.

### REPORT, PAPERS, AND PUBLICATIONS

None.

### ANTICIPATED AND ENCOUNTERED PROBLEM AREAS

The period of performance for this task currently expires on March 31, 2003.

### PLANS FOR NEXT REPORTING PERIOD

Over the next reporting period, PNNL staff will continue to answer question and conduct discussions with the NRC Technical Monitor on an "as needed" basis. All work on this task will remain on hold until continuation is requested by the NRC Technical Monitor. If PNNL staff are requested to continue over the next reporting period, the original parametric investigation will be performed, and writing of a draft report will be initiated.

### FINANCIAL STATUS AND VARIANCE ANALYSIS

The cost and funding information reported on the Cost Status by Element Table includes the necessary adjustments to account for the DOE Adder. All other cost information reflects only the Pacific Northwest National Laboratory costs and does not include the DOE Adder.

### PROPERTY AND SOFTWARE

None.

JCN - J5167

SPENT FUEL REVIEW ASSISTANCE

M. A. Khaleel  
(509) 375-2438  
February 2003

	Current Month	FYTD	Cumulative To Date
I. Direct Staff Labor Hours	342.5	1,701.5	16,436.3
II. Direct Salaries	19,807	98,333	864,851
Materials & Services (Excluding ADP)	4	90	14,596
ADP Support	0	0	0
Subcontracts	0	0	57,316
Travel Expenses	4,089	6,342	53,145
Indirect Labor Costs	10,020	46,749	385,681
Other Direct Costs	1,800	8,535	87,901
G&A, Nuclear, and Serv Assmt	15,953	71,450	638,006
Total PNNL Costs	\$51,672	\$231,499	\$2,101,496
Percent Spent		87%	98%
Total Costs to NRC (Includes DOE Adder)	\$53,222	\$238,444	\$2,168,318

III. Overall Funding Status

PNNL Available Funding (Adjusted: Reflects DOE Adder Initiated in FY92)

<u>Total JCN Funding</u>	<u>Prior FY Carryover</u>	<u>FY03 Projected Funding Level</u>	<u>FY03 Funds Received to Date</u>	<u>FY03 Funding Bal. Needed</u>
\$2,137,508	\$56,832	\$582,524	\$210,680	\$371,845

NRC Funding Provided to DOE

<u>Total JCN Funding</u>	<u>Prior FY Carryover</u>	<u>FY03 Projected Funding Level</u>	<u>FY03 Funds Received to Date</u>	<u>FY03 Funding Bal. Needed</u>
\$2,205,100	\$58,537	\$600,000	\$217,000	\$383,000

JCN - J5167

Task Funding Status (PNNL dollars)

Task No.	NRC \$ Task Funds	PNNL \$ Task Funds	NRC Funds Rec To Date	PNNL Funds Rec. To Date	Monthly Costs	Cumulative Costs	Remaining Funds	Additional NRC Funds Requested
Completed Tasks	1,779,234	1,724,043	1,738,100	1,684,106	0	1,682,355	1,751	41,136
TO 12	518,900	503,786	315,000	305,825	30,302	292,709	13,117	203,900
TO 13	368,400	357,670	90,000	87,379	14,465	82,073	5,306	278,400
TO 14	62,000	60,194	62,000	60,194	6,905	44,359	15,835	0
Total	2,728,534	2,645,693	2,205,100	2,137,508	51,672	2,101,496	36,009	523,436

**JCN - J5167**

**Task 14 - Inelastic Buckling Capacity of High Burn-up Fuel Subject to End Impact Loads**

**1. Financial Summary**

**PNNL Available Funding (Adjusted: Reflects DOE Adder Initiated in FY92)**

<u>Authorized</u> <u>Cost Ceiling</u>	<u>Funding</u> <u>Obligation</u>	<u>Period Costs</u>	<u>Total</u> <u>Costs to Date</u>	<u>Cumulative</u> <u>Percent Spent</u>
\$60,194	\$60,194	\$6,905	\$44,359	73.7%

**NRC Funding Provided to DOE**

<u>Authorized</u> <u>Cost Ceiling</u>	<u>Funding</u> <u>Obligation</u>	<u>Period Costs</u>	<u>Total</u> <u>Costs to Date</u>	<u>Cumulative</u> <u>Percent Spent</u>
\$62,000	\$62,000	\$7,112	\$45,690	73.7%

**2. Task Cost Status:**

	<u>Current</u> <u>Month</u>	<u>Fiscal</u> <u>Year to Date</u>	<u>Cumulative</u> <u>To Date</u>
<b>Direct Staff Labor Hours</b>	47.0	353.5	353.5
<b>Labor</b>	\$5,562	\$43,016	\$43,016
<b>Travel Expenses</b>	\$1,338	\$1,338	\$1,338
<b>Service Equipment Centers</b>	\$0	\$0	\$0
<b>Other Intermediate Costs</b>	\$0	\$0	\$0
<b>Value Added Overheads</b>	\$0	\$0	\$0
<b>Services - Other RL Contractors</b>	\$0	\$0	\$0
<b>Procurements</b>	\$5	\$5	\$5
<b>Subcontracts</b>	\$0	\$0	\$0
<b>Total PNNL Costs</b>	<u>\$6,905</u>	<u>\$44,359</u>	<u>\$44,359</u>
<b>Total Costs to NRC</b>	<u>\$7,112</u>	<u>\$45,690</u>	<u>\$45,690</u>

(Includes DOE Adder)



**JCN - J5167**

**Task 13 - Dynamic Structural Analyses in Support of Risk-Informing**

**10 CFR Part 71**

**1. Financial Summary**

**PNNL Available Funding (Adjusted: Reflects DOE Adder Initiated in FY92)**

<b>Authorized</b>	<b>Funding</b>		<b>Total</b>	<b>Cumulative</b>
<b>Cost Ceiling</b>	<b>Obligation</b>	<b>Period Costs</b>	<b>Costs to Date</b>	<b>Percent Spent</b>
\$357,670	\$87,379	\$14,465	\$82,073	93.9%

**NRC Funding Provided to DOE**

<b>Authorized</b>	<b>Funding</b>		<b>Total</b>	<b>Cumulative</b>
<b>Cost Ceiling</b>	<b>Obligation</b>	<b>Period Costs</b>	<b>Costs to Date</b>	<b>Percent Spent</b>
\$368,400	\$90,000	\$14,899	\$84,537	93.9%

**2. Task Cost Status:**

	<b>Current</b>	<b>Fiscal</b>	<b>Cumulative</b>
	<b><u>Month</u></b>	<b><u>Year to Date</u></b>	<b><u>To Date</u></b>
<b>Direct Staff Labor Hours</b>	106.0	553.0	652.5
<b>Labor</b>	\$13,086	\$67,579	\$78,905
<b>Travel Expenses</b>	\$1,379	\$2,896	\$2,896
<b>Service Equipment Centers</b>	\$0	\$94	\$267
<b>Other Intermediate Costs</b>	\$0	\$0	\$0
<b>Value Added Overheads</b>	\$0	\$0	\$0
<b>Services - Other RL Contractors</b>	\$0	\$0	\$0
<b>Procurements</b>	\$0	\$6	\$6
<b>Subcontracts</b>	\$0	\$0	\$0
<b>Total PNNL Costs</b>	<u>\$14,465</u>	<u>\$70,575</u>	<u>\$82,073</u>
<b>Total Costs to NRC</b>	<u>\$14,899</u>	<u>\$72,692</u>	<u>\$84,537</u>

(Includes DOE Adder)

**JCN - J5167**

**Task 12 - Development of Analysis of Spent Fuel & Radioactive Material Cask  
Cask Models for Casework Evaluations**

**1. Financial Summary**

PNNL Available Funding (Adjusted: Reflects DOE Adder Initiated in FY92)

Authorized <u>Cost Ceiling</u>	Funding <u>Obligation</u>	Period Costs	Total <u>Costs to Date</u>	Cumulative <u>Percent Spent</u>
\$503,786	\$305,825	\$30,302	\$292,709	95.7%

NRC Funding Provided to DOE

Authorized <u>Cost Ceiling</u>	Funding <u>Obligation</u>	Period Costs	Total <u>Costs to Date</u>	Cumulative <u>Percent Spent</u>
\$518,900	315,000	\$31,211	\$301,491	95.7%

**2. Task Cost Status:**

	Current <u>Month</u>	Fiscal <u>Year to Date</u>	Cumulative <u>To Date</u>
Direct Staff Labor Hours	189.5	795.0	2,087.6
Labor	\$26,797	\$110,464	\$273,091
Travel Expenses	\$3,506	\$5,418	\$9,572
Service Equipment Centers	\$0	\$594	\$767
Other Intermediate Costs	\$0	\$0	\$0
Value Added Overheads	\$0	\$0	\$0
Services - Other RL Contractors	\$0	\$0	\$0
Procurements	\$0	\$92	\$9,279
Subcontracts	\$0	\$0	\$0
Total PNNL Costs	\$30,302	\$116,568	\$292,709
Total Costs to NRC	\$31,211	\$120,065	\$301,491

(Includes DOE Adder)

