INEL
Idaho National Engineering Laboratory

July 13, 1990

Dr. Gary R. Burdick
Special Assistant
Division of Safety Issue Resolution
US Nuclear Regulatory Commission
5650 Nicholson Lane
Rockville, MD 20852

JUNE MONTHLY REPORT TO NRC/RES/DSR FOR FIN B5699, ISLOCA RESEARCH PROGRAM - JHB-40-90

Dear Dr. Burdick:

The monthly report describing work under FIN B5699, being performed by EG&G Idaho, Inc. is attached. Technical and fiscal status are included, and a status summary is provided in this letter. This report covers the accounting period beginning on May 28, 1990, and ending on June 24, 1990.

Technical Status Summary

A meeting was held with the NRC Project Manager to finalize the workscope, budget, and schedule for additional work to be included in the ISLOCA program. The following were discussed and agreed upon: additional tasks to finalize the results for the Davis-Besse plant, the workscope that relates to completion of the evaluations for Catawba, and all workscope for evaluation of an ISLOCA at the Waterford plant. The NRC Form 173 was received for the finalized workscope. Additional analyses needed to finalize the Davis-Besse ISLOCA results were initiated and analysis of the data obtained from the plant visit to Catawba continued. Preparations were made for the initial information gathering visit to the Waterford plant.

Fiscal Status Summary

The fiscal status is summarized in the attached table.

Very truly yours,

John H. Bickel

Dr. John H. Bickel, Manager
NRC Risk Analysis Unit

B-56

cc: DOE-ID
N. S. Burrell
R. S. Bostian
R. M. Stallman
S. L. Zeigler

NRC
R. J. Barrett, NRC/NRR/PRAB
F. D. Coffman, NRC/RES/HFB
M. S. Farr, NRC/RES/DSR
J. A. Murphy, NRC/RES/DSR
J. A. O'Brien, NRC/RES/SSEB
T. G. Ryan, NRC/RES/HFB
M. W. Weston, NRC/OC/BUDB

REPORT DATE: 06/20/90

F' IANCE AND PROGRESS STATUS SUMMARY
FOR MONTH OF JUNE

FOR BRANCH: DSR

F.I.N. NUMBER	F.I.N. TITLE	STAT CODE	(1) FY-1990 Y.T.D. BUDGET	(2) FY-1990 Y.T.D. COSTS	(3)* VARIANCE	(4) O/S COMMIT	(5) FY-1990 OBGL AUTH	(6) YTD % SPENT AGNST CURR OBGL AUTH	(7) ANTICIPATED ADDITIONAL DOLLARS	(8) TOTAL OBGL AUTH	(9) PROPOSED CARRYOVER FY-1990	(10) FY-1990 - '90 CAC COSTS	(11)A % SPNT	(12) % COMP
BS499	ISLOCA	O	$484.1	$462.2	$21.9	$48.5	$1,060.6	44%	$6.0	$1,066.6	$0.0	$1,066.6	43%	43%

* ALL 189'S WITH LESS THAN $500K MUST HAVE EXPLANATIONS FOR VARIANCES EXCEEDING $10K AND 189'S FOR MORE THAN $500K MUST HAVE EXPLANATIONS FOR VARIANCES EXCEEDING $25K. VARIANCE STATEMENTS ARE INCLUDED IN THE TECHNICAL REPORT.

A. UNLESS INDICATED OTHERWISE ALL PERCENTAGES IN THIS COLUMN ARE THE RATIO OF COLUMN (2) TO COLUMN (10).

FINANCIAL INFORMATION WITHIN THIS REPORT MAY VARY SLIGHTLY DUE TO ROUNDING.

B5699: ISLOCA Research Program
EG&G Program Manager: D. J. Hanson
EG&G Principal Investigator: W. J. Galyean
DOE Technical Monitor: S. L. Zeigler
NRC Project Manager: G. R. Burdick

The objective of this project is to provide the NRC with qualitative and quantitative information on the hardware, human factors, and accident consequence issues that dominate nuclear power plant risks for Interfacing System Loss Of Coolant Accidents (ISLOCA). This information is to be used in:

- Developing a PRA framework for evaluating the ISLOCA and identifying insights with respect to the risk contribution from both hardware and human error issues along with recommendations for risk reduction.

- Highlighting the effects of specific types of human errors and their root causes on ISLOCA risk along with recommendations for risk reduction.

- Evaluating the fragility of low pressure systems when exposed to a high pressure, high temperature reactor coolant system. This evaluation will include identification of likely failure locations and their probabilities of failure.

- Identifying and describing potential ISLOCA sequences with respect to sequence timing, possible accident management strategies and effects of ISLOCAs on other equipment and systems.

- Estimating the consequences associated with postulated ISLOCA events, including estimates of source terms and offsite consequences. Again, important issues will be identified and recommendations will be made on possible consequence reduction actions.

Real and potential ISLOCA problems considered in this program are limited to the containment bypass variety.

1. Summary of Work Performed During June 1990:

A meeting was held with the NRC Project Manager to finalize the workscope, budget, and schedule for additional work to be included in the ISLOCA program. The following topics were discussed and agreed upon: (1) additional tasks to finalize the results for the Davis-Besse plant, (2) the workscope that relates to completion of the evaluations for Catawba, and (3) all workscope necessary for an evaluation of the Waterford plant. The NRC Form 173 was received for the additional workscope.

The additional analyses needed to finalize the Davis-Besse ISLOCA results were initiated. Comparisons with existing large and small break calculations to establish the timing for the ISLOCA events at

Davis-Besse were begun. Information was obtained on the external event analysis for Draft NUREG-1150 to ensure that a consistent approach is used. Commitments were obtained for the assignment of manpower to begin most tasks in early July.

Analysis of the data obtained from the plant visit to Catawba continued. The preliminary event trees and fault trees developed prior to the visit were refined and additional information was incorporated. Preparations were made to initiate the detailed human reliability analysis.

Preparations were made for the initial visit to the Waterford plant to obtain preliminary information.

2. Summary of Work to be Performed During July 1990:

The initial estimates for timing of the ISLOCA events for Davis-Besse will be completed. Evaluation of the capability to close the valves at the high system pressures and flow rates involved in an ISLOCA at Davis-Besse will begin. An abbreviated plant visit will be arranged to collect information on external events, mitigative actions for an ISLOCA, and release pathways from the auxiliary building. Evaluation of the results obtained from this plant visit will begin.

Evaluation of the Catawba results will continue. RELAP5 models of the piping systems will be developed and calculations initiated to provide estimates of the pressure distribution in the low pressure piping systems during an ISLOCA. Plant information will by transmitted to Impell so that the component and piping failure analysis can begin. Detailed analysis of the human reliability events on the event trees will continue.

An initial visit to Waterford will be completed. Preliminary event trees will be developed to help prioritize the gathering of information during the expended plant visit. The extended plant information gathering visit will begin.

3. Problems and Potential Problems:

None

4. Cost Breakdown:

Total cost is shown on the Finance and Progress Status Summary.

5. Variance Explanation

The under expenditure shown for June does not reflect the new work scope defined for the three plants. A new work breakdown structure and associated budget and schedule are being developed to incorporate the new work scope. This will be developed in July but will not be included in the computerized tracking system until mid August. As a result, the budgetary portions of the monthly reports for June and July will not provide an accurate comparison of the spending rates and the budget.

N R C COST CATEGORIES FOR
JUNE

189 NO. B5699

COST CATEGORIES	CURRENT MONTH ($0.0 K)	YEAR-TO-DATE ($0.0 K)
DIRECT SALARIES	$ 6.0	$ 116.0
MATERIALS, SERVICES AND OTHER COSTS	0.1	5.1
ADP SUPPORT	0.0	1.6
SUBCONTRACTS	0.0	70.0
TRAVEL	0.1-	26.0
INDIRECT LABOR COSTS	9.9	189.5
GENERAL AND ADMINISTRATIVE	2.5	54.0
CAPITAL EQUIPMENT	0.0	0.0
T O T A L S	$ 18.4	$ 462.2

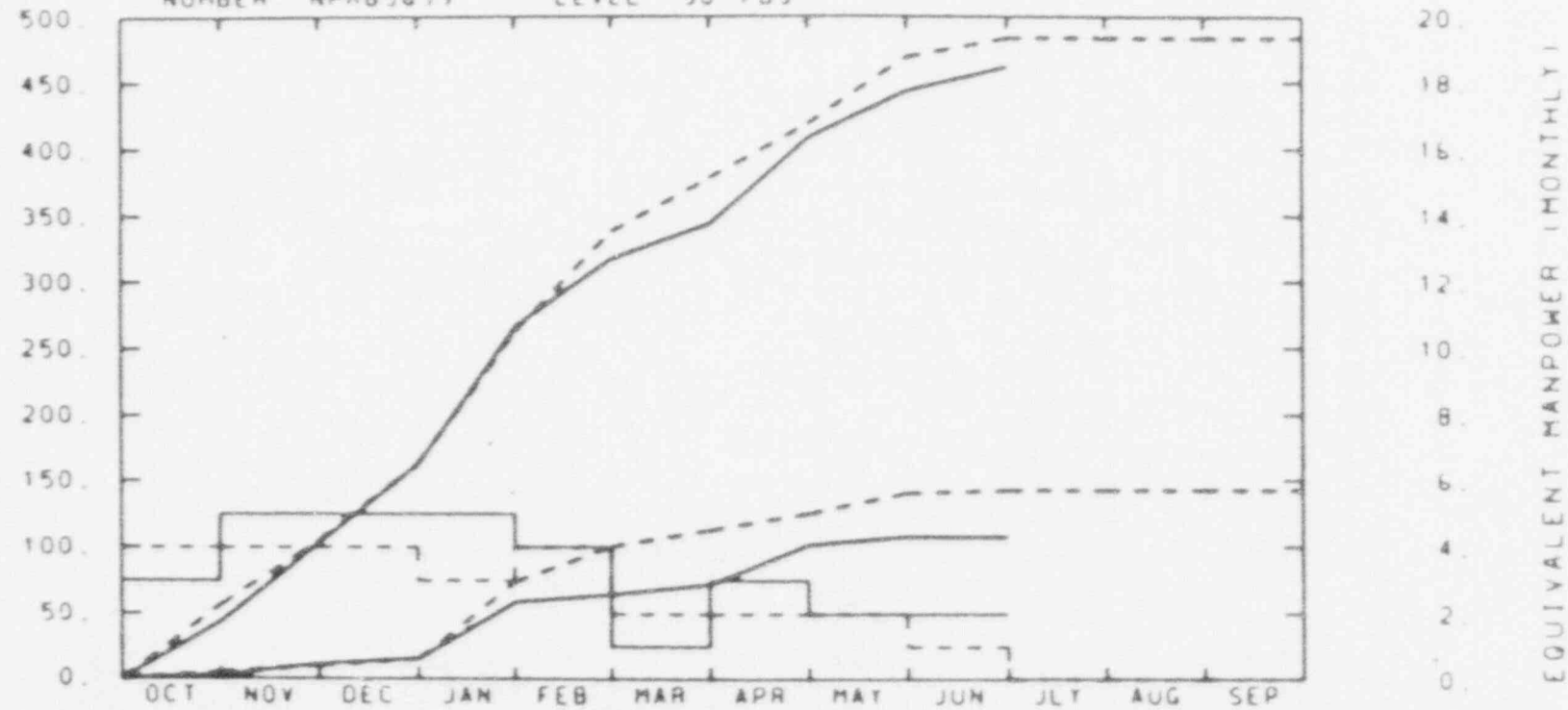
RESPONSIBLE MANAGER
MACDONALD

EG&G IDAHO INC

SCHED NO : P46PM093-A

ISLOCA

NUMBER NPRB5699 LEVEL 50 FBS



TOTAL PROGRAM

BUDGET	57	105	163	263	338	379	419	469	484	484	484	484
ACTUAL	44	103	162	266	318	344	408	444	462			

MATERIAL

BUDGET	5	10	16	74	101	113	125	141	143	143	143	143
ACTUAL	3	12	16	59	65	72	102	108	108			

MANPOWER

BUDGET	4	4	4	3	4	2	2	2	1	0	0	0
ACTUAL	3	5	5	5	4	1	3	2	2			

BUDGET - - - - - -

ACTUAL ———

NRC FORM 189 (Rev 04-83)

U.S. NUCLEAR REGULATORY COMMISSION

PROJECT AND BUDGET PROPOSAL FOR NRC WORK

Date of Proposal: August 1990

☐ New ☑ Revision No. 2

Project Title: ISLOCA RESEARCH PROGRAM

FIN: B5699

NRC Office: Office of Nuclear Regulatory Research (RES), Division of Systems Research (DSR)

NRC B&R Number: 9 60 19 30 040

DOE Contractor: EG&G Idaho, Inc.

Contractor Account Number: I-1066

Site: IDAHO NATIONAL ENGINEERING LABORATORY (INEL)

DOE B&R Number: 40 10 01 C60

COGNIZANT PERSONNEL	ORGANIZATION	FTS PHONE NUMBER	PERIOD OF PERFORMANCE
NRC Project Manager: G. R. Burdick	NRC/RES	492-3509	Starting Date: 08-01-89
Other NRC Technical Staff: M. A. Cunningham / F. D. Coffman, Jr.	NRC/RES / NRC/RES	492-3965 / 492-3520	Completion Date: 09-30-91
DOE Project Manager: S. L. Zeigler	DOE-ID	583-1546	
Contractor Project Manager: D. J. Hanson	EG&G Idaho	583-9751	
Principal Investigator(s): W. J. Galyean	EG&G Idaho	583-0627	

STAFF YEARS OF EFFORT (Round to nearest tenth of a year)	FY -1989	FY -1990	FY -1991	FY -1992	FY -1993
Direct Scientific/Technical	1.0	5.4	2.9		
Other Direct (Graded)	0.0	0.0	0.0		
TOTAL DIRECT STAFF YEARS	1.0	5.4	2.9	0.0	0.0
COST PROPOSAL ($000)					
Direct Salaries	40	244	139		
Material and Services (Excluding ADP)	1	14	6		
ADP Support	0	0	0		
Subcontracts	0	120	45		
Travel Expenses — Foreign	0	0	0		
Travel Expenses — Domestic	5	50	16		
Indirect Labor Costs — Direct Labor Overhead	40	243	138		
Indirect Labor Costs — Common Support	26	156	89		
Other (Specify) (carryover)	146	(24)	(122)		
Other (Specify)	0	0	0		
General and Administrative (16.0 %)	21	112	64		
TOTAL OPERATING COST	279	915	375	0	0
Capital Equipment	0	0	0	0	0
TOTAL PROJECT COST	279	915	375	0	0

FY 19 90 MONTHLY FORECAST EXPENSE

Total Forecast Expense $ 939K

October	November	December	January	February	March
44	59	59	104	51	27
April	**May**	**June**	**July**	**August**	**September**
64	35	18	49	214	215

APPROVAL AUTHORITY-SIGNATURE: Philip E. Mackin

Date: 8/20/90

NRC FORM 189 (Rev 04-83)

B-59

NRC FORM 189
(Rev. 04-83)

U.S. NUCLEAR REGULATORY COMMISSION

PROJECT AND BUDGET PROPOSAL FOR NRC WORK

FIN: B5699

Date: August 1990

Project Title

ISLOCA RESEARCH PROGRAM

DOE Proposing Organization: IDAHO OPERATIONS OFFICE (ID)

FORECAST MILESTONE CHART: Scheduled to Start - △——▲ - Completed (Shown in Quarter Year)

PROVIDE ESTIMATED DOLLAR COST FOR EACH TASK FOR EACH FISCAL YEAR

TASK		FY - 1989				FY - 1990				FY - 1991				FY - 1992				FY - 1993			
		1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
PWR Portion of Program	Schedule																				
	Cost																				
Task 1: Configuration Review	Schedule	△	▲																		
	Cost	53K																			
Task 2: Operational Data Assessment	Schedule	△	▲																		
	Cost	37K																			
Task 3: Engineering Analysis	Schedule	△	——	——	——	——	——	——	——	——	——	▲									
	Cost					110K				58K											
Task 4: Human Factors / Human Reliability Analysis	Schedule	△	——	——	——	——	——	——	——	——	——	▲									
	Cost					228K				54K											
Task 5: Develop Improved Methodology	Schedule	△	——	——	▲																
	Cost					66K															
Task 6: Trial Application	Schedule	△	——	——	——	——	——	——	——	——	——	▲									
	Cost					261K				72K											
Task 7: Develop ISLOCA Evaluation Procedures	Schedule									△	——	▲									
	Cost									68K											
Task 8: Program Management	Schedule	△	——	——	——	——	——	——	——	——	——	▲									
	Cost	43K				74K				30K											
Task 9: Davis-Besse Analysis Completion	Schedule					△	——	——	——	——	——	▲									
	Cost					150K				10K											
Task 10: ISLOCA External Events Analysis	Schedule							△	——	——	——	▲									
	Cost					50K				50K											

NRC FORM 189
(Rev. 04-83)

NRC FORM 189
(Rev. 04-83)

U.S. NUCLEAR REGULATORY COMMISSION

PROJECT AND BUDGET PROPOSAL FOR NRC WORK

FIN: B5699

Date: August 1990

Project Title

ISLOCA RESEARCH PROGRAM

DOE Proposing Organization: IDAHO OPERATIONS OFFICE (ID)

FORECAST MILESTONE CHART: Scheduled to Start - △——▲ - Completed (Shown in Quarter Year)
PROVIDE ESTIMATED DOLLAR COST FOR EACH TASK FOR EACH FISCAL YEAR

TASK		FY-1989 (1st, 2nd, 3rd, 4th)	FY-1990 (1st, 2nd, 3rd, 4th)	FY-1991 (1st, 2nd, 3rd, 4th)	FY-1992 (1st, 2nd, 3rd, 4th)	FY-1993 (1st, 2nd, 3rd, 4th)
Task 11: Inside Containment ISLOCA Analysis	Schedule			△——▲		
	Cost			35K		
Task 12: Cost-Benefit Analysis	Schedule			△——▲		
	Cost			120K		
BWR Portion of Program	Schedule					
	Cost			*TBD		
	Schedule					
	Cost					
	Schedule					
	Cost					
	Schedule					
	Cost					
	Schedule					
	Cost					
	Schedule					
	Cost					
	Schedule					
	Cost					
	Schedule					
	Cost					
SUBTOTAL		133K	939K	497K	0K	0K
CARRYOVER		146K	(24K)	(122K)	0K	0K
TOTAL ESTIMATED PROJECT COST		279K	915K	375K	0K	0K

NRC FORM 189
(Rev. 04-83)

* To Be Determined (TBD)

NRC FORM 189 (Rev 04-83) U.S. NUCLEAR REGULATORY COMMISSION

PROJECT AND BUDGET PROPOSAL FOR NRC WORK

FIN: B5699

Date: August 1990

Project Title

ISLOCA RESEARCH PROGRAM

DOE Proposing Organization: IDAHO OPERATIONS OFFICE (ID)

PROJECT DESCRIPTION: (Provide narrative descriptions of the required topics in numerical order. If an item is not applicable, list title and so state.)

(1) OBJECTIVE OF PROPOSED WORK

a. Background

Interfacing Systems Loss-Of-Coolant Accidents (ISLOCAs) have been identified in some Probabilistic Risk Assessments (PRAs) as major contributors to risk at Nuclear Power Plants (NPPs). They have the potential to lead to core melt and in some instances bypass of the containment which leads to early release of large quantities of fission products. Recent events at several operating plants have been identified as precursors to an ISLOCA which have raised concerns over the frequency of occurrence, potential initiators, and means of identifying and mitigating this potential accident. This program was initiated in response to the June 7, 1989 memorandum from Thomas E. Murley to Eric S. Beckjord, "Request for Office of Nuclear Regulatory Research (RES) Support for resolution of the ISLOCA Issue".

b. Objective

The objective of this program is to provide the Nuclear Regulatory Commission (NRC) with qualitative and quantitative information on the hardware, human factors, and accident consequence issues that are significant with respect to risk of an ISLOCA. This information is to be used in:

- Developing a PRA framework for evaluating the ISLOCA and identifying insights with respect to the risk contribution from both hardware and human error issues along with recommendations for risk reduction.
- Highlighting the effects of specific types of human errors and their root causes on ISLOCA risk, along with recommendations for risk reduction.
- Evaluating the fragility of low pressure systems when exposed to high pressure, high temperature Reactor Coolant System (RCS). This evaluation will include identification of likely failure locations and their probabilities of failure.
- Identify and describe potential ISLOCA sequences with respect to sequence timing, possible accident management strategies and effects of ISLOCAs on other equipment and systems.

Project Title

ISLOCA RESEARCH PROGRAM

DOE Proposing Organization IDAHO OPERATIONS OFFICE (ID)

PROJECT DESCRIPTION: (Provide narrative descriptions of the required topics in numerical order. If an item is not applicable, list title and so state.)

(1) OBJECTIVE OF PROPOSED WORK (Continued)

b. Objective (Continued)

- Estimating the consequences associated with postulated ISLOCA events, including estimates of source terms and off-site consequences. Again, important issues will be identified and recommendations will be made on possible consequence reduction actions.

Real and potential ISLOCA problems considered in detail in this program are limited to those that could lead to core damage and could bypass the containment. However, the work associated with this program will be performed with a view to possible future expansions to cover ISLOCA problems inside the containment. Preliminary information will be generated in the near term to support an Office of Nuclear Reactor Regulation (NRR) ISLOCA pilot audit program and later, more complete information will support an NRR evaluation of industry safety with respect to ISLOCA.

(2) SUMMARY OF PRIOR EFFORTS

FY-1989:

The following Tasks were performed during Fiscal Year (FY)-1989.

Task 1: Configuration Review

Existing Light Water Reactor (LWR) PRAs have focused on the residual heat removal systems and the check valves which separate these low pressure systems from the reactor primary coolant systems. However, the number and type of reactor operating events (problems) which have occurred in recent years suggest not only that the check valve reliability may be less than usually assumed (because of both mechanical and human problems), but that systems other than the residual heat removal system may be involved in an ISLOCA. It was, therefore, necessary to identify the plant specific characteristics of the systems and equipment which can be involved in an ISLOCA.

The purpose of this task was to identify and characterize (group) systems and equipment that may be involved in an ISLOCA. The information available from the NRC sponsored Inservice Testing (IST) program reviews of most of the United States (U.S.) NPPs was used. Much of the needed component information was obtained from the Piping and Instrumentation Diagrams (P&IDs) obtained during this program. Additional information was obtained from the plant Final Safety Analysis Reports (FSARs).

PROJECT DESCRIPTION: (Provide narrative descriptions of the required topics in numerical order. If an item is not applicable, list title and so state.)

(2) SUMMARY OF PRIOR EFFORTS (Continued)

FY-1989: (Continued)

Task 1: Configuration Review (Continued)

The described information was used to develop the following:

1. All plants were grouped according to Vendor and Architect Engineer (AE). These groupings were further divided into specific plant configurations. For example: two loop Westinghouse, three loop Westinghouse, etc. NUREG-1350 Vol. 1 was utilized to identify these groupings.

2. Six representative plants were selected from the vendor/AE groups and compared to other plants/vendors to verify that their interfacing systems were representative of as many plants as possible.

3. All Pressure Isolation Valves [(PIVs), i.e., those valves that are normally closed and separate the reactor coolant system from low pressure and/or low temperature piping] were identified for the six plants. The list of PIVs were then broken into lists of ISLOCA valves (those valves whose failure would result in a loss of reactor coolant outside containment) and Non-ISLOCA valves (those valves whose failure would result in a loss of reactor coolant inside containment). Those valves in the Non-ISLOCA group were not considered further in these studies.

4. Based on the plant P&IDs, one line drawings of the affected systems in the representative plants were produced showing interfacing system configurations. These drawings focused only on the relevant components, showing line sizes, class changes, relief valve location, flanges, and expansion joints. Valve sizes, types, operators, and other unique features were also included. The identified systems from the six plants, four systems per plant, were then utilized for detailed review. As much as possible, the plants were selected to correspond with the plants selected for the NRR pilot inspection program.

5. Additional technical information (i.e. not typically found on the plant P&IDs) concerning the representative systems was collected where sources could be found. This information included piping size, schedule, temperature, and pressure rating. For a limited number of systems the additional information included: pump ratings, heat exchanger ratings, relief valve inlet size, and setpoints. This information was added to the simplified drawings.

Project Title

ISLOCA RESEARCH PROGRAM

DOE Proposing Organization IDAHO OPERATIONS OFFICE (ID)

PROJECT DESCRIPTION: (Provide narrative descriptions of the required topics in numerical order. If an item is not applicable, list title and so state.)

(2) SUMMARY OF PRIOR EFFORTS (Continued)

FY-1989: (Continued)

Task 2: Operational Data Assessment

Potential precursors to an ISLOCA have occurred and these will need to be adequately represented in the PRA analysis. Events that must be modeled include both mechanical failures of equipment and human errors in addition to the hypothetical valve failure events currently considered in the ISLOCA analysis. To aid in ensuring that the PRA analysis is as complete as possible, a review of all the relevant historical experience, specifically Licensee Event Reports (LERs), was performed to identify the specific modes and mechanisms that have contributed to the occurrence of an ISLOCA. Both primary component (equipment) failures and human influenced failures were considered. The primary equipment failure modes considered included: back-leakage through a check valve as a function of time, and a check valve sticking open given there had been flow through it. The review of potential human error events included: a) errors of commission, b) maintenance errors (e.g., valves assembled incorrectly, interlocks miswired, and c) errors during testing (e.g., the recent Pilgrim event). The completed data set established from these reviews was evaluated to determine the frequency of events with failures in the identified systems.

Task 8: Program Management

Overall management of this Form 189 was provided, including the necessary administrative and management functions to coordinate the activities related to the ISLOCA Research Program. These included, but were not limited to, the following: (1) tracking of program costs, preparation of monthly reports and other documents that were required by the NRC Project Manager (PM) to implement the program; (2) technical management of the activities of all Idaho National Engineering Laboratory (INEL) program participants; (3) preparation of a Statement of Work (SOW) and initiation of a Form 189; and (4) travel to support program needs.

(3) WORK TO BE PERFORMED AND EXPECTED RESULTS

a. Work Required

FY-1990:

The work required for FY-1990 comprises two major efforts. First, the INEL personnel will obtain human factors and hardware configuration information from the pilot audits being performed by NRR.

Project Title

ISLOCA RESEARCH PROGRAM

DOE Proposing Organization IDAHO OPERATIONS OFFICE (ID)

PROJECT DESCRIPTION: (Provide narrative descriptions of the required topics in numerical order. If an item is not applicable, list title and so state.)

(3) WORK TO BE PERFORMED AND EXPECTED RESULTS (Continued)

a. Work Required (Continued)

FY-1990: (Continued)

Second, the INEL will perform an ISLOCA risk evaluation that will identify the significant contributors, in terms of hardware design and human factors issues, to the risk posed by the possibility of an ISLOCA. Preliminary information will be shared with the NRR pilot audit teams by review and comment on the audit guidance packages, delivered through the NRC PM. These potentially significant contributors will be developed through the analysis of six specific NPPs and subsequently utilized to compile a set of potential inspection guidelines that can be used to evaluate the risk for additional plants. An additional product will result from the plant specific evaluations in the form of a library of interfacing system models, which could be used to quantify the ISLOCA core melt frequency for the remaining plants.

Although the individual tasks are planned to be performed for a total of six plants, the first plant evaluated will be used as a test case. The experience gained during the review of this plant will be used to determine the extent of data collection required during plant visits for the remaining plants. In addition, upon completion of the analysis of the third plant, the results will be reviewed and a decision will be made as to whether analysis of the remainder of the plants will be performed. The information on costs, schedule, and deliverables are applicable to the analysis necessary for these three plants which include Davis-Besse, Catawba, and Waterford. For these three plants the following tasks will be performed unless otherwise noted.

Task 3: Engineering Analysis

This task will identify the most likely failure locations, median failure pressures (and associated uncertainties), and leak areas based on best-estimate realistic analysis. This information will be directly utilized in the PRA quantifications of pipe and component failure probabilities as a function of pressure. From Task 1 the component types (pipes, flanges, valves, pumps, heat exchangers, etc.) that could potentially fail will be selected for the representative systems of plants analyzed. Best estimate failure and leak models will be developed for each component type using a consistent methodology. A consistent methodology should be used to assure the calculated relative pressure retaining capacities of the components reflect their actual relative strengths. If different methods are

PROJECT DESCRIPTION: (Provide narrative descriptions of the required topics in numerical order. If an item is not applicable, list title and so state.)

(3) WORK TO BE PERFORMED AND EXPECTED RESULTS (Continued)

a. Work Required (Continued)

FY-1990: (Continued)

Task 3: Engineering Analysis (Continued)

used for the various components, the calculated relative pressure retaining capacities may reflect differences in the analytical techniques rather than the actual relative strengths.

The method expected to be used is limit analysis; however, previous relative analyses by Brookhaven National Laboratory (BNL), Industry Degraded Core Rulemaking Program (IDCORP) and others will be considered in selecting the method and the results from these analyses will be utilized where appropriate.

The limit analysis method assumes the material is elastic until the yield stress is reached and then becomes perfectly plastic so that the structural elements deform elastically until the limit stress is reached then deform without increased load carrying capacity so that additional load is supported by the members not yet at the yield stress. When the load is sufficient so that all members in the failure path are at the yield stress the structure is considered to have failed. The yield stress at temperature used in the analysis will be adjusted to account for strain hardening where appropriate, such as for stainless steel components. The technique also provides a method of selecting the probable failure path and is therefore useful in developing the expected failure loads for continuum structures such as pipes, flange rings, etc.

Analysis of failures of structures with large elastic follow-up, such as bending failures of short pipe sections connected to long unrestrained pipe sections, will include stresses from thermal expansion caused by the hot RCS coolant entering the cold low pressure system. In some cases the relative dimensions of the parts will influence the development of the models. This information is expected to be available from Task 1 and detailed component drawings. In developing the models potential undetected flaws such as cracks that have not propagated through the wall will be considered and incorporated where appropriate. The actual method of estimating flaw size will be developed as part of this work but is expected to be based on the minimum flaw size detectable by Inservice Inspections (ISI).

PROJECT DESCRIPTION: (Provide narrative descriptions of the required topics in numerical order. If an item is not applicable, list title and so state.)

(3) WORK TO BE PERFORMED AND EXPECTED RESULTS (Continued)

a. Work Required (Continued)

FY-1990: (Continued)

Task 3: Engineering Analysis (Continued)

Some of the models will not be in the form of classic limit load equations even though developed from limit load principles. For example, the model for a bolted flange is envisioned as a model with the bolts elongating while below their limit stress reducing the support for the gasket until the combination of reduced support and increased pressure causes the gasket to reach its limit stress and extrude opening a leak path. The limit load would be calculated as the pressure at which the gasket extrudes. The leak area would be estimated based on the resultant flow path through the space where the gasket was. The model would include the method for calculating the increased leak area as pressure increases beyond that which would initiate a leak. The models for all the components would be similar in that they would identify the failure pressure and would provide the method for estimating the resultant leak area.

The component information of dimension, wall thickness, bolt size, etc., from Task 1 and detailed component drawings along with material property information will be used to develop numerical values for the terms of the models. The effects of aging such as reduced wall thickness from corrosion, increased crack size from fatigue, changes in material properties from thermal embrittlement, etc., will be considered in developing the numerical values. The actual methods for estimating these effects will be developed as part of this task with input from the NRC aging research.

Best estimates of the pressures that would initiate the leak and the leak sizes at the maximum expected pressure for the system would be calculated for each component. The calculated results would be compared to known behavior where available from test results or from actual plant experiences and the models adjusted if necessary to assure realistic results.

Most pressurizations of the interfacing systems are expected to be relatively slow. They are expected to result from leaking valves or mispositioning of the valves. Leaks, of course, result in low flow rates which may, in most cases, be accommodated by the thermal relief valves. Mispositioning (opening) of valves will take several seconds and therefore will also result in a relatively slow pressure rise except perhaps for a partially filled system. Sudden failure of a valve, although unlikely, could result in a rapid pressure rise. Also for a system with an initial steam

(3) WORK TO BE PERFORMED AND EXPECTED RESULTS (Continued)

a. Work Required (Continued)

FY-1990: (Continued)

Task 3: Engineering Analysis (Continued)

pocket which would collapse when pressurized may result in a dynamic loading. Any gas products from release of dissolved gas would mitigate the rate of pressure rise. Appropriate dynamic load factors will be developed based on previous analysis of similar systems and will be used where appropriate.

A family of pressure dependent fragility curves representing the statistical distributions of the terms in the failure and leak models (part dimensions, material properties, etc.) will be determined from consideration of the manufacturing processes and material property test (these distributors are expected to be available from standard tests and reports). Estimates of the distribution of the effects of the aging mechanism (wall thinning from corrosion, crack growth from fatigue, change of material properties from thermal embrittlement, etc.) will be included as model uncertainties. The statistical distributions of the terms will be combined by the relationships defined by the model to provide a statistical distribution of the failure pressures and leak areas as a function of pressure. These distributions will serve as input to the thermal hydraulic analysis and will be combined with the flow through the thermal relief valves to provide the leak rates for the plant analysis. The combined result will provide the information necessary for the PRA analysis of Task 6.

Task 4: Human Factors/Human Reliability Analysis

The primary objective of Task 4 is to support development of evaluation guidelines, and identification of recommendations for remedial actions (e.g., training, procedures, management oversight).

Intermediate objectives of Task 4 are: (1) to develop a taxonomy of human errors (omission, commission) and their related causal (contributing) factors involved in ISLOCA; and (2) to support development and testing of a methodology for fully integrating human, hardware, engineering, and design considerations in the reliability and risk assessment process for ISLOCA.

Project Title

ISLOCA RESEARCH PROGRAM

DOE Proposing Organization IDAHO OPERATIONS OFFICE (ID)

PROJECT DESCRIPTION: (Provide narrative descriptions of the required topics in numerical order. If an item is not applicable, list title and so state.)

(3) WORK TO BE PERFORMED AND EXPECTED RESULTS (Continued)

a. Work Required (Continued)

FY-1990: (Continued)

Task 4: Human Factors/Human Reliability Analysis (Continued)

To accomplish primary and intermediate objectives of this task, three interrelated subtasks will be carried out. These are:

1. A retrospective analysis of existing information about ISLOCA events in the area of human behavior, specifically to determine factors which can cause and or contribute to the ISLOCA event.

2. Field data collection to support all other Task 4 activities, and other tasks of this Form 189.

3. Human Reliability Analysis (HRA), as required within the context of the ISLOCA quantification methodology (Task 6).

Note: Portions of this task involve a novel application of HRA to provide input to the PRA portion of this program. Due to it's unique nature, the HRA approach described herein will be evaluated upon completion of the Davis-Besse analysis (Davis-Besse being the first plant to be analyzed under Task 6). The evaluation criteria could include, but not be limited to: repeatability (objectivity), measurability, applicability, defensibility, utility, cost, and acceptability. Following evaluation, a decision will be made by RES program and line management on how to proceed with human error quantification on the remaining plant(s).

Subtask 4.1: Retrospective Analysis

The purpose of this subtask is to conduct a review of existing information and data concerning human involvement in ISLOCA, and develop a taxonomy of human errors of omission and commission and their measurable causal (i.e. contributing) factors for input to the methodology development (Task 6) and quantification (Task 7).

Primary information for conducting this subtask will be obtained: (1) from a search of the Sequence Coding and Search System, (2) from an initial review of ISLOCA involved LERs by Office for Analysis and Evaluation of Operational Data (AEOD) reported in the memorandum, "Requested List of LERs Possibly Relevant to Interfacing Systems ISLOCA Entry," from Thomasson (AEOD) to Diab (NRR), dated May 12, 1989, (3) from published PRAs, and (4) from Generic Issue (GI) 105 documentation prepared by BNL.

Project Title

ISLOCA RESEARCH PROGRAM

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PROJECT DESCRIPTION (Provide narrative descriptions of the required topics in numerical order. If an item is not applicable, list title and so state.)

(3) WORK TO BE PERFORMED AND EXPECTED RESULTS (Continued)

a. Work Required (Continued)

FY-1990: (Continued)

Task 4: Human Factors/Human Reliability Analysis (Continued)

Subtask 4.1: Retrospective Analysis (Continued)

These sources will be supplemented by plant-specific information and data collected under Subtask 4.2, and eventually by quantitative and qualitative results obtained from Subtask 4.3 below.

The taxonomy will be presented as a matrix of human actions and causal (contributing) factors which attempts to account for their interrelationships. This subtask will provide input for the analysis of the individual plants.

This subtask will be performed coincident with Tasks 1 through 7, and should involve exchanges of information with Subtasks 4.2 and 4.3 of Task 4.

The product of this subtask will be input to the methodology development and quantification (Tasks 5 and 6) and the taxonomy of human actions and causal factors and their interrelatedness. This will include a written explanation of the taxonomy.

Subtask 4.2: Field Data Collection

The purpose of this subtask is to gather plant-specific human factors information and data to support other subtasks under Task 4, and thereby, provide insights regarding human factors issues for developing ISLOCA evaluation guidelines (Task 7).

This subtask will involve visits to participating plants selected as part of Task 1. It is assumed that three plants will be visited in conjunction with the NRR audit program and three plants will be visited as part of the research related tasks.

It is assumed that data for the total program will be collected in two phases. The first phase will be a short plant visit where the list of potential human failures will be expanded using questionnaires and walk-through/talk-throughs (where possible) to identify other mechanisms of failure. The second phase will be a detailed data collection effort using the following process:

PROJECT DESCRIPTION: (Provide narrative descriptions of the required topics in numerical order. If an item is not applicable, list title and so state.)

(3) WORK TO BE PERFORMED AND EXPECTED RESULTS (Continued)

a. Work Required (Continued)

FY-1990: (Continued)

Task 4: Human Factors/Human Reliability Analysis (Continued)

Subtask 4.2: Field Data Collection (Continued)

1. Obtain a list of potential human failures from Task 6. This list will represent the integration of all the prior tasks including the prior short plant visit.

2. Produce a task analysis form incorporating the list of required information for input to the following HRA Models: THERP, HCR, NUCLARR, MAPPS, or SLIM-MAUD. A determination will be made based upon the failure being investigated as to which information categories will be collected at the plant visits.

3. A list of additional queries will be developed to tap other mechanisms of failure and other nontraditional performance shaping factors (i.e. safety culture). These queries will be made of the personnel involved in the ISLOCA tasks.

4. Collect and review relevant plant documentation (procedures, PRA, incidents reports etc.).

5. Conduct plant personnel interviews and walk-throughs to support task analysis.

6. Perform observations at the plant.

For the purposes of developing a concrete cost and schedule estimate for the data collection effort it is assumed that this analysis will encompass 20 human failures per plant (five failures for each of four systems). An example of a human failure is "failure to perform logic test properly such that the pressure boundary is violated". It is assumed that each failure will be considered in terms of one context. This effort includes one week of preparation and a maximum of two weeks data gathering at the plant for each of two analysts.

The products of this subtask will include:

PROJECT DESCRIPTION: (Provide narrative descriptions of the required topics in numerical order. If an item is not applicable, list title and so state.)

(3) WORK TO BE PERFORMED AND EXPECTED RESULTS (Continued)

a. Work Required (Continued)

FY-1990: (Continued)

Task 4: Human Factors/Human Reliability Analysis (Continued)

Subtask 4.2: Field Data Collection (Continued)

1. Lists of potential human failure mechanisms, completed task analysis forms, and results of interviews with operations personnel for input to the quantification task (Task 4.3).

2. Series of insights to guide revision of the emerging NRR evaluation guidelines and written input to the NRR evaluation reports.

This subtask should be performed coincident with and be guided by inputs from Task 1 (Configuration Review), Task 2 (Operational Data Assessment), Task 3 (Engineering Analysis), and Task 5 (Improved ISLOCA Quantification Methodology). Subtask products should feed into other subtasks under Task 4, Task 5, and Task 6.

Subtask 4.3: Human Reliability Analysis

The purpose of this subtask is to conduct HRA of pertinent human task actions initiating, otherwise contributing to, or important to recovery of the error. That is, this subtask will consider human task actions which are a part of the task sequences as identified in the Task 6, Trial Application. These results will be used, when incorporated into the risk assessment, to help improve guidelines for evaluating licensee policies, practices and procedures relevant to ISLOCAs.

Primary sources of information for completing this subtask will come from Subtask 4.1 and 4.2 of Task 4, and from Task 1 (Configuration Review), Task 2 (Operational Data Assessment), Task 3 (Engineering Analysis), Task 5 (Improved ISLOCA Methodology), and Task 6 (Trial Application of Methodology).

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PROJECT DESCRIPTION: (Provide narrative descriptions of the required topics in numerical order. If an item is not applicable, list title and so state.)

(3) WORK TO BE PERFORMED AND EXPECTED RESULTS (Continued)

a. Work Required (Continued)

FY-1990: (Continued)

Task 4: Human Factors/Human Reliability Analysis (Continued)

Subtask 4.3: Human Reliability Analysis (Continued)

It is anticipated that this subtask should involve human error quantification tools (such as the SLIM-MAUD, HCR, THERP, and MAPPS computer codes), and generic data sources [such as the Nuclear Computerized Library for Assessing Reactor Risk (NUCLARR) data management system], for the analyses. It will also involve the application of current documentation on the TALENT HRA/PRA integrating concept being prepared by Lawrence Livermore National Laboratory (LLNL), where appropriate, to insure the proper level of HRA and PRA integration.

There should be three products emerging from this subtask:

1. Quantitative estimates and qualitative insights estimating the contribution of human task actions to ISLOCA-centered reliability and risk (support Task 6).

2. A set of recommendations for evaluation procedures and remedial actions based on HRA quantitative and qualitative results (support Task 7).

3. Procedures for improving the integration of HRA into PRA for ISLOCA (support Tasks 5, 6 and 7).

Task 5: Develop Improved Methodology

The objective of this task is to develop a state-of-the-art PRA analysis method for quantifying the frequency of an ISLOCA and for performing sensitivity calculations aimed at identifying effective ISLOCA prevention, recovery, and mitigation actions.

Subtask 5.1: Develop Format for Analyzing Risk

Task 5 will begin with a detailed literature search (a preliminary search was performed during the preparation of this Form-189). Using input from the information obtained from the literature search, an initial format for

(3) WORK TO BE PERFORMED AND EXPECTED RESULTS (Continued)

a. Work Required (Continued)

FY-1990: (Continued)

Task 5: Develop Improved Methodology (Continued)

Subtask 5.1: Develop Format for Analyzing Risk (Continued)

analyzing ISLOCA risk will be developed. Subsequently, as information from the other tasks of this effort become available, it will be incorporated into the ISLOCA Analysis Method format. (Note: in order to be as responsive as possible to the timing requirements of NRR's inspections, Tasks 1, 2, 3, and 4 will progress in parallel. The final form of the methodology and inspection guidelines, which will incorporate all of the results and insights of the other tasks, will be available upon the completion of Task 6).

Subtask 5.2: Event Tree Development

In this initial effort, representative high/low pressure interfaces will be modeled using a component-level, multi-branched event tree to identify those combinations of human errors and equipment faults that result in a possible accident sequence. The event trees will be expanded to reflect the effects of mitigating system operation and to incorporate important time-dependent events, dependent events (i.e., common cause and vital area events), and mutually exclusive events (such as: preexisting conditions, fast/slow equipment failure mechanisms, test and maintenance errors, recovery actions, etc.) in the model. Each interface would require an event tree for each reactor operating mode that will be included in the project scope.

Subtask 5.3: Fault Tree Development

In this task, the individual event tree headings will be expanded to account for different fault mechanisms. These models will most likely be in the form of simple fault trees.

Therefore, Task 5 will function as a central collection point for the information generated in all other tasks. The important plant attributes, method format and insights list will be updated during the performance of Task 6 with a final update in Task 7. The product of this task will reflect the integration of information generated in Tasks 1 through 7 and

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(3) WORK TO BE PERFORMED AND EXPECTED RESULTS (Continued)

a. Work Required (Continued)

FY-1990: (Continued)

Task 5: Develop Improved Methodology (Continued)

Subtask 5.3: Fault Tree Development (Continued)

will include a number of generic ISLOCA models and a list of plant specific informational requirements (both hardware and human factors related) for evaluating ISLOCA risk.

Task 6: Trial Application

The objective of this task is to apply the methodology developed in the previous task in full scale applications on the plants chosen in Task 1. An evaluation of the HRA methodology will be conducted following completion of the first plant and a method selected for the remaining plants. Following completion of the evaluation of the third plant, a review will be performed and a decision will be made as to whether analysis of additional plants will be performed. Execution of this task will require detailed HRA using plant specific procedures, plant specific thermal hydraulic analysis, and plant specific component capacity analysis developed in the previous tasks.

Subtask 6.1: Thermal-Hydraulic Evaluation

It is assumed that Thermal/Hydraulic (T/H) calculations are available or can be extrapolated from existing calculations and that only simple or minimal additional calculations will be required in this project. Specifically, given the distribution of possible break sizes produced in Task 3, simple T/H calculations will be performed to estimate the leak rates. These leak rates will then be compared to calculations performed for past analyses to estimate the time to core uncovering, core damage and time available for recovery actions.

Subtask 6.2: Consequence Analysis

As a part of this task, the plant specific consequences portion of the risk calculations, will be performed using either MACCS or CRAC2 (preferably MACCS) and a plant specific input deck. The basic approach will be to develop a single site information deck, estimate plant specific

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(3) WORK TO BE PERFORMED AND EXPECTED RESULTS (Continued)

a. Work Required (Continued)

FY-1990: (Continued)

Task 6: Trial Application (Continued)

Subtask 6.2: Consequence Analysis (Continued)

source term from existing literature, and run the MACCS Code. The required source term inputs for the pertinent ISLOCA sequences will be estimated based on existing literature. This is a reasonable approximation since by definition, these releases bypass containment and therefore are unaffected by variations in containment system designs.

Subtask 6.3: ISLOCA Quantification

As the models are being developed for each plant, particular attention will be given to the identification of opportunities for errors of commission. Preliminary model development and identification of such opportunities will be done prior to plant visits to help focus activities under Subtask 4.2, Field Data Collection.

This task will calculate ISLOCA sequence frequencies for the representative sample of plants. Also, as part of this task, the plant specific analyses will be extended in an evaluation of various mitigative strategies. This will be done through the mechanism of sensitivity calculations on the plant specific models. Any promising mitigative strategies will be incorporated into the final procedures document.

Task 8: Program Management

Overall management of this Form 189 will be provided, including the necessary administrative and management functions to coordinate the activities related to the ISLOCA Research Program. These include, but are not limited to, the following: (1) tracking of program costs, preparation of monthly reports and other documents that are required by the NRC PM to implement the program; (2) technical management of the activities of all INEL program participants; (3) review of all materials prepared for the program; (4) travel to support program needs; and (5) participation in and organization of technical seminars and services as requested by the NRC PM.

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(3) WORK TO BE PERFORMED AND EXPECTED RESULTS (Continued)

a. Work Required (Continued)

FY-1990: (Continued)

Task 9: Davis-Besse Analysis Completion

The following subtasks are necessary to address areas of uncertainty existing in Davis-Besse results to date and to finalize the Davis-Besse ISLOCA report. The Catawba and Waterford analyses are to be scheduled to reap maximum benefits from what is learned in Task 9 as guidance in their analysis.

Subtask 9.1: Sequence Timing

Estimate the timing of the dominant sequences based upon extrapolation from existing calculations as opposed to performing additional RELAP5 analyses.

Subtask 9.2: Sequence Mitigation

Based upon the results of Subtask 9.1, reevaluate likelihoods of sequence detection and mitigation.

Subtask 9.3: Evaluation of Valve Capabilities

Evaluate capabilities of valves to operate against differential pressures significantly higher than those for which they were designed. In particular, identify valve design features affecting operability during ISLOCA situations. Determine the effects that results of this evaluation have on the Davis-Besse quantification.

Subtask 9.4: Sensitivity Evaluation

For comparison purposes, determine Davis-Besse ISLOCA sequence sensitivity to typical PRA values.

Subtask 9.5: Evaluation of Decontamination Factors

Determine decontamination factors for the Davis-Besse ISLOCA sequences. Evaluate the effects of such factors on risk estimates.

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(3) WORK TO BE PERFORMED AND EXPECTED RESULTS (Continued)

a. Work Required (Continued)

FY-1990: (Continued)

Task 9: Davis-Besse Analysis Completion (Continued)

Subtask 9.6: HRA Analysis Review

Engage a human reliability expert as a consultant on the HRA approach on Davis-Besse. The consultant should critique the approach with respect to: repeatability (objectivity), measurability, traceability, applicability (e.g., to errors of commission), defensibility, utility, cost (compared to alternative equally accurate approaches), and acceptability.

Subtask 9.7: Documentation Revision

Incorporate the results of Subtasks 9.1 through 9.5 into the Davis-Besse report. Prepare a presentation on how the report differs from the original draft. The presentation is to include a discussion of reviewers' comments to date and how each comment has affected the revised report. Group comments by similarity to the extent possible. Anticipate an Advisory Committee on Reactor Safeguards (ACRS) review of the revised report prior to finalization.

Subtask 9.8: IMPELL NUREG

Provide to the NRC PM a camera-ready copy of the IMPELL Davis-Besse engineering analyses for publication as a NUREG/CR report.

Task 10: ISLOCA External Events Analysis

Perform a simplified External Events Analysis (EEA) on Davis-Besse or Catawba similar to that performed for NUREG-1150 ISLOCA sequences under the leadership of Sandia National Laboratories (SNL). Obtain pertinent references from the SNL NUREG-1150 EEA PM. In conducting the EEA, utilize as much existing information as possible including documents produced under the Seismic Safety Margins Research Program (SSMRP) (also contact SNL).

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SLOCA RESEARCH PROGRAM

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(3) WORK TO BE PERFORMED AND EXPECTED RESULTS (Continued)

a. Work Required (Continued)

FY-1991:

Tasks 3, 4, 6, 8, 9, and 10 for PWRs will be completed in FY-1991 as the analyses of the Catawba and Waterford Plants (Plants 2 and 3) are completed. The following additional tasks relating to the PWR analyses will be initiated and completed in FY-1991.

Task 7: Develop ISLOCA Evaluation Procedures

The integrated list of critical plant characteristics and operational issues which dominates the risk of ISLOCA will be updated a final time. These critical plant design characteristics and operational issues, along with the information and insights from the pilot audits, will then be used to produce a final ISLOCA Evaluation Procedures Document guidelines that were originally drafted in Task 5 and updated in Task 6.

This document will identify such things as combinations of poor design characteristics, surveillance procedures, control room indication, operating procedures, emergency procedures, and feasibility of potential recovery actions, which significantly influence ISLOCA frequency and risk. Included will be a checklist of practices or other items useful in maintaining low risk from ISLOCA.

Task 11: Inside Containment ISLOCA Analysis

For one Pressurized-Water Reactor (PWR) (Davis-Besse or Catawba), review and screen by pipe size all systems inside containment with ISLOCA potential. Of those not screened out, failure scenarios will be postulated and quantified. Given an overpressure failure of the interfacing system, probabilities and likely locations will be determined and the likelihood of water draining into the containment sump will be assessed. Scenarios that include water reaching the containment sump and are within the plant design basis will not be examined further. Specifically, multiple independent failures of the Emergency Core Cooling System (ECCS) will not be included. However, inside containment ISLOCA events which are coupled in a common-cause or cascade manner to ECCS failures will be analyzed.

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(3) WORK TO BE PERFORMED AND EXPECTED RESULTS (Continued)

a. Work Required (Continued)

FY-1991: (Continued)

Task 12: Cost-Benefit Analysis

In support of regulatory analysis required for resolution of GI-105, a study will be conducted to identify and to assess the cost of ISLOCA risk reduction alternatives. Work on this task will be in accord with the contents of NUREG/CR-0058, "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission," Rev. 1, 1984, and NUREG/CR-3568, "A Handbook for Value-Impact Assessment," PNL, December 1983. Other useful documents might be NUREG/CR-3971 and NUREG/CR-4568. Work under this task will proceed on one PWR only until the overall Boiling-Water Reactor (BWR) portion of the program is formulated. This work will consist of the following subtasks:

Subtask 12.1: Identify ISLOCA Changes

Identify potential changes (hardware and nonhardware) from ISLOCA research. These changes will include consideration of, but not be limited to, the five items listed on page 17 of the Task Action Plan for GI 105, "Interfacing Systems LOCA in Light Water Reactors," Rev. 4, February 1990.

Subtask 12.2: Collection of Data on Costs

Collect data and other information as required to assess the costs associated with the changes identified in Subtask 12.1. Included in this subtask are visits to one each PWR and BWR to realistically assess all aspects affecting costs of changes.

Subtask 12.3: Cost-Benefit Calculations

Calculate costs and benefits from information emanating from Subtasks 12.1 and 12.2. Include sensitivity analyses. Include as benefits, costs, and savings from averted precursors (exposures and cleanup).

Subtask 12.4: Letter Report

Document the results of Task 12 in a letter report.

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(3) WORK TO BE PERFORMED AND EXPECTED RESULTS (Continued)

a. Work Required (Continued)

FY-1991: (Continued)

Finalization of the BWR tasks to be performed are also expected to be completed by the end of the first quarter FY-1991, contingent on identification of scope by the middle of the fourth quarter of FY-1990. Final documents will be produced on the PWR analyses and the ISLOCA Evaluation Procedures.

b. Meetings and Travel

FY-1990:

Upon approval of the NRC PM, one initial visit will be made for each of the plants with two or three people participating. One data collection visit will also be made for each of the plants with a total of three people participating on each visit. The locations to be visited will depend on the plants selected which will be a joint decision of NRR and project personnel.

Upon approval of the NRC PM, one trip for three persons to Rockville, Maryland (MD) to discuss the results of the initial plant visit and two trips for one person to Rockville, MD to coordinate the program activities will be required at a later time.

Upon approval of the NRC PM, three trips will be made to Mission Viejo, California (CA) to monitor and discuss results from the subcontract with IMPELL Corporation for Task 3.

One visit to a PWR by two people is required to obtain hardware and procedure changes cost and precursor cleanup cost information.

FY-1991:

One visit to a BWR by two people is required to obtain hardware and procedure changes cost and precursor cleanup cost information. Six trips will be required for program review and program management discussions. Travel to Water Reactor Safety Information Meeting (WRSIM) is authorized for one IMPELL Corporation employee for presentation of a paper on the engineering analysis work done on Davis-Besse.

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(3) WORK TO BE PERFORMED AND EXPECTED RESULTS (Continued)

c. NRC Furnished Materials

A list of LERs possibly relevant to ISLOCA (Neil Thomasson memorandum to Sammy Diab, May 12, 1989) has been provided.

Draft NRR planning material on overall ISLOCA program and ISLOCA pilot inspection programs have been provided.

For each plant undergoing detailed analysis, the following information will be required:

- Updated FSAR.
- Plant Technical Specifications (TSs).
- Plant elevation and layout drawings for interfacing systems.
- Sample PIV maintenance procedures.
- Test and surveillance procedures for PIVs.
- Emergency operation procedures for an ISLOCA event.
- Interfacing system descriptions (e.g., from training manuals).

The NRC will provide for access, by contractor personnel, to the plants selected for the detailed analyses. The contractor will be identifying the plants to be analyzed by September 29, 1989 to ensure no programmatic delay.

NRR's ISLOCA Team Audit Inspection plans as they become available.

(4) DESCRIPTION OF ANY FOLLOW-ON EFFORTS

FY-1992, FY-1993, and Beyond:

No follow-on efforts are anticipated beyond FY-1991.

(5) RELATIONSHIP TO OTHER PROJECTS

This work is closely related to that performed by BNL on GI 105 [Funding Identification Number (FIN): A3829] and the Argonne National Laboratory (ANL) technical assistance being provided to NRR under FIN: L1231. This work will be coordinated with Task 1 of FIN: A6854, as modified 7/17/39.

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(6) REPORTING REQUIREMENTS AND SCHEDULE

a. Technical Reports

FY-1990:

A letter report documenting the results of the review of the initial or pilot plant will be completed in February 1990.

A draft NUREG/CR report on Davis-Besse will be provided to the NRC by the end of September 1990.

A draft NUREG of the IMPELL Davis-Besse report will be provided to the NRC by the end of September 1990.

A paper describing the engineering analysis work on Davis-Besse will be prepared by IMPELL Corporation for presentation at the WRSIM (cf. Subtask 9.8).

FY-1991:

Draft NUREG/CR reports on Catawba and Waterford will be completed by the end of November and by mid March, respectively. The Waterford draft NUREG will include the developed ISLOCA Evaluation Procedures. Letter reports will be provided on the EEA, the cost benefit analysis, and the results of the ISLOCA inside containment analysis. Documentation of the BWR portion of the program is anticipated in FY-1991.

b. Monthly Letter Status Report

EG&G Idaho, Inc. will prepare a monthly business letter status report in accordance with the current NRC Manual Chapter 1102.

c. Publication of Research Results

The INEL and the NRC PM will discuss whether the information resulting from this research warrants publication in refereed scientific and engineering journals. Such publication will focus on advances in science and technology, and minimize conclusions and/or recommendations that may have regulatory implications. The NRC PM will make the final determination whether the publication of research results may be pursued as an allowable cost under this project and will notify the laboratory of the decision. If the decision is made to publish, the laboratory will actively pursue the publication in accordance with the provisions of NRC Manual Chapter 3206. The notification will be provided to the laboratory in

PROJECT DESCRIPTION: (Provide narrative descriptions of the required topics in numerical order. If an item is not applicable, list title and so state.)

(6) REPORTING REQUIREMENTS AND SCHEDULE (Continued)

c. Publication of Research Results (Continued)

writing and the laboratory will not incur costs associated with such publication until after receipt by the laboratory of notification that publication should be pursued. The laboratory will coordinate all such publications with, and transmit a copy of the proposed article to, the NRC PM prior to publication.

(7) SUBCONTRACTOR INFORMATION

A subcontract has been given, through competitive bid process, to IMPELL Corporation to perform the engineering analysis described in Task 3. The cost of this effort is $120K for IMPELL and $11K for material handling charges. The subcontract will not result in a real or apparent conflict of interest situation. If the NRC program office requires additional specific subcontractor information or limitations, those requirements shall be stated on the NRC Form 173.

(8) LIST NEW CAPITAL EQUIPMENT REQUIRED

FY-1990/FY-1991:

Not applicable.

(9) DESCRIBE SPECIAL FACILITIES REQUIRED

Not applicable.

(10) CONFLICT OF INTEREST INFORMATION

All current and previous work conducted by EC&G Idaho, Inc., and where applicable, subcontractor personnel assigned to this project, have been reviewed and no known real or apparent conflict of interest exists.

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DOE Proposing Organization IDAHO OPERATIONS OFFICE (ID)

PROJECT DESCRIPTION. (Provide narrative descriptions of the required topics in numerical order. If an item is not applicable, list title and so state.)

(11) EXPECTED CLASSIFICATION OR SENSITIVITY

If proprietary or company confidential data is provided to the INEL by the government in connection with this contract, the INEL agrees to safeguard such information in accordance with 10 CFR 2.790 and agrees not to release such information to any person not directly involved in the performance of work under this contract unless such release is authorized in writing by the Contracting Officer. Upon completion or termination of this contract, all copies of any such proprietary or company confidential data will be returned.

(12) OTHER IDENTIFIED CATEGORIES

None.

Summarize
Status
Recommendations for future

Prep w. Gary S. 4/5 am

Sept. 16 - 21 Gary → IDAHO

Oct.

Nov. EARLY ~~Gary~~ IDAHO [illegible]
ACRS [illegible] ✓

Dec. G.L. to new DRAFT

Jan. ACRS subcomm. ✓

Feb.

Mar. RES [illegible] analysis for Dec.
ACRS Full ✓