V. Anderson
J. Burns
R. Blond

OAK RIDGE NATIONAL LABORATORY
OPERATED BY
UNION CARBIDE CORPORATION
NUCLEAR DIVISION

POST OFFICE BOX X
OAK RIDGE, TENNESSEE 37830

February 17, 1983

Dr. E. G. Arndt
Mechanical/Structural Engineering Branch
Division of Engineering Technology
Office of Nuclear Regulatory Research
M.S. 5650 N.L.
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Dr. Arndt:

Enclosed is our initial version of the "Containment Leak Rate Sensitivity Study" 189. An official version is wending its way through channels. I apologize for the dealy in getting this to you. Organizing the effort took longer than we had anticipated.

Sincerely,

Thomas J. Burns

Thomas J. Burns

TJB:nc

Encl

2/24/83
Called T. J. Burns ; raised schedule + content objections

FOIA-85-143

63

NRC FORM 189
Page 1 of 3
(3-81)

U.S. NUCLEAR REGULATORY COMMISSION

PROJECT AND BUDGET PROPOSAL FOR NRC WORK

DATE OF PROPOSAL: 02-10-83 0

☒ NEW
☐ REVISION NO.

PROJECT TITLE:
Containment Leak Rate Sensitivity Study Preliminary Draft

FIN NUMBER: B0489

NRC OFFICE: Office of Nuclear Regulatory Research
Division of Engineering Technology

NRC B&R NUMBER: 60 19 01 01

DOE CONTRACTOR: UNION CARBIDE CORPORATION

SITE: OAK RIDGE NATIONAL LABORATORY
OAK RIDGE, TENNESSEE 37830

PATENT STATUS

This proposal is being transmitted in advance of patent review for evaluation purposes only. No further dissemination or publication shall be made without prior approval of the Assistant General Counsel for Patents, DOE.

CONTRACTOR/ORNL ACT. 418955139 DIV. 12

DOE B&R NUMBER: 40 10 01 6

COGNIZANT PERSONNEL	ORGANIZATION	FTS PHONE NUMBER	PERIOD OF PERFORMANC
NRC PROJECT MANAGER: E. G. Arndt	DET/RES	443-5997	STARTING DATE: 02-01-83
OTHER NRC TECHNICAL STAFF			COMPLETION DATE: 09-30-83
DOE PROJECT MANAGER: W. R. Bibb	DOE/ORO	626-0742	
CONTRACTOR/ORNL			
PROG. DIR.: A. L. Lotts	CMO	624-0422	
PROG. MGR.: G. F. Flanagan	EPD	624-6155	
PROJ. MGR.: T. J. Burns	EPD	624-6101	
PRIN. INVESTIGATOR(S): T. J. Burns	EPD	624-6101	

STAFF YEARS OF EFFORT (Round to nearest tenth of a year)	FY 19 83	FY 19	FY 19	FY 19	FY 19
Direct Scientific/Technical	0				
Other Direct	0				
TOTAL DIRECT STAFF YEARS					

COST PROPOSAL (OBLIGATIONS)	($ In Thousands)				
Direct Salaries (Cost Centers)	0				
Material and Services (Excluding ADP)	4				
ADP Support	34				
Subcontracts and Consultants	0				
Travel Expenses — Foreign	0				
Travel Expenses — Domestic	0				
Indirect Labor Costs (Cost Centers)					
Other (Specify) GSO Change	0				
General and Administrative (G&A/GPS)	12				
TOTAL OPERATING COST (Obligations)	50				
CAPITAL EQUIPMENT FIN CHARGED:	0				
TOTAL PROJECT COST (Obligations)	50				

FY 83	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH
MONTHLY FORECAST EXPENSE					6	6
	APRIL 6	MAY 7	JUNE 6	JULY 6	AUGUST 6	SEPTEMBER 7

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(3 9-81)

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U.S. NUCLEAR REGULATORY COMMISSION

PROJECT AND BUDGET PROPOSAL FOR NRC WORK

FIN NUMBER: B0489

DATE: 02-10-83

PROJECT TITLE:

Containment Leak Rate Sensitivity Study

DOE PROPOSING ORGANIZATION:

UNION CARBIDE CORPORATION
OAK RIDGE NATIONAL LABORATORY
OAK RIDGE, TENNESSEE 37830

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

PROVIDE ESTIMATED DOLLAR COST FOR EACH TASK FOR EACH FISCAL YEAR

TASK		FY 1983 1st	2nd	3rd	4th	FY 19 1st	2nd	3rd	4th	FY 19 1st	2nd	3rd	4th	FY 19 1st	2nd	3rd	4th	FY 19 1st	2nd	3rd	4th
	SCHEDULE	△			▲																
	COST	24																			
	SCHEDULE	△			▲																
	COST	22																			
	SCHEDULE	△			▲																
	COST	4																			
	SCHEDULE																				
	COST																				
	SCHEDULE																				
	COST																				
TOTAL ESTIMATED PROJECT COST		50																			

PROJECT DESCRIPTION: (Provide narrative descriptions on NRC Form 189 page 3 of 3 for the following topics in the order listed. Check applicable block. If an item is not applicable, so state.)

- [X] 1. OBJECTIVE OR PROPOSED WORK
- [X] 2. SUMMARY OF PRIOR EFFORTS
- [X] 3. WORK TO BE PERFORMED AND EXPECTED RESULTS
- [X] 4. DESCRIPTION OF ANY FOLLOW-ON EFFORTS
- [X] 5. RELATIONSHIP TO OTHER PROJECTS
- [X] 6. REPORTING SCHEDULE
- [X] 7. SUBCONTRACTOR INFORMATION
- [X] 8. LIST NEW CAPITAL EQUIPMENT REQUIRED
- [X] 9. DESCRIBE SPECIAL FACILITIES REQUIRED
- [X] 10. CONFLICT OF INTEREST INFORMATION
- [X] 11. OBLIGATION ESTIMATES
- [ ] 12. OTHER *(SPECIFY)*:

APPROVAL AUTHORITY-SIGNATURE

DATE

UCN-14505A
(3 9-81)

U.S. NUCLEAR REGULATORY COMMISSION

PROJECT AND BUDGET PROPOSAL FOR NRC WORK

FIN NUMBER B0489

PROJECT TITLE:

Containment Leak Rate Sensitivity Study

ITEM NO.

1. OBJECTIVE OF PROPOSED WORK:

The overall objective of Tasks 1-3 is to determine the importance of the containment leak rate relative to the consequences of specified accident scenarios. In particular, the objective of Task 1 is to determine the sensitivity of the risk of the specified accident scenarios to changes in the containment leak rate. Task 2 addresses the prediction of the containment leak rate between leak tests, and Task 3 is designed to investigate the potential for alternate leak rate criteria as possibly safety-enhancing and/or more cost effective. This work supports NRC's continuing re-assessment of containment integrity criteria.

2. SUMMARY OF PRIOR EFFORTS:

Not applicable.

3. WORK TO BE PERFORMED AND EXPECTED RESULTS:

Summary

Tasks for FY-1983 concentrate on three areas of work. First a sensitivity study to determine the relative change in risk to the general public associated with differences in the containment leak rate under postulated accident conditions. Second, an initial attempt at developing (and verifying) an appropriate methodology for predicting the actual post-test containment leak rate. Third, a preliminary assessment of possible alternate leak rate criteria which might be capable of providing similar containment integrity information at reduced cost or better information at similar costs.

FY-1983

Task 1 - Containment Leak Rate Sensitivity Analysis. The relative change in the risk to the general public for specified accident scenarios as a function of the containment leak rate will be estimated. In particular, the standard reactor source terms given in NUREG-0773 will be utilized, and the offsite risk in terms of dose will be estimated as a function of the postulated containment leak rate. Scoping calculations will be performed to verify the completeness of the specified source terms for very short time periods/high containment leak rates. The resulting analysis will provide a relative measure of the change in the risk as a function of the leak rate.

Task 2 - Methods Development. The primary concern regarding the containment leak rate is the actual leakage rate which is present during the hypothetical accident scenario. An initial approach towards estimating the changes in leak rate versus the time between tests will be developed. This will entail a preliminary study to determine whether a correlation exists between actual leak rates (as indicated by LERs, as found tests, etc.) and leakage test values and/or leakage test intervals. This data will be employed to test the workability/suitability of the leak rate prediction methodology.

PROJECT TITLE:

Containment Leak Rate Sensitivity Study

ITEM NO.

Task 3 - Leak Rate Criteria Assessment. The goal of Appendix J, 10 CFR 50 is to provide assurance that containment integrity is within acceptable bounds. As part of this study, alternate criteria and test intervals will be examined to assess the possible changes in risk relative to the Appendix J specified criteria. An example of this assessment would be the change in risk inherent in the replacement of the Appendix J leak rate tests with a simple gross containment integrity check.

Beyond FY-1983

Not Applicable.

4. DESCRIPTION OF FOLLOW-ON EFFORTS:

Not Applicable.

5. RELATIONSHIP TO OTHER PROJECTS:

This project utilizes data generated under two NRC programs; (1) Reactor Accident Source Terms: Design and siting perspectives and (2) data collected under ORNL's Containment Leak Rate Testing Program.

6. REPORTING SCHEDULE:

Expected Future Reports

1. Report describing the results of the containment leak rate sensitivity analysis (July 1983).

2. Report describing the proposed leak rate prediction methodology (September 1983).

7. SUBCONTRACTOR INFORMATION:

No subcontracting is anticipated.

8. LIST NEW CAPITAL EQUIPMENT REQUIRED:

Not applicable.

9. DESCRIBE SPECIAL FACILITIES REQUIRED:

Not applicable.

10. CONFLICT OF INTEREST INFORMATION:

There are no known relationships between this organization or its employees with industries regulated by the NRC and suppliers thereof that might give rise to an apparent or actual conflict of interest regarding the work described herein.

U.S. NUCLEAR REGULATORY COMMISSION

PROJECT AND BUDGET PROPOSAL FOR NRC WORK

FIN NUMBER

B0489

PROJECT TITLE:

Containment Leak Rate Sensitivity Study

ITEM NO.

11. OBLIGATION ESTIMATES:	FY-1983	FY-1984	FY-1985
(1) Cost Est	50	0	0
(2) Goods & Services on order - GSO est	0	0	0
Less Uncosted Balance	0	0	0
GSO Change	0	0	0
Total Obligation Change	50	0	0

2/16/81

To Do List

I Trip Items

A - Dave Anton & John Campbell - DNA

(1) Verify DNA Cyber/LANL HASP hookup

★ (2) Send Dave Anton 3 copies latest H+N results with a letter + comments; mention Bob Young

★ (3) Send copy VCS proposed to Scott, Marcum

(4) Check w/ John Campbell re 3-D H+N Study

B - Wayne Lauder - H+N Study

(1) He will respond to Don's writeup

(2) Write up (or re-type) list of data sources

(3) Wayne would like list cut at uncertainties as now exist (not mathematical applic) to concentrate on resulting uncertainty in free-in-air dose - for H+N & Neutron Study

~~Jill Johnson~~ C - AFRRI

(1) Shelly Levin worried about ATR vs "real" spectra

(for chair vs wheel) (2) Bob Young needs depth-dose calc of total source

? SAI had 3-D calcs ↑ (3) Levin wants doses re-normalized to source

Question - Why wheel monkeys live longer?

(4) Send John Campbell copy of report for Bob Young

D - DOE (Hamming)

(1) See when can change return trip to 26th

(2) Send letter requesting questions + comments on JTTO data received from distributees - then to Pres

HWE include in (3) Verify & heating meas vs calc in FFTF

(4) Look at & heating data to determine if need other

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(3-81)

U.S. NUCLEAR REGULATORY COMMISSION

PROJECT AND BUDGET PROPOSAL FOR NRC WORK

DATE OF PROPOSAL: 02-10-83

XX NEW
☐ REVISION NO.

PROJECT TITLE:
Containment Leak Rate Sensitivity Study (DRAFT)

FIN NUMBER: B0489-B

NRC OFFICE: Office of Nuclear Regulatory Research
Division of Engineering Technology

NRC B&R NUMBER: 60 19 01 01

DOE CONTRACTOR: UNION CARBIDE CORPORATION

SITE: OAK RIDGE NATIONAL LABORATORY
OAK RIDGE, TENNESSEE 37830

PATENT STATUS

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CONTRACTOR/ORNL ACT. 418955139
DIV. 12

DOE B&R NUMBER: 40 10 01 6

COGNIZANT PERSONNEL	ORGANIZATION	FTS PHONE NUMBER
NRC PROJECT MANAGER: E. G. Arndt	DET/RES	443-5997
OTHER NRC TECHNICAL STAFF		
DOE PROJECT MANAGER: W. R. Bibb	DOE/ORO	626-0742
CONTRACTOR/ORNL		
PROG. DIR.: A. L. Lotts	CMO	624-0422
PROG. MGR.: F. J. Homan	M&C	624-5169
PROJ. MGR.: T. J. Burns	EPD	624-6101
PRIN. INVESTIGATOR(S): T. J. Burns	EPD	624-6101

PERIOD OF PERFORMANCE
STARTING DATE: 02-01-83
COMPLETION DATE: 09-30-83

STAFF YEARS OF EFFORT (Round to nearest tenth of a year)	FY 19 83	FY 19	FY 19	FY 19	FY 19
Direct Scientific/Technical	0				
Other Direct	0				
TOTAL DIRECT STAFF YEARS					

COST PROPOSAL (OBLIGATIONS)	($ In Thousands)				
Direct Salaries (Cost Centers)	0				
Material and Services (Excluding ADP)	4				
ADP Support	34				
Subcontracts and Consultants	0				
Travel Expenses — Foreign	0				
Travel Expenses — Domestic	0				
Indirect Labor Costs (Cost Centers)					
Other (Specify) GSO Change	0				
General and Administrative (G&A/GPS)	12				
TOTAL OPERATING COST (Obligations)	50				
CAPITAL EQUIPMENT FIN CHARGED:	0				
TOTAL PROJECT COST (Obligations)	50				

FY 83 MONTHLY FORECAST EXPENSE	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH
					6	6
	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER
	6	7	6	6	6	7

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Page ____

FIN Page 1 of 5

rec'd + reviewed 3/23/83 eft

(12)

NRC FORM 189
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(3-81)

U.S. NUCLEAR REGULATORY COMMISSION

PROJECT AND BUDGET PROPOSAL FOR NRC WORK

FIN NUMBER: B0489-B

DATE: 02-10-83

PROJECT TITLE:

Containment Leak Rate Sensitivity Study

DOE PROPOSING ORGANIZATION:

UNION CARBIDE CORPORATION
OAK RIDGE NATIONAL LABORATORY
OAK RIDGE, TENNESSEE 37830

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

PROVIDE ESTIMATED DOLLAR COST FOR EACH TASK FOR EACH FISCAL YEAR

TASK		FY 1983 1st	2nd	3rd	4th	FY 19 1st	2nd	3rd	4th	FY 19 1st	2nd	3rd	4th	FY 19 1st	2nd	3rd	4th	FY 19 1st	2nd	3rd	4th
1. Sensitivity Analysis	SCHEDULE	△			▲																
	COST	22																			
2. Methods Development	SCHEDULE	△			▲																
	COST	22																			
3. Leak Rate Criteria	SCHEDULE	△			▲																
	COST	6																			
	SCHEDULE																				
	COST																				
	SCHEDULE																				
	COST																				
TOTAL ESTIMATED PROJECT COST		50																			

PROJECT DESCRIPTION: (Provide narrative descriptions on NRC Form 189 page 3 of 3 for the following topics in the order listed. Check applicable block. If an item is not applicable, so state.)

- [X] 1. OBJECTIVE OR PROPOSED WORK
- [X] 2. SUMMARY OF PRIOR EFFORTS
- [X] 3. WORK TO BE PERFORMED AND EXPECTED RESULTS
- [X] 4. DESCRIPTION OF ANY FOLLOW-ON EFFORTS
- [X] 5. RELATIONSHIP TO OTHER PROJECTS
- [X] 6. REPORTING SCHEDULE
- [X] 7. SUBCONTRACTOR INFORMATION
- [X] 8. LIST NEW CAPITAL EQUIPMENT REQUIRED
- [X] 9. DESCRIBE SPECIAL FACILITIES REQUIRED
- [X] 10. CONFLICT OF INTEREST INFORMATION
- [X] 11. OBLIGATION ESTIMATES
- [X] 12. OTHER *(SPECIFY)*:

  (a) QA
  (b) Cost and Milestone Charts

APPROVAL AUTHORITY-SIGNATURE

DATE

UCN-14505A
(3 9-81)

PROJECT TITLE:

Containment Leak Rate Sensitivity Study

ITEM NO.

1. OBJECTIVE OF PROPOSED WORK:

The overall objective of Tasks 1-3 is to determine the importance of the containment leak rate relative to the consequences of specified accident scenarios. In particular, the objective of Task 1 is to determine the sensitivity of the risk of the specified accident scenarios to changes in the containment leak rate. Task 2 addresses the prediction of the containment leak rate between leak tests, and Task 3 is designed to evaluate the potential of additional containment integrity information (such as a simple gross containment monitoring system) in reducing the risk. Additionally Task 3 will assess the adequacy of the current $0.25L_A$ safety margin and the desirability/limitations of single leak rate criteria applying to the majority of containment systems.

2. SUMMARY OF PRIOR EFFORTS:

Not applicable.

3. WORK TO BE PERFORMED AND EXPECTED RESULTS:

Summary

Tasks for FY-1983 concentrate on three areas of work: first a sensitivity study to determine the relative change in risk to the general public associated with differences in the containment leak rate under postulated accident conditions; second, an initial attempt at developing (and verifying) an appropriate methodology for predicting the actual post-test containment leak rate; and third, a preliminary assessment of the potential value of additional containment integrity information, the adequacy of the current safety margin, and the desirability/limitations inherent in a single containment leak rate criteria for different containment designs.

FY-1983

Task 1 - Containment Leak Rate Sensitivity Analysis. The relative change in the risk to the general public for specified accident scenarios as a function of the containment leak rate will be estimated. In particular, the standard reactor source terms given in NUREG-0773 will be utilized, and the offsite risk in terms of dose will be estimated as a function of the postulated containment leak rate. Scoping calculations will be performed to verify the completeness of the specified source terms for very short time periods/high containment leak rates. The resulting analysis will provide a relative measure of the change in the risk as a function of the leak rate.

Task 2 - Methods Development. The primary concern regarding the containment leak rate is the actual leakage rate which is present during the hypothetical accident scenario. An initial approach towards estimating the changes in leak rate versus the time between tests will be developed. This will entail a preliminary study to determine whether a correlation exists between actual leak rates (as indicated by LERs, as found tests, etc.) and leakage test values and/or leakage test intervals. These data will be employed to test the workability/suitability of the leak rate prediction methodology.

PROJECT TITLE:

Containment Leak Rate Sensitivity Study

ITEM NO.

Task 3 - Leak Rate Criteria Assessment. The results of Tasks 1 and 2 will be utilized to answer specific questions regarding the containment leak rate. In particular, the value of additional information regarding containment integrity (such as from a gross integral test or on-line monitoring system) will be assessed. Furthermore, the adequacy of the current $0.25L_A$ safety margin will be evaluated. Finally, the possible use of a single leak rate criteria for the majority of containment types will be investigated.

Beyond FY-1983

Not Applicable.

4. DESCRIPTION OF FOLLOW-ON EFFORTS:

Not Applicable.

5. RELATIONSHIP TO OTHER PROJECTS:

This project utilizes data generated under two NRC projects: (1) Reactor Accident Source Terms: Design and siting perspectives and (2) Containment Leak Rate Testing Project at ORNL.

6. REPORTING SCHEDULE:

Expected Future Reports

1. Report describing the results of the containment leak rate sensitivity analysis (July 1983). (Task #1)

2. Report describing the proposed leak rate prediction methodology (September 1983). (Task #2)

3. Itr rpt (" #3) (Sept 83)

7. SUBCONTRACTOR INFORMATION:

No subcontracting is anticipated.

8. LIST NEW CAPITAL EQUIPMENT REQUIRED:

Not applicable.

9. DESCRIBE SPECIAL FACILITIES REQUIRED:

Not applicable.

10. CONFLICT OF INTEREST INFORMATION:

There are no known relationships between this organization or its employees with industries regulated by the NRC and suppliers thereof that might give rise to an apparent or actual conflict of interest regarding the work described herein.

U.S. NUCLEAR REGULATORY COMMISSION

PROJECT AND BUDGET PROPOSAL FOR NRC WORK

FIN NUMBER B0489-B

PROJECT TITLE:

Containment Leak Rate Sensitivity Study

ITEM NO.

11. OBLIGATION ESTIMATES:

	FY-1983	FY-1984	FY-1985
(1) Cost Est	50	0	0
(2) Goods & Services on order - GSO est	0	0	0
Less Uncosted Balance	0	0	0
GSO Change	0	0	0
Total Obligation Change	50	0	0

12. OTHER:

12(a). QUALITY ASSURANCE AND CONTROL: Work will be performed according to the Engineering Physics Division and ORNL QA programs.

12(b). COST AND MILESTONE CHARTS

A. PROJECT COST SCHEDULE

Prior Costs	Years	1983	1984	1985	1986	1987	Total Estimated Cost
Task 1	0	22	0	0	0	0	22
Task 2	0	22	0	0	0	0	22
Task 3	0	6	0	0	0	0	6

B. 189 SUBTASK/MILESTONE CHARTS

END

UCN-12200 (3 2-82)

NO. 12(b)

SUBTASK/MILESTONE SCHEDULE

SUBTASK/MILESTONE	FY 82				FY 83				FY 84				FY 85	FY 86	FY 87	FY 88	FY 89	BEYOND FY 89
	1	2	3	4	1	2	3	4	1	2	3	4						
1. Task 1: Sensitivity Analysis																		
a. Complete leak rate sensitivity study																		
2. Task 2: Methods Development																		
a. Formulate approach to leak rate prediction																		
b. Test leak rate prediction methodology																		
3. Task 3: Leak Rate Criteria Assessment																		

TITLE:

ACTIVITY NO. _____
89A NO. _____
or
FTP/A NO. _____

Page _____ of _____

Page _____