



U.S. NUCLEAR REGULATORY COMMISSION

PROJECT AND BUDGET PROPOSAL FOR NRC WORK

DATE OF PROPOSAL
July 15, 1983

☒ NEW
☐ REVISION NO.

PROJECT TITLE: Marviken Support and Technical Assistance		FIN NUMBER B0831				
NRC OFFICE Office of Nuclear Regulatory Research, Division of Accident Evaluation		NRC S&R NUMBER 60 19 02 01				
DOE CONTRACTOR UNION CARBIDE CORPORATION	PATENT STATUS <i>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.</i>		CONTRACTOR/ORNL ACT. 41 32 00 00 0 DIV. (16), (3)			
SITE OAK RIDGE NATIONAL LABORATORY OAK RIDGE, TENNESSEE 37830			DOE S&R NUMBER 40 10 01 06			
COGNIZANT PERSONNEL	ORGANIZATION	FTS PHONE NUMBER	PERIOD OF PERFORMANCE			
NRC PROJECT MANAGER M. Jankowski	FBBR/ASTPO	427-4461	STARTING DATE 10-01-85			
OTHER NRC TECHNICAL STAFF			COMPLETION DATE 09-30-85			
DOE PROJECT MANAGER W. R. Bibb	DOE-ORO	626-0742				
CONTRACTOR/ORNL PROG. DIR.: A. P. Malinauskas	CMO	624-0422				
PROG. MGR.: T. S. Kress	ETD	624-0561				
PROJ. MGR.:						
PRIN. INVESTIGATOR(S): T. S. Kress, G. W. Parker	ETD CT	624-0561 624-6858				
STAFF YEARS OF EFFORT (Round to nearest tenth of a year)	FY 1983	FY 1984	FY 1985	FY 1986	FY 1987	
Direct Scientific/Technical		0.7	0.7			
Other Direct						
TOTAL DIRECT STAFF YEARS		.7	0.7			
COST PROPOSAL (OBLIGATIONS)		(\$ in Thousands)				
Direct Salaries (Cost Centers)		60	65			
Material and Services (Excluding ADP)		15	13			
ADP Support		5	5			
Subcontracts and Consultants		47	52			
Travel Expenses	Foreign	12	12			
	Domestic	3	3			
Indirect Labor Costs (Cost Centers)						
Other (Specify) GSO Change		26	-26			
General and Administrative (G&A/GPS)		32	33			
TOTAL OPERATING COST (Obligational)		200	157			
CAPITAL EQUIPMENT		-	-			
FIN CHARGED:						
TOTAL PROJECT COST (Obligational)		200	157			
FY 1984	OCTOBER 13	NOVEMBER 13	DECEMBER 13	JANUARY 13	FEBRUARY 13	MARCH 14
MONTHLY FORECAST EXPENSE	APRIL 14	MAY 15	JUNE 15	JULY 16	AUGUST 17	SEPTEMBER 18

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Marviken Support and Technical Assistance

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 19 83				FY 19 84				FY 19 85				FY 1986				FY 1987			
		1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
A. Marviken support	SCHEDULE																				
	COST						50			50											
B. Technical Assistance (ad hoc)	SCHEDULE																				
	COST						57			56											
C. Subcontract funding and administration	SCHEDULE																				
	COST						47			52											
D. Demona support	SCHEDULE																				
	COST						20			25											
	SCHEDULE																				
	COST																				
TOTAL ESTIMATED PROJECT COST							174			183											

PROJECT DESCRIPTION: (Provide narrative descriptions on NRC Form 189 page 1 of 3 for the following topics in the order listed. Check applicable block. If an item is not applicable, so state.)

- | | |
|--|---|
| <input checked="" type="checkbox"/> 1. OBJECTIVE OR PROPOSED WORK | <input checked="" type="checkbox"/> 9. DESCRIBE SPECIAL FACILITIES REQUIRED |
| <input checked="" type="checkbox"/> 2. SUMMARY OF PRIOR EFFORTS | <input checked="" type="checkbox"/> 10. CONFLICT OF INTEREST INFORMATION |
| <input checked="" type="checkbox"/> 3. WORK TO BE PERFORMED AND EXPECTED RESULTS | <input checked="" type="checkbox"/> 11. OBLIGATION ESTIMATES |
| <input checked="" type="checkbox"/> 4. DESCRIPTION OF ANY FOLLOW-ON EFFORTS | <input checked="" type="checkbox"/> 12. OTHER (SPECIFY): |
| <input checked="" type="checkbox"/> 5. RELATIONSHIP TO OTHER PROJECTS | a. Quality Assurance and Control |
| <input checked="" type="checkbox"/> 6. REPORTING SCHEDULE | b. Cost and Milestone Schedule |
| <input checked="" type="checkbox"/> 7. SUBCONTRACTOR INFORMATION | |
| <input checked="" type="checkbox"/> 8. LIST NEW CAPITAL EQUIPMENT REQUIRED | |

APPROVAL AUTHORITY-SIGNATURE

Q. P. Malin

DATE

9-14-83

PROJECT AND BUDGET PROPOSAL FOR NRC WORK

80831

PROJECT TITLE:

Marviken Support and Technical Assistance

ITEM NO.

1. OBJECTIVE OF PROPOSED WORK:

Summary

The Marviken Support and Technical Assistance Project provides NRC with a flexible multi-purpose mechanism with which it can respond quickly and effectively to technical needs as they arise. It is focused primarily on the support needs for the Marviken Fission Product and Aerosol Transport Tests for which it will provide a means to fund, administer, and coordinate the efforts of ORNL, Sandia National Laboratory, and Battelle Columbus Laboratory in providing supporting small scale experiments, providing technical assistance, reviewing plans and procedures, participating in tests, and reviewing and evaluating the test results. Similar assistance will be provided related to the Demona project as needed. In addition, it is anticipated that a variety of presently unspecified needs for technical assistance will arise relative to the general area of source term assessment and that this project will be used to provide such ad hoc assistance on demand.

2. SUMMARY OF PRIOR EFFORTS:

Summary

Previously, the activities under this project were largely included within a specific task area of 80488, "The Trap-Melt Verification Test Program". Additional aspects related to Demona and to ad hoc source term technical assistance were supported from a variety of related programs - a practice which tended to perturb well laid plans for milestones, schedules, and budgets. Activities previously performed that would now fit into this project include: (1) ORNL Marviken support (review of original proposal, service on working groups to develop project design and test plans, aerosol generator design and testing support, technical reviews, recommendations on "fissium" and "corium", calibration of cyclones, review of upper plenum simulator designs, and technical assistance following the shakedown testing); (2) funding and administering BCL and SNL subcontracts for their technical assistance; (3) developing and administering a subcontract for a BCL attaché to serve at the Marviken site; (4) technical assistance to the Demona project (reviews, selection of aerosol simulant, specification and design of aerosol generators, and plasma-torch efficiency testing for specific aerosols; or general (ad hoc) source term assistance to NRC (development of models for FP release and improvements to the Te release model, BWR improvements in March transmitted to BCL and review of BCL's BMI-2104 study). In addition, much of the ORNL work done so far on developing the report on the status of validation of the computer codes used in BMI-2104 was covered under this task element.

3. WORK TO BE PERFORMED AND EXPECTED RESULTS:

Summary

All Marviken support activities will continue including reviews, small scale testing and/or calibration of equipment, participation in working groups, technical assistance relative to conducting the tests, and review and evaluation of test results. The subcontracts to permit additional support work by SNL and

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3. WORK TO BE PERFORMED AND EXPECTED RESULTS: (continued)

and BCL will be continued at NRC's request. Technical support will be provided to NRC related to Demona on request. Ad hoc technical assistance will be provided on demand on issues as they arise related to source terms. This could include participation in peer reviews, funding of peer consultants, participation in technical conferences, evaluating proposals, information exchange, technical assessments, fission product and aerosol transport calculations, response to ONRR needs, IDCOR review and evaluation, etc.

FY 1984

See summary (these are all continuing activities)

FY 1985

See summary (these are all continuing activities)

Beyond FY 1985

(Not applicable)

4. DESCRIPTION OF ANY FOLLOW-ON EFFORTS:

(Not applicable)

5. RELATIONSHIP TO OTHER PROJECTS:

Work performed under this project will utilize expertise and (if necessary) facilities developed in several other related projects. These include B0121 (LWR Aerosol Release and Transport), B0488 (Trap-Melt Verification Tests), B0127 (Fission Product Release from LWR Fuel), B0453 (Post-Accident Fission Product Chemistry), B0815 (FP Deposition on Aerosols), and B0452 (Severe Accident Sequence Analysis).

6. REPORTING SCHEDULE:

Because of the special continuing technical assistance nature of this project, the bulk of the reporting is expected to be quick-response letter reports directly to NRC.

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7. SUBCONTRACTOR INFORMATION:

	Cost Estimates	
	FY 1984	FY 1985
Subcontracts and Consultants		
1. Sandia National Laboratory (Marviken Support)	30	20
2. Battelle Columbus Laboratory (Marviken Support)	5	20
3. Consultant Subcontract (James W. Cobble)	12	12
	<u>47</u>	<u>52</u>

8. NEW CAPITAL EQUIPMENT REQUIRED:

(None)

9. SPECIAL FACILITIES REQUIRED:

Some minor testing activities are anticipated that would utilize the existing CRI-II fission product and aerosol test facility of B0121 (LWR Aerosol Release and Transport) along with its aerosol generation equipment and instrumentation.

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 in this proposal.

11. OBLIGATION ESTIMATES:

	Obligation Estimates				
Prior Years	FY 1983	FY 1984	FY 1985	FY 1986	FY 1987
Operating Expenses					
(1) Cost Estimate		174	183		
(2) Goods and Services on Order-GSO Estimate	*	26	0		
Less: Uncosted balance		<u>0</u>	<u>26</u>		
GSO Change		26	-26		
(3) Total Obligations Change		<u>200</u>	<u>157</u>		

*Not Applicable - Project started in FY 1984 and defined through FY 1985.

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12. OTHER:

(a) QUALITY ASSURANCE AND CONTROL:

The work will conform to procedures defined in the ORNL, the Engineering Technology Division, and the Chemical Technology Division Quality Assurance Manuals.

(b) COST AND MILESTONE CHARTS:

A. PROJECT COST SCHEDULE

<u>Costs</u>	<u>Prior Years</u>	<u>FY 1983</u>	<u>FY 1984</u>	<u>FY 1985*</u>
Subtask A	*	*	50	50
Subtask B	*	*	57	56
Subtask C	*	*	47	52
Subtask D	*	*	20	25

*Project to start in FY 1984 and defined through FY 1985.

NO. 12(b)

B. SUBTASK/MILESTONE SCHEDULE

SUBTASK/MILESTONE	FY 83				FY 84				FY 85				FY86	FY87	FY 88	FY 89	FY	BEYOND FY
	1	2	3	4	1	2	3	4	1	2	3	4						
A. <u>Marviken Support</u>					Continuing Activity													
1. Participation in working groups																		
2. Reviews and assessments of test plans, etc																		
3. Small scale testing and/or calibration of equipment																		
4. Technical assistance to project																		
5. Review and evaluation of test results																		
B. <u>Technical Assistance (Ad Hoc)</u>					Continuing Activity													
(e.g. peer reviews, evaluating of proposals, technical assessments, fission product and aerosol transport calculations, code utilization, consultation, review, etc., relative to source terms, information exchange, IDCOR review and evaluation)																		
C. <u>Subcontract Funding and Administration</u>					Continuing Activity													
1. SNI Tech. Assistance Subcontract																		
2. BCL Tech. Assistance Subcontract																		
3. Peer Review Consultant																		
D. <u>Demona Support</u>					Continuing Activity													
(e.g. Aerosol generator testing, selection of simulant aerosols, technical assistance in conducting tests, review and evaluation of results)																		

Summary

9.e.1



BROOKHAVEN NATIONAL LABORATORY
ASSOCIATED UNIVERSITIES, INC.

Upton, Long Island, New York 11973

Department of Nuclear Energy

(516) 282-2616
FTS 666

July 13, 1984

Mr. John Telford
U.S. Nuclear Regulatory Commission
Containment Systems Research
7915 Eastern Avenue
Silver Springs, Maryland 20910

Dear Mr. Telford:

I am enclosing a summary of the calculational results performed at Brookhaven in support of the CLWG Standard Problem 5 (BWR Mark II).

A detailed report describing the BNL contributions to the CLWG is in preparation and will be published late this fiscal year. Comparisons of BNL results with that of BCL and SNL are reported in the Appendix E of the Consensus Summaries and are also enclosed.

Very truly yours,

Ji-Wu Yang
Accident Analysis Group

JWY:tr
Encls.(2)

8506180521

Summary of BNL Results for Standard Problem 5

(BWR Mark II)

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~~8506 180 523~~

The BWR Mark II containment loads were calculated using the MARCH 1.1/CORCON codes. The Standard Problem conditions and the summary of the computed results are shown in Table 1. Based on the sensitivity studies, the following conclusions are made:

1. Type of Concrete - Higher containment temperatures and pressures are encountered with the limestone concrete.
2. Free H₂O - A higher percentage of free water levels to high containment temperatures and pressures.
3. Corium Temperature and Spread - The higher temperature corium which spreads further leads to higher containment atmospheric temperatures and pressures.
4. Pool Loss - A higher percentage of pool loss implies less corium/concrete interactions and reduces the containment pressures and temperatures. The suppression pool remains at a subcooled state during the entire transient.

The uncertainties of the base case (Case 5) are shown in Table 2. The high, low, and medium values are approximated by considering the basic assumptions and uncertainties of the analyses.

Table 1 Summary of BWR Mark II Standard Problem Results

	Mark II (TQUV)							
Case	5	5a	5c	5d	6	7	7a	8
Corium Spread (m)	5				3	5		3
Debris Temperature (°F)	4130				2700	4130		2700
Concrete Type	L				L	B		B
Free H ₂ O (%)	3	6			3	4	8	4
Steel in Corium (lb)	140K				140K	140K		140K
Pool Losses (%)	0		25	50	0	0		0
Results								
Peak Pressure (psia)	130	135	102	83	118	114	140	94
Peak Temperature (°F)								
Drywell Atmosphere	623	670	570	510	600	480	585	450
Drywell Concrete	320	330	305	280	340	310	325	280
Drywell Steel Liner	315	330	275	265	330	280	325	280
Wetwell Atmosphere	360	360	345	335	345	345	355	345

Table 2 Uncertainty of Base Case (Case 5)

	Peak Pressure (psia)	Peak Drywell Temperature (°F)
High	145*	800
Low	100	600
Medium	135	720

*Assumed containment failure pressure.