FEB 2 1 1986

FOIA-86-678
6/80

Mr. D. G. Romatowski, Manager
Albuquerque Operations Office
U. S. Department of Energy
P. O. Box 5400
Albuquerque, New Mexico 87115

Dear Mr. Romatowski:

FY 1986 NUCLEAR REGULATORY RESEARCH ORDER NO. 60-86-134 FOR SANDIA NATIONAL LABORATORIES

Please authorize Sandia National Laboratories to execute the program described in the enclosed NRC Order.

If this meets with your approval, it is requested that acceptance be indicated on the enclosed form and the original be sent to the NRC Office of Resource Management and one copy returned to this office.

Sincerely,

Frank P. Gillespie, Director
Division of Accident Evaluation
Office of Nuclear Regulatory Research

Enclosures:
1. NRC Order
2. Program Brief

cc w/enclosures:
G. F. Barber, DOE/EP
C. L. Konoyer, PNL

DISTR
Subj
Circ
Chron
McDonald:rdg
G. Johnson, ORM
S. Burson, DAE
[redacted]
T. Lee, DAE
L. Chan, DAE
C. Ryder, DAE
P. Worthington, DAE
T. Walker, DAE
R. Wright, DAE
J. Han, DAE
R. Hoskins, DAE
Wylbur

RECORD NOTE: These FINs approved by SCRB 1/7/86 (#92)

OFFICE ►	RES:FPCB	RES:FPCB	RES:DAE	RES:DAE	RES:DAE	RES:DAE	RES:DAE
SURNAME ►	Ricci	Gustave/Hayes	Curtis	Silberberg	Hoskins	Morris	Gillespie
DATE ►	2/18/86	2/21/86	2/19/86	2/19/86	2/19/86	2/ /86	2/ /86

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NRC FORM 173 (1-84) — U.S. NUCLEAR REGULATORY COMMISSION

STANDARD ORDER FOR DOE WORK

ORDER NUMBER: 60-86-134

DATE: FEB 2 1 1986

ISSUED TO: (DOE Office)	ISSUED BY: (NRC Office)
Albuquerque Operations Office	Division of Accident Evaluation

PERFORMING ORGANIZATION AND LOCATION

Sandia National Laboratories

FIN TITLE

See Attached

ACCOUNTING CITATION

APPROPRIATION SYMBOL: 31X0200.606

B&R NUMBER: See Attached

FIN NUMBER: See Attached

WORK PERIOD - THIS ORDER

FIXED ☐	ESTIMATED XX
FROM: 10/1/85	TO: 9/30/86

OBLIGATION AVAILABILITY PROVIDED BY:

A	THIS ORDER	$ 6,314,000
B	TOTAL OF ORDERS PLACED PRIOR TO THIS DATE WITH THE PERFORMING ORGANIZATION UNDER THE SAME "APPROPRIATION SYMBOL" AND THE FIRST FOUR DIGITS OF THE "B&R NUMBER" CITED ABOVE	$ 14,497,000
C	TOTAL ORDERS TO DATE (TOTAL A & B)	$ 20,811,000
D	AMOUNT INCLUDED IN "C" APPLICABLE TO THE "FIN NUMBER" CITED IN THIS ORDER	$ See Attached

FINANCIAL FLEXIBILITY

☐ FUNDS WILL NOT BE REPROGRAMMED BETWEEN FINS. LINE D CONSTITUTES A LIMITATION ON OBLIGATIONS AUTHORIZED
☒ FUNDS MAY BE REPROGRAMMED NOT TO EXCEED ±10% OF FIN LEVEL UP TO $50K. LINE C CONSTITUTES A LIMITATION ON OBLIGATIONS AUTHORIZED

STANDARD TERMS AND CONDITIONS (see NRC Manual Chapter 1102, Appendix Part 4) ARE PART OF THIS ORDER UNLESS OTHERWISE NOTED

ATTACHMENTS
THE FOLLOWING ATTACHMENTS ARE HEREBY MADE A PART OF THIS ORDER
☐ STATEMENT OF WORK
☐ ADDITIONAL TERMS AND CONDITIONS
☐ OTHER

☐ FEE RECOVERABLE WORK
☐ NON-FEE RECOVERABLE WORK

SECURITY
☐ WORK ON THIS ORDER INVOLVES CLASSIFIED INFORMATION. NRC FORM 187 IS ATTACHED
☐ WORK ON THIS ORDER INVOLVES UNCLASSIFIED SAFEGUARDS, PROPRIETARY, OR OTHER SENSITIVE INFORMATION
XX WORK ON THIS ORDER IS UNCLASSIFIED AND NOT SENSITIVE

REMARKS *(Reference the proposal by number and date, and indicate if the attached statement of work modifies the DOE proposal)*

REF: SOEW #60-86-007 dated 11/22/85 for previous FY 1986 funds and work scope.

ISSUING AUTHORITY	ACCEPTING ORGANIZATION
SIGNATURE: Frank P. Gillespie, Director	SIGNATURE:
TITLE: Division of Accident Evaluation, Office of Nuclear Regulatory Research	TITLE:
	DATE:

NRC FORM 173 (1-84)

FEB 2 1 1986

SOEW #60-86-134

SANDIA NATIONAL LABORATORIES

FY 1986

(DOLLARS IN THOUSANDS)

B&R NO.	FIN NO.	TITLE	PREV. FY 86 OBLIG	THIS ORDER	TOTAL FY 86 OBLIG
601930	A1019-6	Molten Fuel-Concrete Interactions (CORCON/VANESA)	$ 81	$ 244	$ 325
601930	A1030-6	Corium-Coolant Interactions	146	279	425
601930	A1198-6	Containment Analysis - CONTAIN Code Development and Application	200	600	800
601930	A1218-6	Core Melt Technology	363	1087	1450
601930	A1227-6	High Temperature Fission Product Chemistry	100	350	450
601930	A1246-6	Hydrogen Behavior Program	300	900	1200
601930	A1258-6	PWR Severe Accident Sequence Analysis-SNL	150	150	300
601930	A1335-6	ACRR Melt Progression Experiments	250	480	730
601930	A1342-6	Melt Progression Analysis (MELPROG)	200	600	800
601930	A1389-6	ACRR Source Term Experiments	375	875	1250
601930	A1405-6	MELPROG Validation Experiments and Analysis	88	262	350
601930	A1406-6	Direct Containment Heating	163	487	650
		TOTAL	$2416	$6314	$8730

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

FEB 2 1 1986

Mr. R. G. Romatowski, Manager
Albuquerque Operations Office
U. S. Department of Energy
P. O. Box 5400
Albuquerque, New Mexico 87115

Dear Mr. Romatowski:

FY 1986 NUCLEAR REGULATORY RESEARCH ORDER NO. 60-86-134 FOR SANDIA NATIONAL LABORATORIES

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Sincerely,

Frank P. Gillespie, Director
Division of Accident Evaluation
Office of Nuclear Regulatory Research

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1. NRC Order
2. Program Brief

cc w/enclosures:
R. W. Barber, DOE/EP
J. L. Kenoyer, PNL

U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REGULATORY RESEARCH

REVISED FY 1986 PROGRAM BRIEF

TITLE: ACRR SOURCE TERM EXPERIMENTS FIN: A1389
CONTRACTOR: Sandia National Laboratories
PRINCIPAL INVESTIGATORS: P. S. Pickard, D. A. Powers, and W. J. Camp

NRC PROJECT MANAGERS: R. W. Wright and L. K. Chan
DIVISION: Accident Evaluation
BRANCH: Fuel Systems Research

BUDGET ACTIVITY: 601930

Prev. FY 86 Oblig.: $ 375K
This Order: $ 875K
Total FY 86 Oblig.: $1,250K

OBJECTIVE: To perform a series of separate-effects Source-Term (ST) experiments in ACRR on fission-product and aerosol release rates from reactor fuel and the fission-product and aerosol chemical form under core-uncovery accident conditions and at temperatures up to fuel melt. The results are to be used in fission-product release codes, including the VICTORIA fission product and aerosol module in the MELPROG mechanistic core-melt progression code, and to benchmark laboratory fission-product and aerosol release experiments. This program is part of the international integrated Severe Fuel Damage (SFD) and Source Term (ST) research program of the Fuel Systems Research Branch. It is anticipated that additional funding of $1000K for this program will be provided by foreign partners in the SFD and ST research program under a separate FIN.

FY 1986 SCOPE OF WORK:

1. Perform the first two Source Term experiments, ST-1 and ST-2. These experiments are to investigate the effects of low and high pressure in a reducing hydrogen environment on fuel liquifaction and fission-product release and chemical form and on aerosol generation up to peak temperatures of about 2500K.

2. Issue a quick-look report on the results of experiments ST-1 and ST-2. Analyze the ST-1 and ST-2 results and apply them to the CORSOR fission-product release correlation, the FASTGRASS mechanistic fission product release code, and the MELPROG fission-product module VICTORIA.

3. Make inital preparations for experiments ST-3 and ST-4. These are to be in particulate debris-bed geometry, a high-pressure steam environment, and to be taken to 2,800K for data on non-volatile release.

4. Coordinate the ACRR Source Term experimental program with the laboratory fission-product and aerosol release experiments in the RES source term research program and with the RES code assessment activities.

5. Provide RES with fast-response technical consultation on fission-product and aerosol release under LWR Severe Accident conditions for the RES Source Term reassessment and other Severe-Accident activities.

DELIVERABLES AND MAJOR MILESTONES:

1. Perform ST-1 Experiment (June 1986).

2. Perform ST-2 Experiment (August 1986).

3. Quick Look Report on Experiments ST-1 and ST-2 (September 1986).

U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REGULATORY RESEARCH

REVISED FY 1986 PROGRAM BRIEF

TITLE: ACRR MELT PROGRESSION EXPERIMENTS FIN: A1335
CONTRACTOR: Sandia National Laboratories
PRINCIPAL INVESTIGATORS: P. S. Pickard and W. J. Camp

NRC PROJECT MANAGER: R. W. Wright
DIVISION: Accident Evaluation
BRANCH: Fuel Systems Research

BUDGET ACTIVITY: 601930

Prev. FY 86 Oblig.: $250K
This Order: $480K
Total FY 86 Oblig.: $730K

OBJECTIVE: To develop a data base and validated analytical models on the development of severe fuel damage (including the oxidation process and hydrogen generation), core-melt progression, and in-vessel aerosol release for the range of LWR severe-accident conditions by performing small-scale integral experiments in the ACRR test reactor. The results are used to assess severe-accident codes, in particular the mechanistic MELPROG and SCDAP codes. These experiments include four Debris Formation and Relocation (DFR) experiments, to be completed early in FY 1986,and follow-on Melt Progression (MP) experiments on the key processes involved in the later stages of in-vessel core-melt progression. This program is part of the international Severe Fuel Damage (SFD) and Source Term (ST) research program of the Fuel Systems Research Branch. It is anticipated that additional funding $1.5M for this program will be provided by foreign partners in the SFD and ST research program under a separate FIN.

FY 1986 SCOPE OF WORK:

1. Issue a quick-look report on the results of the PWR DF-3 experiment with a Ag-In-Cd control rod performed in September 1985. Analyze the results, perform Post-Irradiation Examination (PIE) on the DF-3 experiment capsule, and issue a final experiment report.

2. Perform the BWR DF-4 experiment with a B_4C control blade. Issue a quick-look report on the results of DF-4. Analyze the results and perform PIE on the DF-4 experiment capsule.

3. Complete analysis of results and PIE on experiment DF-2 and issue the final experiment report.

4. Perform experiment planning and begin construction of apparatus for two small integral Melt Progression (MP) experiments that are to be performed in FY 1987.

5. Coordinate the ACRR MPST experimental program with the other elements in the RES experimental program and with the RES code assessment activities.

6. Provide RES with fast-response technical consultation on melt-progression and source term phenomena under LWR severe accident conditions for the RES source-term reassessment and other severe-accident activities.

DELIVERABLES AND MAJOR MILESTONES:

1. DF-3 Quick Look Report (November 1985).

2. DF-2 Final Experiment Report (November 1985).

3. Perform Experimental DF-4 (May 1986).

4. DF-3 Final Experiment Report (March 1986).

5. DF-4 Quick Look Report (July 1986).

February 19, 1986

FY 1986 Program Brief

Program: DAE

Title: PWR Severe Accident Sequence Analysis-SNL

Fin No.: A1258
Contractor: SNL
Site: Albuquerque
State: New Mexico

NRC Technical Monitor: B. Agrawal

Principal Investigator: A. Peterson

Objective: Improve the understanding of containment loading by severe reactor accidents and by events beyond the design basis. Provide interactive analyses with damaged fuel research, accident management developments and containment response.

Budget Activity: 601930

Previously Committed	$150K
This Order	$150K
Total Obligation	$300K

FY 1986 Scope:
(10/01/85-9/30/86)

1. Identify, collect and store information on the design and operation of specific reactors for use in accident response calculations.

2. Develop logic models (such as event trees, operator action event trees, cause-consequence diagrams) to illustrate variations of the basic accident sequence being analyzed.

3. Use best-estimate, state-of-the-art techniques to analyze the physical response of the plant accident sequences approved by NRC. The analyses should emphasize the information available to the operator during the accident, the potential interpretations of that information, the options available for altering an accident sequence, and the probabilities and consequences of those options.

4. Issue the final report on the investigation of the potential for hydrogen detonation in local regions in large dry containments for PWRs. Include potentially severe environmental conditions, due to local detonations, that could cause damage to safety equipment. Make recommendations, if necessary, of safety equipment that may be damaged.

5. Resolve the hydrogen stratification issue. Provide simplified models, if necessary, to enable HECTR/CONTAIN to simulate the diffusion kinetics now under investigation with HMS.

6. Complete the analysis of station blackout with loss of turbine-driven auxiliary feedwater and issue the final report.

January 16, 1986

U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REGULATORY RESEARCH

REVISED FY 1986 PROGRAM BRIEF

TITLE: HIGH TEMPERATURE FISSION PRODUCT CHEMISTRY FIN: A1227
CONTRACTOR: Sandia National Laboratory
PRINCIPAL INVESTIGATORS: D. Powers, R. M. Elrick and R. A. Sallach

NRC PROJECT MANAGERS: L. Chan and C. Ryder
DIVISION: Accident Evaluation
BRANCH: Fuel Systems Research

BUDGET ACTIVITY: 601930

MODIFIED 1986 SCOPE OF WORK:

PREV. FY 86 OBLIG:	$100K
THIS ORDER:	350K
TOTAL FY 86 OBLIG:	$450K

The 1986 Scope of Work for this program is modified to include the following:

7. Conduct experiments to confirm results from previous tests on the effect of ionizing radiation on CsI stability. The work should include:

   a. Complete analyses on remaining samples from previous tests to obtain material balances for the tests.

   b. Conduct reference experiments in the absence of radiation with the present apparatus so that a direct comparison between results from experiments with and without radiation can be made.

   c. Determine the role of structural surfaces in the dissociation of CsI in a radiation field.

8. Conduct analyses to determine the mechanism of CsI dissociation in a radiation field. Establish a model to predict the chemical forms and distribution of iodine in the RCS under severe accident conditions.

DELIVERABLES AND MAJOR MILESTONES:

Topical report on SnTe chemistry	February 1986
Topical report on the thermodynamic data base for the Cs, I, O, H (including ions) system	February 1986
Complete confirmatory experiments on the effect of ionizing radiation on CsI stability	March 1986
Complete calculations to predict RCS iodine forms and distribution	May 1986