

January 14, 2003

Mr. L. Douglas Rigdon, Director
Laboratory Programs Division
US Department of Energy
Albuquerque Operations Office
P.O. Box 5400
Albuquerque, NM 97185-5400

ATTN: Mr. Donald Chavez, MS:LPD

SUBJECT: PLANNING AND IMPLEMENTATION OF PUBLIC EVACUATION PROCESSES

Job Code: J3056

We request a proposal for performance of the attached Statement of Work (SOW) under Job Code J3056 for the Nuclear Regulatory Commission (NRC), Office of Nuclear Reactor Regulation (NRR). The enclosed SOW details the required work and should be used as the basis for proposal preparation.

Cost Proposal

Use NRC Form 189, "DOE Laboratory Project and Cost Proposal for NRC Work." The form includes instructions for its completion.

Also, submit a spending plan as part of your cost proposal. Guidance for completion of the plan is contained in the instructions portion of NRC Form 189.

Technical Proposal Content

At a minimum, the technical proposal must contain the following:

- Discussion to substantiate an understanding of the scope of work;
- Discussion of the technical approach to meet the project's objective;
- Discussion of the experience and capabilities of key personnel and the laboratory in performing similar work;
- Identification of key personnel and the number of staff hours that will be committed to complete the work (resumes for key personnel must be included);
- Identification of administrative support personnel and/or facilities needed to assist professional personnel in completing the work;

Mr. L. Douglas Rigdon

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- Identification of any hardware or software to complete the project;
- Discussion of any potential organizational conflict-of-interest issues; and
- Discussion of anticipated problem areas or deviations from the NRC's SOW.

A Department of Energy (DOE)-approved proposal must be submitted within 30 calendar days from the date of this Request for Proposal (RFP). Expedited handling by both DOE and National Infrastructure Simulation and Analysis Center/Sandia National Laboratories (NISAC/SNL) is requested.

The RFP is not an authorization to start work.

Work under this project will not require access to and/or the origination of classified information, as indicated on the enclosed NRC Form 187, and will not require access to and/or the origination of sensitive unclassified information.

The original proposal and two copies should be sent to US Nuclear Regulatory Commission, Attn: Debra A. Schneck, Office of Nuclear Reactor Regulation, Division of Inspection Program Management, Equipment and Human Performance Branch, Emergency Preparedness and Health Physics Section, Mail Stop O-6H2, Washington, DC 20555-0001.

Questions concerning this request should be addressed to Debra A. Schneck, at (301) 415-3079. Thank you for your assistance in this matter.

Sincerely,

/RA/ Theodore R. Quay for:

Bruce A. Boger, Director
Division of Inspection Program Management
Office of Nuclear Reactor Regulation

Enclosures:
Statement of Work
NRC Form 189 with Instructions
NRC Form 187

cc: Sandia National Laboratories
Org 6414, Mail Stop 0742
P.O. Box 5800
Albuquerque, NM 87185-0736
ATTN: Ms. Barbara Hawkins

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Statement of Work

NRC Form 189 with Instructions

NRC Form 187

cc: Sandia National Laboratories
 Org 6414, Mail Stop 0742
 P.O. Box 5800
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 ATTN: Ms. Barbara Hawkins

ADAMS Accession Number: ML023530622

*See previous concurrence

OFFICE	DIPM/IEHB*	DIPM/IEHB*	DIPM/IEHB*	DIPM/NRR
NAME	DSCHNECK	KGIBSON	TQUAY	BBOGER
DATE	12/20/2002	12/23/2002	1/9/2002	1/14/2003

OFFICIAL RECORD COPY

**OFFICE OF NUCLEAR REACTOR REGULATION
DIVISION OF INSPECTION PROGRAM MANAGEMENT**

STATEMENT OF WORK

PROJECT TITLE: *Planning and Implementation
of Public Evacuation Processes*

JOB CODE: J3056

XII. BACKGROUND

Studies of severe reactor accidents and their consequences have led the NRC staff to conclude that the preferred initial protective action for a severe (core damage) accident is to evacuate promptly rather than to shelter the population near the plant, barring any constraints to evacuation. Supplement 3 to NUREG-0654 provides guidance, implementing this conclusion and thereby simplifying the decision making process for protective actions in response to severe reactor accidents.

NUMARC/NESP-004, *Identification and Analysis of Factors Affecting Emergency Evacuations*, published in 1989, is one of the few source documents dealing with the quality and efficacy of public evacuations, both preplanned and ad hoc. As noted in this document, public evacuations in response to natural disasters, or technological and industrial accidents, occur rather frequently in the United States. According to NUMARC/NESP-004: "Emergency evacuations of 100 or more individuals occur, on the average, more than once a week. These evacuations generally have proceeded smoothly and safely, even when managed by local emergency response officials without plans and with little or no evacuation training."

Around nuclear power plants, the possibility of evacuating the public has received wide and critical attention, and is seen as controversial at many sites. Within some segments of the public and for some critics of nuclear power, the prospect of evacuating even small population centers is generally feared and the implications misunderstood.

The change in the threat environment has added to this situation, and served to increase political pressure on NRC's Emergency Preparedness (EP) regimen. Draft laws and calls to increase the size of the Emergency Planning Zone (EPZ) have occurred. Even with no regulatory change, NRC regulations require that nuclear power plant licensees provide a full range of protective action recommendations beyond the 10-mile EPZ, should that prove to be necessary. Supporting NRC guidance currently states that ad hoc evacuation measures are acceptable beyond the 10-mile EPZ, in part, because planning within the EPZ can be safely and effectively extended. The regulatory basis for reasonable assurance that the public health and safety can be protected beyond the 10-mile EPZ rests with ad hoc evacuation processes being proven effective.

At the same time, the NRC has exempted licensees from having to plan for offsite EP activities for nuclear power plants undergoing decommissioning. Since that decision, the spent fuel pool risk study raised questions about the appropriateness of these exemptions. The change in threat environment has also increased these concerns. However, even if a credible risk from spent fuel pools is assumed, a regulatory solution can be developed based on efficacy of the ad hoc evacuations of the affected public.

In an attempt to deal with this issue practically, to more completely and confidently understand the process in light of the new threat environment, and to contribute to the NRC's regulatory basis, the Contractor will evaluate major (more than 1000 people) evacuation events over (approximately) the past 10 years. Based on experiences and lessons learned, the Contractor will objectively assess the emergency evacuation process, and provide as associated evaluation within the framework of a technical report.

While NUMARC's study has been usable for certain regulatory issues, an update is necessary to include considerations and represent issues associated with the current threat environment, as well as recent evacuation history. As such, the impetus for this research is directly related to homeland security and preparedness. Logistically, the study is to be prepared and published as a NUREG to better serve NRC's needs for regulatory guidance in this area.

Requirements, Related Guidance & Reports

10 CFR 50, Section 50.47, *Emergency Plans*.

Regulatory Guide 1.101, Rev. 2, *Emergency Planning and Preparedness for Nuclear Power Plants*.

NUREG-0654/FEMA-REP-1, Rev. 1, *Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants*.

Supplement 3 to NUREG-0654/FEMA-REP-1, Rev. 1, *Criteria for Protective Action Recommendations for Severe Accidents*.

NUMARC/NESP-004, Identification and Analysis of Factors Affecting Emergency Evacuations.

NUREG/CR-1745, Analysis of Techniques for Estimating Evacuation Times for Emergency Planning Zones.

NUREG/CR-1856, An Analysis of Evacuation Time Estimates Around 52 Nuclear Power Plant Sites, Vol. 1 & 2.

NUREG/CR-4831, NNL-776, State of the Art in Evacuation Time Studies for Nuclear Power Plants, 1992.

NUREG/CR-4873, PNL-6171, Benchmark Study of the I-DYNEV Evacuation Time Estimate Computer Code, 1988.

NUREG/CR-4874, PNL-6172, The Sensitivity of Evacuation Time Estimates to Changes in Input Parameters for the I-DYNEV Computer Code, 1988.

Environmental Protection Agency (EPA) EPA-520/6-74-002, Evacuation Risks - An Evaluation, 1974.

EPA 520/1-78-001A, Protective Action Evaluation Part I: The Effectiveness of Sheltering as a Protective Action Against Nuclear Accidents Involving Gaseous Releases, 1978.

Federal Emergency Management Agency (FEMA)-REP-6, Exercise Evaluation and Simulation Facility, Evacuation Events Models: Part I - PREDYN Users Guide, 1984.

FEMA-REP-7, Exercise Evaluation and Simulation Facility, Evacuation Events Models: Part II - Users Manual, 1984.

FEMA-REP-8, Application of the I-DYNEV System (to Compute Estimates of Evacuation Travel Time at Nuclear Power Stations), 1984.

FEMA, RG REP 05, Rev.1, REP Evacuation Time Study Review Guide (Checklist), 1993.

FEMA / Disaster Research Center at Ohio State University, Evacuation Behavior and Problems: Findings and Implications from the Research Literature, 1980.

FEMA / Oak Ridge National Laboratory (ORNL), RR-9, Evacuation: An Assessment of Planning and Research, 1987.

FEMA / Systan Co., Emergency Evacuation Management Requirements and Concepts, 1981.

Atomic Industrial Form (AIF) / Battelle Human Affairs Research Centers, et al., Planning Concepts and Decision Criteria for Sheltering and Evacuation in a Nuclear Power Plant Emergency, 1985.

National Science Foundation/Battelle Human Affairs Research Center, Evacuation Decision Making and Emergency Planning, 1980.

ORNL/TM-9882, Evacuations Due to Chemical Accidents: Experience From 1980 to 1984, 1986.

ORNL/TM-10277, Evacuation in Emergencies: An Annotated Guide to Research, 1987.

Perry, Ronald W., Citizen Evacuation in Response to Nuclear and Non-Nuclear Threats, 1981.

Perry, Ronald W., Comprehensive Emergency Management: Evacuating Threatened Populations, 1985.

Perry, Ronald W., et al., Evacuation Planning in Emergency Management, 1981.

Witzig, W. F. and J. K. Shillenn, Evaluation of Protective Action Risks. Prepared under contract to the NRC by Penn State University, 1987.

II. OBJECTIVE

The Contractor shall provide a draft NUREG/CR that evaluates a select set of public evacuation processes. This report will evaluate:

- Evacuation experience (e.g., timeliness, related injuries, hazard avoidance),
- Critical factors contributing to success or failure of an evacuation (e.g., training, drills, preparedness, experience, resources, facilities, organizational structure, and whether or not the evacuation was ad hoc or preplanned).

III. TASK STATEMENT

TASK 1: The Contractor shall develop a draft NUREG/CR, which will document knowledge and understanding gained from data compiled on emergency evacuations occurring in the United States since 1990. The Contractor shall choose 50 representative occurrences, involving the evacuation of 1000 or more persons, in response to both natural and man-made hazards. Specifically, the report will evaluate:

- Evacuation experience (e.g., timeliness, related injuries, hazard avoidance),

- Critical factors contributing to success or failure of an evacuation (e.g., training, drills, preparedness, experience, resources, facilities, organizational structure, and whether or not the evacuation was ad hoc or preplanned).

Note: It is anticipated that the Contractor's efforts will use the methodology described in NUMARC/NESP-004 and Quarantelli's "Model of Evacuation Behavior." Recommended exceptions to, or enhancements of, the methodology can be found within the descriptions of specific tasks in this Section. The Contractor may also propose an alternative methodology, but any proposal must be in keeping with the spirit of the intended project and approved by the NRC Technical Monitor.

Sub-task a: Collect and document evacuation-related data.

The Contractor shall develop and implement a research approach, in concert with the NRC Technical Monitor, to support an extensive literature review; identify major U.S. evacuations since 1990; select 50 representative incidents; and collect incident-specific data and information.

Sub-task a.1: The Contractor shall conduct an extensive literature review on the general topic of public evacuation as well as on specific evacuation experiences. This review will be conducted with the intent of developing an up-to-date compilation of evacuation literature; contributing to a general (and current) understanding of the evacuation process; and, developing the analytical framework for this study. The NRC Technical Monitor will share with the Contractor a list of potential sources of documents and information sources, and citations from previously known research.

Sub-task a.2: The Contractor shall systematically identify the universe of evacuations from which the 50 representative occurrences will be chosen. The universe of evacuations will be limited to the following:

- U.S. mainland public evacuations;
- Evacuations occurring after January 1, 1990;
- Evacuations involving more than 1,000 people; and
- Evacuations of people from more than a single building or industrial facility.

Sub-task a.3: The Contractor shall profile each of these evacuations, using the following criteria:

- Size of evacuation;
- Type of incident (natural or technological);
- Category of hazard (e.g., dam failure, flood, fixed site);
- Year of occurrence;
- Special problems encountered;

- Type of community (urban, suburban or rural); and
- State or region.

Sub-task a.4: The Contractor shall summarize quantitatively and statistically the information resulting from the performance of Sub-task a.3 (e.g., size, frequency, percentage of natural vs. technological hazards).

Sub-task a.5: From the universe of evacuations identified, the Contractor, in concert with the NRC Technical Monitor, shall choose a cross-section of 50 incidents.

Sub-task a.6: The Contractor shall develop a form to facilitate data collection. The questions on the form will be designed to elicit the information necessary to evaluate the effectiveness of the 50 evacuations, and determine why they were effective or not.

Sub-task a.7: The Contractor shall collect information related to the 50 individual evacuations, and document the information for each on the form developed in Sub-task a.6. To obtain this information, the Contractor shall conduct a series of interviews (preferably by telephone or email) with emergency response officials involved in the evacuations, and research secondary sources (hardcopy and internet), such as the national news wire services, clippings from local newspapers, after-action reports of the involved agencies, and case studies prepared by industry groups.

Sub-task a.8: From the information collected, the Contractor shall write 50 individual case studies, providing a brief and accurate account of each incident. As a minimum, the case studies will include the following information:

- Community Context – General community information; history or experience with hazards or emergencies; resources available, emergency preparedness activities (e.g., planning, training, drills and exercises, and community awareness).
- Threat Conditions – Basic information on the threat or hazard that caused the evacuation; weather and road conditions; unusual circumstances.
- Consequences – Date, time and duration of the event; time to complete evacuation; statistics on the number evacuated, killed or injured; distance necessary to adequately evacuate from hazard; cost information.
- Emergency Response – General information on the organization(s) responding; decision making; communications; notification and warning (e.g., time to warn); traffic movement and control; shelters; law enforcement; re-entry.
- Investigator Comments – What factors made the evacuation work well? What factors contributed to the evacuation's faults or problems? What

were the lessons learned in this evacuation? Did the public's prior knowledge of the hazard, or prior evacuations, contribute to the success of the evacuation? Were alerting methods effective? What effect did the time of day and/or season have on alerting the public and on the execution of the evacuation? Did the length of time spent on decision making or notification affect the evacuation? Were there any innovative techniques or processes used for the problems associated with evacuations of special or critical facilities?

- Contact Information & References.

Sub-task a.9: The Contractor shall submit the draft documentation to the NRC Technical Monitor for review and comment.

Sub-task a.10: The Contractor shall provide support at a public meeting(s) hosted by the NRC and presentations to internal and external stakeholders.

Sub-task a.11: Based on NRC comments, the Contractor shall make any necessary changes to the draft documentation, and submit a copy of the completed material to the NRC Technical Monitor.

Estimated Completion Date: four months after project initiation.

Estimated Level of Effort: three staff months. (Includes administrative and managerial time.)

Sub-task b: Develop and implement a methodology for evaluating evacuation effectiveness.

Sub-task b.1: The Contractor, in concert with the NRC Technical Monitor, shall develop a methodology (qualitative, quantitative, statistical) for determining a "successful" evacuation. The evaluation should consider the following key components of an evacuation: direction and control, notification and warning, traffic movement and control, sheltering, and re-entry.

Sub-task b.2: The Contractor shall apply the methodology to the information gathered, summarize the results (including a description of methodologies used and background information), and submit this summary to the NRC Technical Monitor for review and comment.

Sub-task b.3: The Contractor shall provide support at any related public meetings hosted by the NRC, and presentations to internal and external stakeholders.

Sub-task b.4: Based on NRC comments, the Contractor shall make any necessary changes.

Estimated Completion Date: seven months after project initiation.

Estimated Level of Effort: 2.5 staff months. (Includes administrative and managerial time.)

Sub-Task c: Prepare draft NUREG/CR.

Sub-task c.1: The Contractor shall prepare a draft NUREG/CR, and submit it to the NRC Technical Monitor for review and comment. The draft NUREG/CR should include:

- Description of the methodologies used;
- Description and brief analysis of the universe of evacuations from which the sample was drawn;
- Data summary of the 50 evacuations selected and an associated analysis;
- Summary of results (e.g., positive contributors, “best practices,” negative factors);
- Comparison of findings with earlier research;
- Recommendations and criteria that can be used to improve evacuations; and
- References.

Sub-task c.2: The Contractor shall provide support at a public meeting(s) hosted by the NRC and presentations to internal and external stakeholders.

Sub-task c.3: The Contractor shall incorporate the comments of the NRC Technical Monitor into the draft NUREG/CR, and upon approval of the draft NUREG/CR by the NRC Technical Monitor, the Contractor shall submit the document for publication.

Estimated Completion Date: nine months after project initiation.

Estimated Level of Effort: two staff months. (Includes administrative and managerial time.)

IV. DELIVERABLES

A. Technical Reporting

Sub-task a.9: Draft documentation, including:

- Compilation of evacuation source references;
- An individual profile of each of the evacuation incidents included in the “universe of evacuations;”
- Summary, quantitatively and statistically, of the “universe;”
- Form designed to facilitate data collection on 50 individual evacuations; and
- 50 individual case studies.

Estimated Completion Date: three months after project initiation.

Sub-task a.11: Complete set of documentation, with comments incorporated.

Estimated Completion Date: four months after project initiation.

Sub-task b.2: Draft summary of the results of the evaluation, including consideration of:

- Direction and control;
- Notification and warning;
- Traffic movement and control;
- Sheltering; and
- Re-entry.

Estimated Completion Date: six months after project initiation.

Sub-task b.4: Summary of the results of the evaluation, as revised.

Estimated Completion Date: seven months after project initiation.

Sub-task c.1: Draft NUREG/CR.

Estimated Completion Date: eight months after project initiation.

Sub-task c.3: Draft NUREG/CR, as revised.

Estimated Completion Date: nine months after project initiation.

B. Monthly Business Letter Report

The Contractor shall submit a monthly business letter report by the 20th of each month to the Project Manager listed in Section VIII, with a copy provided to the NRC Technical Monitor. The Contractor shall include the following information, at a minimum, within the report's content:

- Title of Project.
- Job Code.
- Primary Contractor Contact and Contact Information.
- Period of Performance of the Contract.
- Reporting Period.
- List of Tasks and Sub-Tasks Accomplished to Date.
- Tasks and Sub-Tasks Accomplished During the Reporting Period (along with brief descriptions of how these items were accomplished and dates of accomplishment).
- Tasks and Sub-Tasks to be Accomplished During the Upcoming Reporting Period (along with brief descriptions of how and when these items are to be accomplished).
- Monthly Spending, Total Spending to Date, and Remaining Funds.
- Identification of Any Problems or Concerns.*

* The Contractor shall bring any administrative or technical difficulties which may affect the schedule or costs of the project to the immediate attention of the NRC Project Manager.

C. Submittal of Written Material

All documents mailed from DOE to NRC should have "Addressee Only" on the envelope to keep it from being entered into the NRC's document management system, Agency wide Documents Access and Management System (ADAMS). Send mail for the addressee and cc's as separate mailings.

D. New Standards for Contractors Who Prepare NUREG-Series Manuscripts

The final guidance document will be in the form of a draft revised NUREG/CR. All format guidance for NUREG-Series Manuscripts, as specified in NUREG-0650, Revision 2, remains the same with one exception. There is no longer a requirement to include the NUREG-series designator on the bottom of each page of the manuscript. The NRC will assign this designator when the camera-ready copy is sent to the printer and the designator will then be placed on the cover, the title page and spine. The designator for each report will no longer be assigned when the decision to prepare a publication is made. NRC's Publishing Services Branch will inform the NRC Technical Monitor for the publication of the assigned designator when the final manuscript is sent to the printer.

For the electronic manuscript, prepare the text in WordPerfect 8, and use any of the following file types for tables, charts, spreadsheets, etc.

<u>File Type</u>	<u>File Extension</u>
WordPerfect®	.wpd
Microsoft® PowerPoint®	.ppt
Corel® QuattroPro®	.wb3
Corel® Presentations	.shw
Lotus® 1-2-3	.wk4
Portable Document Format	.pdf

If you chose to publish a compact disk (CD) of your publication, place on the CD copies of the manuscript in the following formats: (1) PDF; (2) WordPerfect 8; and, (3) an Adobe Acrobat Reader, or alternatively, print instructions for obtaining a free copy of the Adobe Acrobat Reader on the back cover insert of the jewel box.

V. MEETINGS AND TRAVEL REQUIREMENTS

Frequently and periodically, over the course of this contract, the Contractor and the NRC Technical Monitor will interact (e.g., email, telephone, conference call) to discuss the contract's progress, NRC comments, and the general conduct and content of sub-tasks associated with this contract. It is anticipated that most of the communication between the NRC and the

Contractor will be handled in this manner. The following specific meetings and travel are anticipated under this project:

Sub-task a: One trip (for two) for five days to NRC Headquarters is anticipated to kick-off the project, meet with the NRC Project Manager and Technical Monitor (whose names are provided in Section VIII), collect information to support the completion of Sub-task "a", and discuss project requirements and schedule as a whole.

Research and interviews will be conducted remotely, if possible.

Sub-task b: Upon completion of Sub-task "b", a meeting (via conference call) will be held to discuss the completed evaluation process and results, and preparation of the draft NUREG/CR.

Sub-task c: Upon completion of Sub-task "c", one trip (for one) for two days to NRC Headquarters will be necessary to meet with the NRC Technical Monitor and Project Manager to cover issues related to project closure.

Travel is also anticipated over the course of the project in support of public meetings hosted by the NRC, and presentations to internal and external stakeholders.

The Contractor may propose additional travel deemed necessary for the successful completion of this effort. Over the course of the contract, NRC staff may travel to the Contractor site for meetings. Once the contract has been awarded, the NRC Technical Monitor and Project Manager must approve all additional travel in advance.

VI. LEVEL OF EFFORT

Management and Technical Staff: 7.5 person-months. Management and Technical Staff staff months are broken down by task in Section III, Task Statement.

VII. PERIOD OF PERFORMANCE

Proposed Period of Performance: 2/15/03 – 11/15/03. No deviation from this schedule is anticipated. Deviation from the established period of performance must be approved by the Project Manager, upon advisement by the NRC Technical Monitor.

VIII. CONTACT INFORMATION

Technical Monitor

Randy Sullivan
Sr. Emergency Preparedness Specialist
Emergency Preparedness and Health Physics Section
Equipment and Human Performance Branch

Phone: 301-415-1123
Email: RXS3@nrc.gov

PROJECT MANAGER

Debra A. Schneck
Project Manager
Emergency Preparedness and Health Physics Section
Equipment and Human Performance Branch

Phone: 301-415-3079
Email: DAS2@nrc.gov

IX. NRC FURNISHED MATERIALS

NRC documents related to planning and implementing public evacuations.

X. CONTRACTOR-ACQUIRED MATERIAL

Normally, the purchase of property costing \$500 or more (including Federal Information Processing (FIP) resources) will be approved through issuance of a work order accepting the proposal in which the property is listed. If additional property costing \$500 or more (including FIP resources) is needed after work starts, the Contractor shall request approval of the additional property in writing to the Project Manager. This written request shall be in the form of a revised proposal or a letter.

XI. SUBCONTRACTING/CONSULTANT INFORMATION

Describe any technical support effort that is proposed to be performed by a subcontractor or consultant. Identify the level of effort, by task, of any proposed subcontractor or consultant and provide an explanation of the need for subcontracting that portion of the effort. For any subcontract or consultant effort, describe the following:

- Necessity of subcontracting;
- Tasks and subtasks the subcontractor or consultant will perform;
- Level of effort proposed for the subcontract effort;
- Status and expected time frame for selection; and
- Method of selection of the subcontractor or consultant.