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Inspection Methods for Physical Protection Project: Quarterly Report, March—May, 1980

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FOREWORD

At the request of the Office of Nuclear Regulatory Research (RES) of the U.S. Nuclear Regulatory Commission (NRC), the Lawrence Livermore National Laboratory (LLNL) has initiated the Inspection Methods for Physical Protection (IMPP) project for the NRC Office of Inspection and Enforcement (IE). The IMPP project team is studying the physical protection systems used by NRC licensees and the methods presently used by IE physical protection inspectors to inspect such systems.

The intended result of this effort is production of improved NRC inspection methods and improved inspector training. The benefit to the licensees will be more uniform inspections, more knowledgeable inspectors, and--we anticipate--more cost-effective physical protection systems.

This is a report of work completed in the fifth quarter of the IMPP project. The fourth quarterly report was included in the Annual Report, March 1979 through February 1980.

This work was supported by the United States Nuclear Regulatory Commission under a Memorandum of Understanding with the United States Department of Energy. The NRC work order is FIN A-0143.

LLNL was established by the U.S. Atomic Energy Commission (AEC) and is operated by the University of California as one of the two national laboratories charged with the design and testing of nuclear weapons. With the advent of the energy shortage, DOE has broadened our mission at LLNL to cover research and development in all aspects of energy, including solar, wind, geothermal, and fossil fuel, as well as commercial nuclear energy. As part of this broadened energy mission, we provide research, development, and technical guidance to the NRC in areas such as waste management, operating safety, seismic safety, and safeguards.

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ABSTRACT

This is the fifth quarterly report to the U.S. Nuclear Regulatory Commission (NRC) on the progress at Lawrence Livermore National Laboratory (LLNL) in the Inspection Methods for Physical Protection (IMPP) project. Besides reporting on trips for field tests and data acquisition, the feasability studies for field evaluation of procedures, and the progress of the E-field intrusion detector training film, the report details the production status of the 23 procedures in the draft module 81100 replacement series already delivered to NRC and the status of 28 procedures now being written for transportation of irradiated fuel and for possession and use of formula quantities of strategic special nuclear materials (SSNM).

EXECUTIVE SUMMARY

The Inspection Methods for Physical Protection (IMPP) project of the Lawrence Livermore National Laboratory (LLNL) continued during the fifth quarter, March--May, 1980, to develop written inspection procedures for inspection of licensed civilian nuclear facilities. The existing inspection procedures have expanded to reflect new technology. New procedures have been written to fill inspection requirements.

The three original IMPP goals continue: (1) to identify the information needed by the inspectors, (2) to produce that information in a form usable in the field, and (3) to train the inspectors in the use of that information.

At the close of the first contract year, IMPP delivered to IE and the Regions the completed draft module for physical protection inspection of nuclear power reactors. During this fifth quarter, 21 procedures of this module were critiqued by IE staff and Region inspectors, and were field tested during inspections in Region II.

We have continued to acquire data and have begun to write the inspection modules on transportation of irradiated fuel and possession of formula quantities of SSNM, using the format of the power reactor inspection module.

As part of the continuing data acquisition phase, IMPP project team members traveled to the Region II office, Atlanta, Georgia; Home Transportation Company near Marietta, Georgia; Brunswick Steam Electric Plant, Soutnport, North Carolina; Tri-State Motor Transit Co., Joplin, Missouri the Carnahan Conference at University of Kentucky, Lexington, Kentucky; and Browns Ferry Nuclear Power Plant near Athens and Decatur, Alabama.

Also during the fifth quarter, team members continued to develop the inspector training film on E-field intrusion detectors, gave presentations to management of the Engineering Research Division at LLNL, collaborated on a paper for the Institute of Nuclear Materials Management conference at Palm Beach, Florida, and completed preliminary versions of an NRC regulation/procedure matrix and an inspection procedure evaluation list, which are being developed for field use by IE inspectors.

INTRODUCTION

At the close of the first contract year, the Inspection Methods for Physical Protection (IMPP) project at Lawrence Livermore National Laboratory (LLNL) delivered to the U.S. Nuclear Regulatory Commission (NRC) Office of Inspection and Enforcement (IE) and to the Region offices a draft version of the inspection module for physical protection of licensed civilian nuclear power reactors.

Three IMPP team members participated in field tests of the power reactor inspection module, and all team members continued with data acquisition for the modules being written for transportation of irradiated fuel and for possession of formula quantities of strategic special nuclear material (SSNM).

Other IMPP tasks in progress include the development of the procedure evaluation methodology for use by IE inspectors in the field, and the production of a training film on E-field intrusion detectors.

FIFTH QUARTER EFFORT

Overview of Inspection Methods for Physical Protection Activities

Major effort expended in the fifth quarter was on the follow-up activities from field testing the power reactor inspection module, on research and data acquisition for writing the modules on SSNM and transportation of irradiated fuel, on developing the regulation/procedures matrix, and on completing the narration and art work and editing the training film on E-field intrusion detectors.

Inspection Module Deliverables

Tables 1, 2, and 3 show the status of the physical protection inspection modules, which are the IMPP deliverables under amended Schedule 189, revised during January, 1980.

TABLE 1. Status report on transportation of irradiated fuel inspection module

Procedure	Status													
81300 Series Replacement	Research	First Draft	LLL Tech. Review	Editing Draft	Field Test Draft	IE Review	Field Test	Post F.T. Draft	LLL Tech. Review	Final Editing Draft	Final Draft	IE Review	Final Approval
81T05 Preinspection	■	■	■	■	■								
81T10 General Requirements	■	■	■	■	■								
81T15 Communications	■	■	■	■	■								
81T20 Postinspection	■	■	■	■	■								

TABLE 2. Status report on power reactor inspection module

Procedure		Status												
81100 Series Replacement		Research	First Draft	LLL Tech. Review	Editing Draft	Fld. Test Draft	IE Review	Field Test	Post F.T. Draft	LLL Tech. Review	Fnl. Ed. Draft	Final Draft	IE Review	Final Approval
81X10	Preinspection	■	■	■	■	■	■	■						
81X14	Orientation	■	■	■	■	■	■	■						
81X18	Security Plan and Implementing Procedures	■	■	■	■	■	■	■						
81X22	Contingency Plan*	■	■	■										
81X26	Guard Training and Qualification Plan*	■	■	■										
81X30	Security Organization*	■	■	■										
81X34	Security Program Audit	■	■	■	■	■	■	■						
81X38	Records and Reports	■	■	■	■	■	■	■						
81X42	Testing and Maintenance	■	■	■	■	■	■	■						
81X46	Locks, Keys, and Combinations	■	■	■	■	■	■	■						
81X52	Physical Barriers--Protected Area	■	■	■	■	■	■	■						
81X54	Physical Barriers--Vital Area	■	■	■	■	■	■	■						
81X58	Security System Power Supply	■	■	■	■	■	■	■						
81X62	Lighting	■	■	■	■	■	■	■						
81X66	Assessment Aids	■	■	■	■	■	■	■						
81X70	Access Control--Personnel	■	■	■	■	■	■	■						
81X72	Access Control--Packages	■	■	■	■	■	■	■						
81X74	Access Control--Vehicles	■	■	■	■	■	■	■						
81X78	Detection Aids--Protected Area	■	■	■	■	■	■	■						
81X80	Detection Aids--Vital Area	■	■	■	■	■	■	■						
81X84	Alarm Stations	■	■	■	■	■	■	■						
81X88	Communications	■	■	■	■	■	■	■						
81X90	Postinspection	■	■	■	■	■	■	■						

*Being rewritten to meet new NMSS acceptance criteria.

TABLE 3. Status report on Category I* fixed site inspection module

Procedure	Status													
81200 Series Replacement	Research	First Draft	LLL Tech. Review	Editing Draft	Field Test Draft	IE Review	Field Test	Post F.T. Draft	LLL Tech. Review	Final Editing Draft	Final Draft	IE Review	Final Approval
81F10 Preinspection	■	■	■										
81F14 Site Orientation	■	■	■										
81F18 Security Plan and Implementing Procedures	■	■											
81F22 Security Organization--Management	■												
81F26 Security Organization--Personnel, T&Q	■												
81F30 Security Organization--Contingency Response	■												
81F34 Security Program Audit	■	■											
81F38 Records and Reports	■	■											
81F42 Testing and Maintenance	■	■											
81F46 Locks, Keys, and Combinations	■												
81F52 Physical Barriers--PA	■												
(Continued)													

*Possessing or using formula quantities of SSNM.

TABLE 3. Contd. Status report on Category I* fixed site inspection module

Procedure		Status												
81200 Series Replacement		Research	First Draft	LLL Tech. Review	Editing Draft	Field Test Draft	IE Review	Field Test	Post F.T. Draft	LLL Tech. Review	Final Editing Draft	Final Draft	IE Review	Final Approval
81F54	Physical Barriers--VA, MAA, & CAA	■												
81F58	Security System Power Supply	■												
81F62	Lighting	■												
81F66	Assessment/Surveillance Aids	■												
81F70	Entry/Exit Control--Personnel	■												
81F72	Entry/Exit Control--Packages, Material, and SNM	■												
81F74	Entry/Exit Control--Vehicles	■												
81F78	Detection Aids--PA	■												
81F80	Detection Aids--VA, MAA, & CAA	■												
81F84	Alarm Stations	■												
81F88	Communications	■												
81F90	Postinspection	■												

*Possessing or using formula quantities of SSNM.

Power Reactor Inspection Module 81100 Replacement Series

Twenty-one of the twenty-three procedures in the power reactor inspection module and the document "Procedures for Reviewing and Using the LLNL-Designed Physical Protection Inspection Module" were delivered to IE Headquarters and the Regions at the close of the fourth quarter. This module is Task 8 in the amended schedule of deliverables. Our revisions of the draft modules will begin to reflect the information exchange with the Regions and IE Headquarters following field testing and critique of the module.

The guard training and qualifications procedure and the contingency plan inspection procedure are being extensively revised. The Security Organization 81X30 draft inspection procedure was based on guidance available at the time it was written and submitted and did not cover in detail inspection of guard training and qualifications (T&Q) and contingency plans. Subsequently, NMSS has developed acceptance criteria for T&Q and contingency plans, contained in the NUREG-0674 draft and in Review Guideline #24. Our resulting expansion of the procedure contents requires a subdivision of the security organization procedure material into logical elements now being developed:

- 81X22 Security Organization--Management
- 81X26 Security Organization--Personnel, Training, and Qualifications, which will include material for inspecting implementation of T&Q plans
- 81X30 Security Organization--Contingency Response, which will include material for inspecting implementation of contingency plans.

(The letter X in the procedure number will change to a number assigned by IE when the draft module is approved.)

While this organization of the inspection procedures dealing with the licensee's security organization appears more logical to us, the information could be reorganized, if required, to construct stand-alone inspection procedures dedicated exclusively to evaluating the implementation of T&Q plans and contingency plans.

Data Acquisition for Inspection Methods for Physical Protection of Fuel Cycle Facilities, Category II and III Facilities, and Transportation of Irradiated Fuel

Outlined as amended tasks 9, 10, and 11 in Appendix B to the IMPP annual report, NUREG/CR-1258 Vol. 2, UCID-18123-79-4, are the tasks of developing new procedures for inspection methods for physical protection of fuel cycle facilities, for research reactors, and for transportation of irradiated fuel. Outlined as amended task 12 is development of procedures for evaluating guard training and qualifications plans.

We have combined data for the amended tasks into our cumulative data base of regulations, regulatory positions, and information from IE headquarters and the field. Our data base for writing the amended tasks is separated into categories I (SSNM), II (moderate strategic significance SNM), and III (low strategic significance SNM).

With an IMPP subcontractor, we began gathering information in the following areas to assist us in developing the module for nonpower/research reactors:

- Review of current NRC positions on physical security practices and procedures at research reactor (RR) sites. This review requires examination of documentation of licensing procedures as well as interviews with NMSS staff on licensing actions that vary as to power rating, reactor type, and institutional category (i.e. university, government, industrial). We need this information about inspection criteria; consistency between regulation-defined inspectables and the current inspection process; procedural and administrative variations; and adequacy of inspector training and reporting.

- Review of research reactor licensees' physical security practices. This review of approved physical security plans will examine such factors as scope, stringency, and specificity. It will assist us to determine attitudes of licensees from the institutional

categories toward compliance and will also expand the IMPP data base concerning site-specific physical protection equipment currently used by nonpower reactor licensees. Our efforts in developing a physical protection equipment profile have been in abeyance during the fifth quarter pending a RES-IE decision whether this work should be resumed.

- Review of other agencies' physical security activities for research reactors. We will examine actions, procedures, and policies that relate to physical protection at research reactor sites at agencies other than NRC, such as the Nuclear Energy Liability Insurance Association (NELPIA).

- Analysis of sabotage prevention and consequences at nonpower and research reactors. We will examine the possibility of sabotage of research reactors with particular attention to consequences on the public health and safety.

Feasability Studies

"The Feasability of Field Evaluation of Physical Protection Procedures" by J. Savage was accepted by NRC and was published as NUREG/CR-1315, UCRL-52740. After reviewing the feasability study, NRC Office of Research (RES) advised the IMPP team to proceed with the development of the procedure evaluation methodology for use by IE inspectors in the field.

R. Thatcher joined the IMPP project mid-quarter to work with J. Savage on the procedure evaluation methodology. They have completed a preliminary version of the regulation/procedure matrix line titles and have designed a preliminary version of the procedure evaluation attribute list. These are drafts to be revised as work progresses.

Training

Training Film on E-Field Intrusion Detectors. Artwork and narration were added to both indoor and outdoor scenes filmed at Stellar Systems Inc. for the training film on E-field intrusion detectors for IE inspectors. An NRC RES review of the film gave additional input to the editing process.

Training Aid Requirements in Support of Power Reactor Modules. We developed a summary table of training aid requirements which identified 47 areas of knowledge or specific skills called for in the power reactor module 81X00. These were then assigned high, medium, or low priority ratings for training. They were further analyzed as to which media could best carry the message: film, videotape, hard copy, slides, or workshop. We developed a rationale for including each item in the training program or for including it in the inspection module procedure. This information, now in draft tabular form, will be used in the ongoing training evaluation and development program.

TRIPS

Members of the IMPP team traveled to two power reactor sites to observe inspections that field tested portions of 18 of the 23 procedures of the new draft module on inspection methods for physical protection. Team members felt that a complete and comprehensive field test inspection at a power reactor would require two inspectors for about two weeks.

The trips to participate in field tests of the 81X00 power reactor inspection module also included data acquisition for the transportation and Category I, II, and III fuel cycle inspection modules. Two other trips to transit companies were primarily for data gathering.

Region II Office, Home Transportation Co.,Inc., and Brunswick Steam Electric Plant -- April 24 to May 1, 1980

A member of the IMPP team visited the NRC Region II office in Atlanta, Georgia, and discussed the physical protection inspection module for nuclear power reactors with Director J. P. O'Reilly, Branch Chief W. B. Kenna, Section Chief F. P. Gillespie, and Senior Inspector W. F. Tobin. As Tobin serves on the committee to revise the ANSI standard on Radiological Security for Operating Nuclear Plants (ANSI N18.17), he and our team member discussed possible implications of several proposed changes to the standard on the deliverables of IMPP project work.

A team member accompanied Inspector D. Moore to Home Transportation Company, Inc., near Marietta, Georgia, to inspect the screening and training records of drivers and escorts who transport spent nuclear fuel. These drivers and escorts were trained and qualified under 10 CFR 73 Appendix D.

At the Brunswick Steam Electric Plant of Carolina Power and Light Company at Southport, North Carolina, we participated in a physical protection inspection that field tested portions of the new module.

Tri-State Motor Transit Co. -- May 7, 1980

A member of the IMPP team visited the Tri-State Motor Transit Co. in Joplin, Missouri, to research data on the transportation of special nuclear material and spent fuel shipments.

Tri-State Transit Co. is licensed to transport SNM but operates under the shipper's license when transporting spent fuel. Drivers are trained and qualified under 10 CFR Appendix D, with Category I SNM drivers being further trained under Appendix B.

From data acquired concerning the 100% surveillance inspections of the Category I SSNM shipments and the sampling of inspections of spent fuel shipments, the IMPP team is devising a broader data base for writing the physical protection inspection module on transportation of irradiated fuel.

Carnahan Conference -- May 14-16, 1980

Members of the IMPP team attended the Carnahan Conference sponsored by the University of Kentucky in Lexington, Kentucky, on crime countermeasures. Of special interest to the IMPP project were papers presented on personnel recognition and verification, alarm systems, and detection and identification. The papers reflected the state of the art relative to intrusion detection aids, personnel identification and authentication, and computer-controlled physical protection systems.

Browns Ferry Nuclear Power Plant -- May 19-23, 1980

IMPP members participated with W. Tobin and A. Tillman of NRC Region II in an inspection of the Browns Ferry Nuclear Power Plant, operated by TVA near Athens and Decatur, Alabama. A major purpose of the inspection was to conduct a field test of the recently produced IMPP 81X00 draft module for inspection of nuclear power plants. While the inspection did not follow exactly the guidance in the LLNL module, the inspectors did provide valuable input, comments, and insight.

PRESENTATION TO ENGINEERING RESEARCH DIVISION--LLNL, May 2, 1980

Following customary practice within the Electronics Engineering Department at LLNL, the IMPP project team of the Nuclear Systems Safety Program (NSSP) made an invited presentation to the Electronics Engineering Research Division management, who annually appraise the team members. The presentation of illustrated lectures explained the interaction of equipment, personnel, and procedures in the overall safeguards systems, with particular emphasis on the

role of the IMPP project in filling tasks mandated by the NRC Office of Inspection and Enforcement and the Office of Nuclear Material Safety and Safeguards (NMSS) through the Office of Research.

Team members explained the physical protection inspection modules for power reactors, nonpower reactors, fuel cycle facilities, and transportation. The 21 procedures of the power reactor module just delivered to IE for field testing were explained in detail, and the team illustrated the difference between the 9 procedure-oriented modules (e.g. records and reports, and audit) and the 14 equipment-oriented modules (e.g. detection aids and emergency power supply).

Most lively questions from the audience were directed toward the systems-engineered approach to the inspection modules; the areas of inspection by IE, such as health physics, material control and accounting, operations, and physical protection; the vulnerability chart; and the technical baseline and confidence level of the licensees, the public, the IE inspectors, and the IMPP team.

INSTITUTE OF NUCLEAR MATERIALS MANAGEMENT (INMM) PAPER

NRC RES and the IMPP team collaborated to prepare a paper for presentation at the 21st annual meeting of the INMM to be held at Palm Beach, Florida, June 30 to July 2, 1980, on the theme "Safeguards - Today and Tomorrow." Preparation of the IMPP paper reflected the systems engineering approach being applied to provide IE with improved methods and guidance for evaluating the physical protection systems of licensed nuclear facilities.

The paper describes the two major phases of the first project year: (1) the data-acquisition phase which included obtaining NRC field office, inspector, and licensee input; observation of physical protection inspections at reactor sites; review of government efforts; and on-going study of the Code of Federal Regulations on administrative and operational procedures, and (2) the

production-of-deliverables phase, which included the writing and submission for field testing of the 23 procedures that comprise the module on inspection of physical protection at nuclear power plants.

The paper summarized how the module was researched, designed, and written. It explained the methodology behind feasability studies, adequacy assessment, and the training required of inspectors who will implement the written module.

CONTINUING EFFORT

Effort in the sixth quarter will focus upon developing the inspection methods for physical protection of transportation activities and fuel cycle facilities. All of the transportation module procedures and 12 of the 23 fuel cycle module procedures will be written, and drafts will be delivered when completed.

We will continue working on inspector training and developing inspection methods for contingency plans and for evaluating implementation of guard training and qualifications plans.

Our data base for Category II and III facilities will be expanded, and the power reactor module procedures will be revised to reflect the results of field testing and critique from IE headquarters and the Regions.

We will also continue developing the procedure evaluation methodology for use by IE inspectors in the field.

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