

May 9, 1978


SECY-78-247

UNITED STATES  
NUCLEAR REGULATORY COMMISSION

**INFORMATION REPORT**

For: The Commissioners

From: Edson G. Case, Acting Director  
Office of Nuclear Reactor Regulation

Thru: Executive Director for Operations 

Subject: NRR PROGRAM FOR THE PHYSICAL PROTECTION OF  
NON-POWER REACTORS

Purpose: To Inform the Commission of Actions Being Taken in Response  
to Commission Guidance on SECY-77-319 "Physical Protection  
for Non-Power Reactors".

Discussion: The NRR staff is engaged in the development of an amendment  
to 10 CFR Part 73 that will provide acceptable levels of  
protection against theft or diversion of special nuclear  
material and industrial sabotage. This paper summarizes  
the NRR staff's activities in the following areas:

1. Participation in the development of proposed  
amendments (SECY-77-283A and 77-79B) to 10  
CFR Part 73 initiated by the Office of Nuclear  
Material Safety and Safeguards.
2. Study of need for protection against sabotage  
of non-power reactors.
3. Drafting of a proposed amendment to 10 CFR  
Part 73 for defining levels of physical pro-  
tection for non-power reactors.

Background: On June 15, 1977 the staff provided the Commission an analysis  
of the safeguard risks associated with the operation of 72  
non-power (research) reactors currently licensed by the NRC  
([SECY-77-319] "Physical Protection of Non-Power Reactors").  
This analysis culminated discussions and reviews of this  
subject (see Enclosure 1) and included recommendations to  
improve the level of physical protection at these facilities  
to levels commensurate with currently perceived risks as  
targets for theft or diversion of special nuclear material

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for use in clandestine nuclear explosives. Specifically, these recommendations were to provide requirements in 10 CFR Part 73 for (a) protecting formula quantities of non self-protecting strategic special nuclear material (SSNM)\* that is currently exempt from the requirements of §73.50 because the material is in a reactor core or has been irradiated, (b) protecting against illicit acquisition of formula quantities of SSNM through theft from multiple sites, and (c) defining a minimum level of protection for all SNM to replace the various staff "position" and "guidance" papers that now form the basis for security plans for non-power reactors. The staff also recommended that the sabotage potential at these facilities be investigated in greater depth.

In response to these recommendations the Commission directed that the staff achieve the desired level of protection of formula quantities of SSNM at non-power reactors through the provisions of the "Upgrade Rule" that had been proposed by the staff in a parallel action (SECY-77-283A) and to provide for the protection of inventories of less than formula quantities of SSNM through a rule to be developed to meet international standards of physical protection against theft (SECY-77-79, 79A, 79B). In addition, the staff was instructed to develop an action plan for carrying out an appropriate staff study of protection against sabotage at non-power reactor facilities. Such a plan was submitted on July 22, 1977 (Memorandum Edson G. Case to Samuel J. Chilk) in which a study of approximately six months was proposed. By means of this memorandum the staff also informed the Commission that no non-power reactor presented an undue safeguard risk; however, efforts were underway to improve the level of protection given to the fuel located at one facility.

Staff Activities: Following the Commission's guidance, the NRR staff has taken the following actions:

1. Worked closely with the management of the facility where improvements are considered to be needed to identify specific safeguards concerns. This licensee is currently

\*"Strategic special nuclear material" means uranium-235 (contained in uranium enriched to 20 percent or more in the U-235 isotope), uranium-233, or plutonium.

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upgrading the protection provided to the SSNM through improvements in physical barriers, surveillance, and response capabilities. The licensee is also performing experiments to determine if the core loading of this critical facility can be reduced to less than a formula quantity of SSNM.

2. Participated with other NRC offices in the review of public comments on the coverage of non-power reactors in the "Upgrade Rule" (especially proposed §§73.20, 73.45 and 73.46) and in the revisions of this Rule. The proposed amendments to 10 CFR 73 in this Rule have been developed to provide acceptable levels of protection against the theft of SSNM. Currently, 21 non-power reactors are authorized to possess more than a formula quantity of SSNM although only six facilities actually possess this amount of SSNM in a form that would not be exempt from §73.20 under the provisions of §73.6.
  3. Participated with other NRC offices in the development of the "Category II/III Rule". With NMSS as the lead office, the staff has recently developed new amendments to 10 CFR 73 to provide levels of protection against theft that are equivalent to international standards for SNM, including less than formula quantities of SSNM. As now written, the requirements in the proposed amendments would apply to 54 research reactors. The licensees of twelve AGN-type reactors would be exempt from both the "Upgrade Rule" and the "Category II/III Rule" because the inventory of SNM is under the threshold quantity (1 kg of uranium enriched to less than 20% in U-235). These requirements have been based on the need to provide a prudent level of protection for less than formula quantities of SSNM and certain quantities of SNM. Within the Rule coverage are approximately 450 licensed possessors of small quantities of SNM such
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as in isotopic neutron sources. SNM in these sources has very little similarity in type, quantity, or use to the SNM in the fuel elements at research reactors.

4. The staff has contracted with the Los Alamos Scientific Laboratory to investigate the potential for radiological sabotage at the 72 licensed non-power reactors. Results from initial investigations and other sources of information indicate that significant releases of fission gases could occur through loss of the integrity of fuel elements caused by melt down or explosive destruction of the core of reactors of 1MW or greater. Using very conservative conditions, the health and safety of "the public" in close proximity to these non-power reactors could be endangered. Therefore, the staff has concluded that in addition to the protection to be provided against theft or diversion, supplemental protection against radiological sabotage is necessary for these higher powered research reactor facilities.
  5. Because of the difficulties associated with providing adequate and equitable protection for non-power reactors for both diversion and sabotage through revising the requirements of proposed §§73.20, 73.45, 73.46 and 73.47 the NRR staff believes that this goal can be achieved more effectively through development of a separate amendment to Part 73 that includes all necessary requirements for achieving an acceptable level of security for this type of facility. The NRR staff is developing a set of requirements that have been structured to provide a graduated level of protection that would be commensurate with the risk from sabotage or theft of SNM. These levels of protection will equal or exceed those provided by both international standards and §73.47 (the "Category II/III Rule"). This approach will provide the flexibility needed to develop security plans that
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accommodate the many unique design and operational features of non-power reactors and their fuels as well as to anticipate reduction in risks that are expected to result in the next several years from new technology directed toward decreasing the enrichment of uranium in research reactor fuel and other technological advances.

In support of these efforts the NRR staff has participated in the following activities:

- . Provided interpretation of current Commission activities in the area of physical protection to associations of users of TRIGA reactors and plate-type fuel elements and to the ANS subcommittee (15.14) that has responsibility in the development of standards for physical protection of non-power reactors.
- . Participated in interagency discussions related to the use of highly enriched uranium (HEU) in research reactor fuels and is remaining cognizant of activities directed toward development of technology to reduce the enrichment of such fuel.

Proposed Plans:

A draft set of graduated physical security requirements proposed for non-power reactors has undergone internal review in the Offices of Nuclear Reactor Regulation, Standards Development, Nuclear Material Safety and Safeguards, and Inspection and Enforcement. The NRR staff is continuing in this effort by taking the following actions:

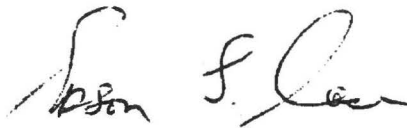
- . April 1 - May 15 - Assess the potential for radiological sabotage at the sites of the higher powered ( $\geq 1$  MW) non-power reactors as well as at the sites of representative types of research reactors of lower power. Simultaneously, evaluate the structure and provisions of the proposed requirements for adequacy of coverage against theft and/or sabotage, impact on the facility, and efficiency of implementation. In addition, the staff proposes to use these site visits to determine more quantitatively the safeguard risks that require the implementation of regulations (e.g. the risks posed by AGN reactors).
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- . May 15 - June 1 - Assess the need to provide protection for vital components of some non-power reactors against sabotage. If such a need is identified, a new amendment to Part 73 will be drafted to incorporate all requirements for protecting non-power reactors against sabotage and theft and thereby removing these licensees from the requirements of proposed sections §§73.20 and 73.47.
- . June 1 - June 15 - Submit the proposed amendment for NRC office concurrence.
- . Approximately June 15 - Submit the proposed amendment for Commission Action.

If the Commission decides to publish the proposed amendment to Part 73, the public and, specifically, the licensees of non-power reactors will be notified that implementation of the rule will consist of submittal of a revised security plan, based on the requirements of the amendment, for approval by the staff by a designated date and implementation by a subsequent date.

Coordination:

This paper has been developed by the Office of Nuclear Reactor Regulation and has been concurred in by the Offices of Standards Development, Inspection and Enforcement, Nuclear Materials Safety and Safeguards, and the Office of the Executive Legal Director.



Edson G. Case, Acting Director  
Office of Nuclear Reactor Regulation

Enclosures:

1. Summary of NRR Actions Relating to Safeguard Risks at Research Reactors
2. Summary Description of Proposed Amendment to 10 CFR Part 73 for Providing Physical Protection to Non-Power Reactors

Summary of NRR Actions Relating to Safeguard  
Risks at Research Reactors

- April, 1974 - Development of "Staff Interim Guidance" for organization and content of security plans for test reactors; low and medium power research and training reactors.
  - May 29, 1974 - Memo K. R. Goller to A. Giambusso, "Applicability of 10 CFR 73.50 to Research Reactors"
  - March 19, 1975 - Memo Commissioner Gilinsky to L. V. Gossick relating to safeguard procedures at university and other research reactors
  - June 16, 1975 - Memo Commissioner Gilinsky to L. V. Gossick, "Research Reactors"
  - July 24, 1975 - Commission briefing on Non-Power Reactors
  - January 22, 1976 - Commission briefing on Non-Power Reactors
  - January 26, 1976 - Memo S. J. Chilk to L. V. Gossick "Staff Requirements from briefing on Non-Power Reactors"
  - April 8, 1976 - Letter to Commissioners from Ben C. Rusche "Technical Feasibility and Impact of Restricting Non-Power Reactors to the Use of Low Enrichment Fuel"
  - May 25, 1976 - Memo Ernst Volgenau to R. B. Minogue "Request for 10 CFR.XX - Physical Protection of Non-Power Reactors"
  - June 21, 1976 - Memo R. B. Minogue to Ernst Volgenau (subject same as May 25, 1976 memo)
  - August 6, 1976 - Memo Ben C. Rusche to Management of ONRR "NRR Reactor Safeguard Program"
  - August 18, 1976 - Memo T. A. Rehm to Ben C. Rusche "Analysis of Safeguards Dangers at Research Reactors"
  - August 31, 1976 - Report of L. Bush and O. Chambers (IE) and R. Cudlin (NRR) to B. Rusche and E. Volgenau "Survey of Physical Security of Non-Power Reactors"
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- September 2, 1976 - Memo Ben C. Rusche to Commissioner Mason (subject same as August 18, 1976 memo)
  - September 3, 1976 - Memo H. D. Thornberg to D. J. Skovholt "Physical Security Improvements for Non-Power Reactors"
  - June 15, 1977 - Letter E. G. Case to Commissioner Mason (SECY-77-319) "Physical Protection of Non-Power Reactors"
  - June 30, 1977 - Memo S. J. Chilk to L. V. Gossick "Commission Guidance on SECY-77-319..."
  - July 22, 1977 - Memo from E. G. Case to S. J. Chilk "Response to Commission Guidance on SECY-77-310..."
  - October 27, 1977 - Memo W. J. Ross to V. Stello, "Status of Protection Provided to Non-Power Reactors"
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Enclosure 2

Summary Description of Proposed Amendment  
to 10 CFR Part 50 for Providing Physical  
Protection to Non-Power Reactors

The proposed rule is structured so that a specified minimum level of physical protection is required for all sites where SNM is used as fuel for research reactors. This basic level described in Paragraphs (a), (b) and (c) is considered to adequately protect facilities such as the 12 licensed AGN reactors where the SNM inventory is less than Category III and presents a minimally attractive target for theft.

The next two levels of protection are considered sufficient for facilities that possess non self-protecting SNM (as defined in §73.6) in amounts equivalent to "low" and "moderate" strategic significance as defined in proposed §73.47. SNM that is self-protecting by virtue of its radiation level is exempt from consideration in the calculation of a licensee's inventory. Inasmuch as a licensee is not required in Parts 70 and 73 to categorize its SNM inventory in terms of radiation level, the level of protection required for each licensed reactor will have to be established through a special inventory and report by the licensee before the staff reviews its security plan for compliance with the proposed rule, and subsequently, when a classification change is required or requested. The requirements in Paragraphs (a) through (d) are, at a minimum, equivalent to international standards for the protection of Category III SNM as defined in proposed §73.47 and INFCIRC/225 (published by the IAEA in July, 1977). Likewise, the requirements in Paragraphs (a) through (e) will equal or exceed international standards for Category II SNM. The specific requirements in Paragraph (e) are consistent with the criteria and format used in §73.55 and in proposed §§73.45 and 73.46 related to access control, detection and alarm systems and testing and maintenance programs.

The requirements in Paragraph (f) are intended to provide a level of protection of SNM equivalent to that now achieved with §§73.60. Most of these requirements are needed to insure that formula quantities of SNM (Category I in international standards) are processed under controlled conditions or stored in a repository of sufficient integrity to insure, with a high degree of reliability, against theft or diversion. This level of protection, and to a lesser extend the protection required in Paragraph (e), also includes specific criteria for contingency planning so that an adequate response capability is available to respond to an attempted theft of SNM.

The proposed rule also provides for protection against industrial (radiological) sabotage whenever this threat is considered possible.

Two studies have been contracted to determine if damage caused by sabotage can lead to the release of radiation in excess of that permitted in 10 CFR Part 100. Realistic mechanisms of fission product release indicate that Part 100 limits would not be exceeded at the majority of facilities where the power level is less than 1 MW. The analysis of pool-type reactors of higher power level has not been completed; however, if industrial sabotage is determined to be a real threat, the limited number of vital components must be protected from overt or covert terrorist activities by an enhanced system of barriers, alarms, access control and response capabilities. The result of the "in-depth" study will be available for use in evaluating the revised security plans to be submitted as implementation of the new rule.

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