

April 9, 1998

FOR: The Commissioners

FROM: L. Joseph Callan /s/
Executive Director for Operations

SUBJECT: DSI-24 IMPLEMENTATION: INNOVATIVE REGULATORY APPROACHES AND RISK-INFORMED, PERFORMANCE-BASED CONCEPTS APPLIED TO DECOMMISSIONING

PURPOSE:

To provide the Commission with the staff's plan for addressing innovative regulatory approaches to decommissioning, as requested in the Staff Requirements Memorandum (SRM), dated April 3, 1997, for Direction-Setting Issue No. 24 (DSI-24), "Power Reactor Decommissioning."

BACKGROUND:

The SRM, among other things, instructed the staff to consider innovative regulatory approaches to decommissioning. The SRM asked that the staff consider how decommissioning issues could be resolved more quickly and whether rulemaking activities could be consolidated. The staff was also asked to evaluate a performance-based approach to radiological site assessments and to consider whether placing an inspector on site during certain phases of decommissioning and centralizing the reactor decommissioning inspection program in headquarters would improve NRC oversight. Additionally, the Commission asked the staff to evaluate public comments that were obtained during the Strategic Reassessment that suggest improvements to existing practices and rulemakings. The Commission also asked the staff to consider lessons learned and available data from recently decommissioned facilities (e.g., survey costs).

CONTACT: Anthony W. Markley, NRR/PDND
415-3165

DISCUSSION:**1996 Decommissioning Rule**

The development of reactor decommissioning regulation and oversight has been affected by external events and recognition of the need for improving the regulation of the decommissioning program. In SECY-96-086, "Final Rulemaking--Revision to 10 CFR Parts 2, 50, and 51 Related to Decommissioning of Nuclear Power Reactors," the Commission adopted the current risk-informed regulatory regime for power reactor decommissioning.

This rule established a regulatory framework that provides an appropriate level of oversight, timely notification, opportunities for public information and participation, and a time frame for completing decommissioning activities. The level of oversight established is commensurate with the levels of risk encountered during decommissioning. Schedules and ground rules for licensee use of decommissioning trust funds were codified. Overall, these changes resulted in NRC and industry resource savings. The regulatory approvals for power reactor decommissioning include technical specification changes and other necessary license amendments, resolution of unreviewed safety questions and environmental impacts that fall outside of previous generic and specific environmental impact statements, and the license termination plan. Notifications and reports include preliminary decommissioning cost estimates, Post-Shutdown Decommissioning Activity Reports and updates, site-specific decommissioning cost estimates, 10 CFR 50.59 reports, event reports, FSAR updates, and license termination plan submittals. Other requirements, such as those concerning compliance with radiation protection standards, waste classification, and transportation of radioactive materials in 10 CFR Parts 20, 61, and 71, respectively, are also applicable.

The 1996 Decommissioning Rule requires license termination plan approval by license amendment. This provides a hearing opportunity for affected members of the public. The license cannot be terminated until the terms and conditions specified in the license termination plan, amendment, and those specified as a result of hearings, have been satisfied. The NRC officially terminates the license by letter stating that the terms and conditions of the license termination have been satisfied and that the license has been terminated.

Consideration of Public Comments

The staff has reviewed the public comments on DSI-24 to (1) consider the views of the public on the "innovative regulatory approaches" to decommissioning mentioned in the Commission's April 3, 1997, SRM, and (2) identify any additional innovative regulatory approaches for staff consideration, beyond those mentioned in the SRM. The staff evaluation of the public comments is presented in Attachment 2. Additionally, the staff reviewed NUMARC (Nuclear Utility Management and Resources Council, predecessor of the Nuclear Energy Institute (NEI)) 92-02, "Regulatory Process for Decommissioning Prematurely Shutdown Plants⁽¹⁾," for other suggestions.

Although the public seemed receptive and supportive of "innovative regulatory approaches" to improving the reactor decommissioning regulatory program, it offered few concrete ideas. The staff review did not reveal any innovative or improved approaches to decommissioning regulations beyond those identified in the April 3, 1997, SRM. The staff held a public meeting with NEI on April 1, 1998 to discuss decommissioning issues. The staff and NEI agreed to hold periodic public meetings to discuss issues and potential innovative approaches to the decommissioning process. Further, as the staff proceeds with the various rulemakings described in this paper, should other commenters or stakeholders request to meet with the staff to discuss decommissioning issues, the staff will arrange such meetings similar to the interactions held with NEI.

Rulemaking

The Commission requested that "the staff should accelerate resolution of decommissioning rulemaking issues and consider the option of combining several rulemakings into a single rulemaking, or a few integrated rulemakings, if practicable. Risk-informed, performance-based approaches to these rulemakings should be used only to the extent that the staff is ready to proceed with such an approach now."

A review of ongoing rulemakings for permanently shutdown nuclear power reactors indicated that some of the pertinent rule changes to resolve decommissioning issues are in an advanced stage of development. Ongoing rulemakings include (1) revised rules for decommissioning financial assurance (deregulation issues), (2) safeguards for spent nuclear fuel in independent spent fuel storage installations, (3) financial protection requirements (insurance and indemnity), (4) emergency preparedness requirements for permanently shutdown plants, (5) required unit staffing levels for plants undergoing decommissioning, and (6) revised rules to allow the use of site-specific decommissioning cost estimates. The staff has reviewed the possible consolidation of decommissioning rulemakings. However, due to the different types of issues involved and since the various rulemakings are at different stages of the process, the staff believes that consolidation of decommissioning rulemakings could increase resources and time necessary to resolve some issues.

There are several areas for which additional rulemaking may be required to clarify or reduce regulatory requirements. These include safeguards for permanently shutdown reactors with spent fuel in the spent fuel pool, the content of decommissioning facility FSARs, the criteria by which permissible changes are evaluated, and inclusion of accident scenarios in the FSAR that are pertinent to decommissioning. Evaluation of safeguards requirements at decommissioned reactors could permit the promulgation of a decommissioning safeguards rule that is risk-informed, obviates the current need for exemptions, and allows an orderly reduction of the operating reactor safeguards program.

The release of materials from licensed facilities appears to merit a risk-informed approach to rulemaking. Insignificant safety benefits have been realized from the expenditure of agency and licensee resources associated with this issue. This issue is presently before the Commission in SECY-98-028, "Regulatory Options for Setting Standards on Clearance of Materials Having Residual Radioactivity," dated February 19, 1998. SECY-98-028 addresses release of metals and concrete. The staff is reviewing the criteria for release of other materials (soil, fill, trash, etc.).

Decommissioning Guidance and Reexamination of 10 CFR 50.59

The staff is engaged in ongoing activities to provide guidance for the implementation of the 1996 Decommissioning Rule. Guidance that is nearly completed or has been issued includes (1) an overview of the decommissioning process, (2) a standard format and content guide for Post-Shutdown Decommissioning Activities Reports, (3) a standard review plan on power reactor licensee financial qualifications and decommissioning funding assurance, (4) a regulatory guide for decommissioning fire protection programs, (5) standardized technical specifications for permanently defueled pressurized water reactors (PWRs), (6) a question-and-answer document for the public on decommissioning, and (7) a standard format and content guide for License Termination Plans. Also, a Standard Review Plan for Decommissioning Power Reactors and a Standard Review Plan for Evaluating Part 50 License Termination Plans are under development. Decommissioning power reactor inspection and inspector qualification programs are being revised. Schedules are addressed in the operating plans.

Since the implementation of the 1996 Decommissioning Rule, reactor licensees planning to decommission one or more nuclear reactors have used the 10 CFR 50.59 process to make changes to their facilities without prior NRC review and approval. These changes are allowed without a license amendment, provided that they do not involve a change to the technical specifications or an unreviewed safety question. Recent experience with using 10 CFR 50.59 in decommissioning indicates that maintaining the operating reactor accident design basis as a reference for evaluation could be improved upon. The staff intends to determine if different criteria should be developed for reactor decommissioning.

Schedules and Budgetary Considerations

The staff evaluated the above rulemaking efforts and proposed decommissioning guidance against the FY99 budget. The FY99 budget for NRR reactor decommissioning activities includes an \$800K increase over the FY98 level of \$200K to accommodate DSI-24 activities. The FY99 budget for NMSS includes 1.0 FTE for DSI-24 support. The staff plans to use the FY99 resources (\$1,000K and approximately 2 FTE) to perform or accelerate the following activities:

- (1) develop guidance for the preparation of preliminary and site-specific decommissioning cost estimates (final in FY00),
- (2) develop decommissioning FSAR conversion guidance (final in FY00),
- (3) reevaluate the current safety review guidance and applicability of the 10 CFR 50.59 process to decommissioning (final in FY00),
- (4) accelerate the ongoing emergency preparedness rulemaking for permanently shutdown reactors (final in FY00),
- (5) accelerate the permanently shutdown reactor operators and unit staffing rulemaking (final in FY00),
- (6) accelerate the site specific decommissioning cost estimate rulemaking (final in FY00), and
- (7) accelerate the decommissioning safeguards rulemaking (final in FY00).

For FY00, the staff plans to perform or accelerate the following activities. Resource requirements will be addressed during the upcoming FY00 program-based budget review.

- (1) complete activities scheduled for FY00 as described above,
- (2) initiate guidance development for free release of material from facilities undergoing decommissioning,

- (3) initiate the decommissioning FSAR content and safety review (10 CFR 50.59) rulemaking (final in FY01).

Using Resident Inspectors During Extended Dismantlement

The experience with extended dismantlement activities has been similar to experiences with operating facilities in extended outages. Onsite inspection should be conducted for radiological characterizations, decontamination, and dismantlement; decommissioning planning and safety evaluations; engineering, heavy loads, and residual operations; disposal of major structures, systems, or components; and radiological surveys in support of license termination. The staff notes that when resident inspectors were not available for oversight of dismantlement activities, headquarters and regional personnel have provided this oversight. Subject matter experts, specialist inspectors, and project managers will continue to provide periodic oversight during extended active dismantlement periods. This practice has been coordinated with the regions to ensure effective use of resources.

The disadvantages of placing an inspector on site during extended dismantlement periods involve administrative issues and availability of inspectors. The advantages include NRC resident inspector oversight during the dismantlement process and potential credibility gains with State and local officials and interested citizens.

The staff does not recommend continuous resident inspector coverage at permanently shutdown reactor facilities for the entire period that the reactor is undergoing decommissioning. Resources for placing resident inspectors at facilities during extended dismantlement periods are not currently budgeted.

Although the SRM did not address using resident inspectors immediately following permanent cessation of operations, the staff has found it beneficial, on a case-by-case basis, to maintain a resident inspector on site during the first year or so following cessation of operations. The presence of a resident inspector at the initial decommissioning stage provides continuity and a historical knowledge for closing out operational and regulatory issues, especially at facilities with troubled regulatory histories. The resident can also inspect initial planning and dismantlement activities, review safety evaluations, and serve as the onsite contact for coordination and facilitation of decommissioning public meetings. Maintaining resident inspectors at prematurely shutdown facilities on a temporary basis will not require additional resources since these are budgeted and the individuals are located at the site.

Centralizing the Reactor Decommissioning Inspection Program

The staff has evaluated the Commission's request to consider centralizing the reactor decommissioning inspection program in headquarters. Current and past practices with regard to using regional inspectors at decommissioning reactor sites were considered. The regions have effectively conducted reactor decommissioning inspections and strongly support maintaining the inspection programs therein. Accordingly, the staff recommends that the reactor decommissioning inspection program be retained in the regions for the foreseeable future. However, should an extensive number of premature plant shutdowns occur in the next several years, this issue may require future reexamination.

The most significant concerns against centralizing the reactor decommissioning inspection program are maintaining staff qualifications and institutional knowledge, opportunity to integrate independent spent fuel storage installation (ISFSIs) inspections with decommissioning inspections, and long-term resource utilization. Regarding staff qualifications and institutional knowledge, a reactor decommissioning inspection program

with its infrastructure would have to be established in headquarters. Since some individuals might not transfer to headquarters, assignment and qualification of new inspectors would be required. The loss of personnel who are familiar with the respective sites could also impact short-term headquarters inspection effectiveness. Relocation of the inspection program to headquarters, while streamlining activity coordination, could create new coordination requirements, particularly at permanently shutdown facilities that are co-located with operating facilities. Integrating inspection efforts for ISFSIs and decommissioning reactor facility inspections was also deemed an advantage for maintaining reactor decommissioning inspection in the regions. In addition, retaining inspectors in the regions would promote consistency between the reactor and materials decommissioning inspection programs.

Consideration of Certain Financial Issues Related to Decommissioning

The staff review of the decommissioning regulatory program identified two additional financial issues: (1) funding adequacy during decommissioning, and (2) extension of 10 CFR Part 171 fees to licensees of permanently shutdown reactors. As discussed below, both of these issues are being addressed in ongoing staff initiatives. Thus, the staff recommends that these issues continue to be evaluated separately from DSI-24.

Adequate Funding During Decommissioning

The NRC rulemaking effort on decommissioning funding assurance, in light of industry restructuring, has addressed several possible new methods of providing decommissioning funding assurance. (See the Advance Notice of Proposed Rulemaking on Financial Assurance Requirements for Decommissioning Nuclear Power Reactors (61 FR 15427; April 8, 1996); and the Proposed Rule on Financial Assurance Requirements for Decommissioning Nuclear Power Reactors (62 FR 47588; September 10, 1997).) These methods include:

- accelerated payment of decommissioning costs;
- a government-sponsored premature decommissioning fund;
- revisions to the financial tests for parent-company and self guarantees;
- long-term contracts; and
- federal and State legislative approaches.

In addition, the staff is reevaluating the basis by which decommissioning costs should be estimated to comply with NRC funding assurance requirements. As directed by the Commission in the SRM dated February 5, 1998, the staff will incorporate actual decommissioning cost data from larger LWRs (e.g., Trojan). As those data become available, the staff will assess the continued viability of the use of generic formulas in 10 CFR 50.75(c) to establish minimum decommissioning funding levels.

Imposition of 10 CFR Part 171 Fees to Permanently Shutdown Reactor Licensees

The imposition of annual fees for decommissioning reactor licensees was identified as an issue that requires further evaluation. Generic decommissioning and decommissioning reclamation activities provide a benefit to both licensees who are authorized to operate and pay annual fees, and licensees in decommissioning who do not pay annual fees. The issue of fee obligations for spent fuel storage in a wet spent fuel pool at a permanently shutdown reactor facility will also be evaluated. Because of the ongoing efforts in the OCFO and issues discussed in SECY-98-034, "FY1998 Proposed Fee Rule," the program offices will support the OCFO in addressing this issue.

Radiological Assessment

The staff reviewed radiological assessment programs used for determining the acceptability of radiological surveys in support of license termination activities. Experience with the Shoreham project indicated that performing a radiological assessment after the completion of licensee activities was time consuming and expensive for both the licensee and the NRC. The identification of problems with a licensee radiological assessment late in the process resulted in delays because, in some cases, the licensee had to perform additional remediation activities and resurveys to meet release criteria. The staff experience indicates that waiting until the completion of licensee final surveys to perform confirmatory surveys is neither performance-based nor efficient. For the Fort St. Vrain decommissioning effort, NRC implemented an "in process" confirmatory survey approach to observe licensee survey procedures and instrumentation controls as the surveys were performed. This streamlining allowed NRC to identify problems earlier, reduce costs, and build a higher confidence in the licensee survey results.

The staff collaborated with the Environmental Protection Agency, the Department of Energy, and the Department of Defense over the past 4 years to develop a methodology for planning, conducting, evaluating, and documenting environmental radiological surveys to demonstrate compliance with dose-based regulations. The result of this collaboration is the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM). The objective of MARSSIM was to describe standardized, consistent, and efficient approaches for surveys to provide a high degree of assurance that established dose-based release criteria, limits, guidelines, and conditions of the regulatory agencies are satisfied at all stages of the process. A review of radiological assessments, experiences, and approaches is provided in Attachment 3. The MARSSIM was issued as a final document in January 1998.

COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objection. The Office of the Chief Financial Officer has reviewed this Commission paper for resource implications and has no objections. The Office of the Chief Information Officer has reviewed this Commission paper for information technology and information management implications and concurs in it.

RECOMMENDATION:

Unless otherwise directed by the Commission, the staff will maintain the decommissioning inspection program in the regions, maintain an ongoing dialog with NEI and other stakeholders, as requested, regarding innovative approaches to decommissioning, and accelerate the completion of decommissioning-related rulemakings and guidance as described above.

L. Joseph Callan
Executive Director for Operations

Attachments: 1. [Consideration of Strategic Reassessment Public Comments](#)
 2. [Radiological Assessment](#)

ATTACHMENT 1

Consideration of Strategic Reassessment Public Comments

The NRC staff review of public comments on DSI-24 noted several possible new approaches:

(1) The Office of Energy of the State of Oregon, the Oregon Health Division, and the Portland General Electric Company (PGE, the licensee for the Trojan plant) urged the Commission to modify its rules to allow for easier transport of reactor vessels with reactor internals installed and other large components. PGE requested that the Commission provide clear guidance to the staff to support the licensing and transportation of large reactor components as Type B packages. Transport of intact reactor vessels was stated to result in cost savings, conservation of decommissioning funds, lower radiation dose, and reduced complications in the decommissioning process caused by the contamination from the removal process.

The staff took no further action on these comments at this time because disposal of the Trojan reactor vessel with the installed internals has been the subject of two previous Commission papers, and will be addressed on the basis of analyses conducted and considerations set forth in those papers.

(2) Westinghouse Energy Systems suggested that the NRC should develop proposed criteria for "current realistic decommissioning activities." Current criteria assume that reactors will either be safe-stored or decommissioned. The lack of offsite spent fuel storage programs and the reduction of waste storage facilities force many utilities to partially decommission their plants, an activity that is not explicitly covered by existing regulatory criteria. The commenter urged the NRC to develop additional criteria or guidance to help in eliminating uncertainties for utility planning.

The staff is currently providing regulatory guidance to the reactor decommissioning community regarding the recently revised decommissioning rules. The 1996 rule made the decommissioning process more flexible and should mitigate the concerns expressed by Westinghouse. The staff also notes that the 1996 Decommissioning Rule does not prohibit a combination of safe storage and active dismantlement. Nevertheless, the staff will review the regulatory guidance being issued and ensure that, wherever practicable, guidance is developed regarding partial decommissioning and changing decommissioning alternatives. Draft Regulatory Guides DG-1067, "Decommissioning of Nuclear Power Reactors" and DG-1071, "Standard Format and Content for Post-Shutdown Decommissioning Activities Report" address these concerns.

(3) Dade Moeller & Associates urged the NRC to apply the "open market trading rule" to the decontamination and decommissioning of commercial nuclear power plants. Moeller advocated use of an "emission trading process" similar to the process used by the EPA to allow industry to control pollutants in the most cost-effective manner. Under this process, if one company can control its releases of a given pollutant more cheaply than another, it is wiser for the second company to assist the first than to spend money to reduce its own releases. Applied to decommissioning, this process would allow a reactor operator to reduce radiation doses to the local population by mitigating other sources of radiation exposure, such as indoor radon exposure.

The NRC requires each licensee to maintain both occupational exposure and environmental releases as low as reasonably achievable (ALARA). The establishment of emissions trading as recommended does not comport with the ALARA requirements and is not within the legislative jurisdiction granted to the NRC because it deals with regulation of overall radiation exposure, from NRC-regulated and non-NRC-regulated sources.

(4) Detroit Edison commented that the NRC should ensure that decommissioning rulemaking properly addresses all shutdown reactors and not just large, recently shutdown plants. Some power reactors have been shut down for more than 20 years and last operated in a different regulatory climate. Recent rulemaking attempts to standardize the requirements for future shutdowns are helpful, but the impacts on some previously shutdown plants are not recognized or addressed.

The staff appreciates the licensee's concern for potential impacts caused by the establishment of generic positions and rulemakings. Decommissioning has been a learning process for both the agency and the industry. The regulations, as amended in 1996, already provide some flexibility in their application to older reactors; for example, the recognition in 10 CFR 50.82(a)(9)(i) that older reactors may not have had FSARs. The staff will take these comments under consideration for future rulemaking and guidance development activities. The staff notes, however, that regulatory effectiveness and efficiency, as well as public health and safety considerations, may favor generic treatment in most instances of all reactors in decommissioning.

Conclusion:

Although the public seemed receptive to "innovative approaches" to improving the regulatory regime for reactor decommissioning, few ideas were presented. Apart from the issues just described, the staff review of the public comments found no new innovative approaches applicable to DSI-24 that had not already been addressed by the Commission in its April 3, 1997, SRM.

ATTACHMENT 2

Radiological Assessment

The formal decommissioning process begins when a licensee decides to terminate licensed activities. Although the majority of materials licenses terminated each year by NRC involve little or no site remediation, the staff reviews several major decommissioning actions each year that involve complex issues such as large areas of ground contamination, contaminated groundwater, large contaminated buildings, etc. This experience has formed a basis for decommissioning inspections at power reactors. License termination at a nuclear power reactor facility is complex because contamination may have spread into various areas within the facility and surrounding areas by movement of materials and equipment, by activation, and by the dispersion of air, water, or other fluids through or along piping, equipment, walls, floors, and drains. Such areas are decontaminated in order to reduce residual radioactivity to acceptable levels for license termination.

NRC regulations in 10 CFR 50.82 require a power reactor licensee to remove its facility from service safely. As part of the decommissioning process, licensees are required to demonstrate that residual radioactivity in facilities and the environment has been reduced to acceptable levels. Typically, licensees demonstrate compliance with radiological criteria for license termination by conducting final status surveys of the site or facility and reporting the survey results to NRC for evaluation. Where appropriate, the NRC staff conducts confirmatory surveys to verify that lands and structures have been adequately remediated.

On July 21, 1997, the NRC amended the regulations in 10 CFR Part 20 to include explicit radiological criteria for decommissioning (62 FR 39057). Subpart E of 10 CFR Part 20 contains dose-based radiological criteria for restricted and unrestricted release, establishing a total effective dose equivalent limit for residual radioactivity above background. These regulations replace earlier NRC guidance based on surface and volume activity concentration limits for specific radionuclides.

To implement the dose criteria in the amended 10 CFR Part 20, final status surveys and confirmatory surveys must be capable of detecting very low levels of residual radioactivity in the presence of background. An essential component of such surveys is a statistical methodology that is appropriate for

radiological data at or near background levels.

The methodology used to conduct surveys has been improved over the years. In 1990, the staff began an effort to upgrade NRC's guidance on acceptable methods for performing surveys to demonstrate that a site meets NRC's decommissioning criteria. This effort was a part of the NMSS Site Decommissioning Management Plan. Draft NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination," published in June 1992, was used as the basis for developing the final survey plans for the Shoreham and Fort St. Vrain power plants. These final survey plans required NRC approval.

In 1994, the NRC, in cooperation with the Environmental Protection Agency, the Department of Energy, and the Department of Defense, initiated an effort to develop the "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM). The purpose of MARSSIM was to update final survey guidance, considering the requirements of NRC's (and EPA's) then-draft decommissioning rules. It was the intent of the NRC not to finalize NUREG/CR-5849, but instead to participate in the development of MARSSIM with the intent of allowing MARSSIM to supersede NUREG/CR-5849. The MARSSIM was published as a draft for public comment in December 1996. Comments have been reviewed by the MARSSIM committee and the manual has been revised. The staff intends to endorse MARSSIM as the primary guidance document for final surveys by referencing it in the regulatory guide that is currently being developed to implement the final rule on "Radiological Criteria for License Termination." The MARSSIM was issued as a final document in January 1998.

The Data Quality Objectives (DQO) process in MARSSIM is used for the planning of final site surveys. This process details methods for determining the number of samples needed to obtain statistically valid comparisons with decommissioning residual radioactivity criteria and methods for conducting the statistical tests with the resulting sample data. The DQO process will allow licensees to select data confidence levels that are commensurate with risk and cost. Decreasing the required confidence level results in a decreased sample size. However, the increase in flexibility allowed in MARSSIM comes at the cost of greater complexity, which may make the survey planning process somewhat more difficult. An increase in the effort required at the planning stage will be offset by some gains resulting from decreased sample size. The extent of this increased effort is not known, but should be relatively low. Also, any increased costs associated with performing surveys to determine if the material meets the regulatory requirements and can thus remain in place are expected to be more than offset by a reduction in the costs associated with the handling, packaging, transporting, and disposal of the material as radioactive waste. As costs for the disposal of radioactive waste increase, the cost-effectiveness of the MARSSIM methodology will also increase.

It is expected that the MARSSIM method for survey design will reduce the number of measurements required during the final status survey and allow decommissioning power reactors and materials licensees to meet regulatory requirements more easily than the NUREG/CR-5849 methodology. This is primarily due to the difference in the method for addressing small areas of elevated contamination (hot spots) and collecting only the data needed to meet the defined goals of the final survey. Because the Radiological Criteria for License Termination Rule is dose based, MARSSIM will be able to implement a dose-based approach to hot-spot surveys. This method will be effective because the instruments routinely used to perform surveys of building surfaces contaminated with fission and activation products have detection sensitivities that should detect surface contamination levels well below that expected to comply with the residual criteria rule. Another advancement in MARSSIM, which produces efficiencies for licensees, is the use of nonparametric statistical analysis, which does not require prior knowledge of the distribution of the target data being analyzed. The nonparametric statistical approach, which will be published in NUREG-1505 in early 1998, is expected to be simpler and more cost effective for designing and analyzing of final status decommissioning surveys when radiological criteria for decommissioning approach background radiation levels.

Along with the residual criteria for license termination rulemaking and associated guidance documents, the staff continues to work toward streamlining its approach for ensuring the accuracy and representativeness of the final survey data. For example, during the decommissioning of the Shoreham reactor, the staff used a contractor to perform a radiological assessment when the facility was ready to be released and the license terminated. The cost of the contractor support was approximately \$700,000. During the decommissioning of the Fort St. Vrain reactor, the staff modified the approach. At Fort St. Vrain, NRC conducted inspections of the licensee's final survey program while the survey was in progress. The inspections focused on the program's quality assurance, operating procedures, training, technical bases, and data management. The number of confirmatory measurements conducted by the contractor was significantly reduced, but some contractor support was shifted to provide expert technical assistance to NRC inspectors in reviewing the program. The contractor cost for Fort St. Vrain was reduced to about \$200,000, even though the number of measurements made by the licensee was 50 percent greater. In addition to the reduction in cost, a significant advantage to the streamlined approach was that the licensee and NRC resolved all major problems and issues well before the project was ended and the final survey report was issued. This gave both the licensee and NRC confidence that there would be no delay at the end of the project (a confidence not possible when problems are identified by confirmatory surveys at the end of the project). Most important, the staff's confidence level in the quality and accuracy of the final survey data at Fort St. Vrain was as high as that gained through the "end of project" survey performed at Shoreham.

1. The NUMARC document provided guidance regarding the processes and issues under the 1988 Decommissioning Rule. Many of the issues identified in the NUMARC document either have been addressed by the 1996 Decommissioning Rule or are being addressed in ongoing rulemaking activities related to emergency preparedness for decommissioning, financial assurance for decommissioning, etc. Beyond these, no new ideas or regulatory approaches were identified.