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Final Generic Environmental Impact Statement
on decommissioning of nuclear facilities

U.S. Nuclear Regulatory Commission

Office of Nuclear Regulatory Research

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OFFICE OF THE SECRETARY RULEMAKINGS AND ADJUDICATIONS STAFF

U.S. NUCLEAR REGULATORY COMMISSION
In the Matter of Louisiana Energy Services, LP
Docket No. 70-3103-ML Official Exhibit No. Staff S4-M
OFFERED by: Applicant/Licensee Intervenor
NRC Staff Other
IDENTIFIED on 3/10/06 Witness/Panel Staff Financial Assurance
Action Taken: ADMITTED REJECTED WITHDRAWN
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For research and test reactors and for nuclear facilities licensed under 10 CFR Parts 30, 40, 70, and 72, occupational doses would be in most cases much less significant than power reactors. Thus, completing decommissioning shortly after cessation of operations is considered the most reasonable option. Delaying completion of decommissioning to allow short lived nuclides to decay may be justified in some cases, however, any extended delay would rarely be justifiable.

Financial Assurance. Consistent with the regulatory objective of decommissioning as described above, reasonable assurance is required from the nuclear facility licensee that adequate funds are available to decommission the facility. The funding mechanisms considered reasonable for providing the necessary assurance include prepayment of funds into a segregated account, insurance, surety bonds, letters of credit, and certain other guarantee methods, and a sinking fund deposited into a segregated account.

Planning. Planning for decommissioning is a critical item for ensuring that the decommissioning activities can be accomplished in a safe and timely manner. Development of detailed plans at the application stage is not possible because many factors (e.g., technology, regulatory requirements, economics) will change before the license period ends. Thus, most of the planning for the actual decommissioning will occur near final shutdown. However, a certain amount of preliminary planning should be done at the application stage.

Information on decommissioning funding provisions must be submitted with an application for a license for a nuclear facility. This information should include the method of assuring funds for decommissioning (as discussed above under Financial Assurance) and an indication of the amount being set aside. Provisions should also be made to adjust cost levels and associated funding levels over the life of the facility.

Facilitation of decommissioning in the design of a facility or during its operation can be beneficial in reducing operational exposures and waste volumes requiring disposal at the time of decommissioning. Although many aspects of facilitation can be covered under existing regulations, specific requirements that records of relevant operational and design information important to decommissioning be maintained should be added.

A final detailed decommissioning plan is required for review and approval by the NRC prior to cessation of facility operation or shortly thereafter. Besides the description of the decommissioning alternative which will be used, the final plan should include a description of the plans to ensure occupational and public safety and to protect the environment during decommissioning; a description of the final radiation survey to ensure that remaining residual radioactivity is within levels permitted for releasing the property for unrestricted use; an updated cost estimate; and for certain facilities as appropriate a description of quality assurance and safeguards provisions. The plan should include an estimate of the cost required to accomplish the decommissioning.

Residual Radioactivity Levels. The selection of an acceptable level is outside the scope of rulemaking supported by this EIS. The Commission is participating in an EPA organized interagency working group which is developing Federal guidance on acceptable residual radioactivity for unrestricted use. Proposed Federal guidance is anticipated to be published by EPA. NRC is planning to

It is imperative that these decommissioning rule amendments in 10 CFR Parts 30, 40, 50, 70, and 72 be issued at this time because it is important to establish financial assurance provisions, as well as other decommissioning planning provisions, as soon as possible so that funds will be available to carry out decommissioning in a manner which protects public health and safety. Based on this need for the decommissioning rule and provisions currently existing and those contained in the rule amendments, the Commission believes that the rule can and should be issued now.

2.6 Financial Assurance

The primary objective of the NRC with respect to decommissioning is to protect the health and safety of the public. An important aspect of this objective is to have reasonable assurance that, at the time of termination of facility operations, adequate funds are available to decommission the facility in a safe and timely manner resulting in its release for unrestricted use, and that lack of funds does not result in delays in decommissioning that may cause potential health and safety problems for the public. The need to provide this assurance arises from the fact that there are uncertainties concerning the availability of funds at the time of decommissioning. The nuclear facility licensee has the responsibility for completing decommissioning in a manner which protects public health and safety. Satisfaction of this objective requires that the licensee provide reasonable assurance that adequate funds for performing decommissioning will be available at the cessation of facility operation.

2.6.1 Present Regulatory Guidance

Present regulatory requirements concerning the degree of financial assurance required of a licensee are not specific enough. 10 CFR 50.33(f) requires that, except for an electric utility applicant for a license to operate a utilization facility, an applicant for a production or utilization facility operating license demonstrate financial capability both to operate the facility and to shut it down and maintain it safely. 10 CFR 50, Appendix F, requires the applicant for a fuel reprocessing plant operating license to demonstrate his financial qualifications "to provide for removal and disposal of radioactive wastes during operation and upon decommissioning." 10 CFR 72 requires an applicant for a license for an independent spent fuel storage installation to provide information on funding for decommissioning. These regulations do not contain sufficient criteria for assuring funds for decommissioning the facilities covered by this EIS.

2.6.2 Implementation of Financial Assurance Requirements

In providing reasonable assurance that funds will be available for decommissioning, there are several possible financing mechanisms, outlined below, which are available to applicants and licensees. The many different types of nuclear facilities present a wide diversity in the cost of decommissioning, in the risk that decommissioning funds might be unavailable, and in the licensees' financial situations. This diversity necessitates that the NRC allow latitude in the implementation of these financing mechanisms. For example, the situation for a large power reactor can be significantly different from that for a small research or testing facility or for a materials license. Generally, for a power reactor, state utility commissions regulate retail rates and the Federal Energy Regulatory Commission regulates wholesale rates, permitting utilities to

recover the cost of providing electricity from their customers. The decommissioning costs are higher than for small facilities, and the licensees are required by 50 CFR 10.54(w) to carry substantial levels of insurance for post-accident decontamination and cleanup. This is significantly different than the situation for a small non-fuel-cycle facility which is not rate regulated and has low decommissioning costs.

In analyzing funding methods, the NRC has developed the following major classification of funding alternatives.

(1) Prepayment - The deposit prior to the start of operation into an account segregated from licensee assets and outside the licensee's administrative control of cash or liquid assets such that the amount of funds would be sufficient to pay decommissioning costs. Prepayment could be in the form of a trust, escrow account, government fund, certificate of deposit, or deposit of government securities.

(2) Surety bonds, letters of credit, lines of credit, insurance, or other guarantee methods - These mechanisms guarantee that the decommissioning costs will be paid should the licensee default. The licensee still must provide funding for decommissioning through some other method. It appears questionable that surety methods of the size necessary and for the time involved with power reactors will be available. However, they appear to be available for facilities that involve smaller costs and periods. The contractual arrangement guaranteeing the surety methods, insurance, or guarantee must include provisions for insuring that these methods will in fact result in funds being available for decommissioning. It should be kept in mind that sureties would only be called if at the time of cessation of facility operation or impending discontinuance of surety by the guarantor, licensee decommissioning funds were inadequate or unavailable.

(3) External sinking funds - A fund established and maintained by setting funds aside periodically in an account segregated from licensee assets and outside the licensee's administrative control in which the total amount of funds would be sufficient to pay decommissioning costs at the time termination of operation is expected. An external sinking fund could be in the form of a trust, escrow account, government fund, certificate of deposit, or deposit of government securities. The weakness of the sinking fund approach is that in the event of premature closure of a facility the decommissioning fund would be insufficient. Therefore, the sinking fund would have to be supplemented by insurance or surety bonds, or letters or lines of credit or other guarantee methods of item (2).

(4) Internal reserve or unsegregated sinking fund - A fund established and maintained by the periodic deposit or crediting of a prescribed amount into an account or reserve which is not segregated from licensee assets and is within the licensee's administrative control in which the total amount of the periodic deposits or funds reserved plus accumulated earnings would be sufficient to pay for decommissioning at the time termination of operation is expected. In this mechanism, the funds are not segregated from the utility's assets, rather they may be invested in utility assets and, at the end of facility life, internal funds are used to pay for decommissioning by, for example, issuance of bonds against licensee assets and the funds raised are used to pay for decommissioning. An internal reserve may also

be in the form of an internal sinking fund which is similar to an external sinking fund except that the fund is held and invested by the licensee. Such a mechanism is generally considered to be less expensive in terms of net present value than the options listed above, although, as discussed below, whichever funding mechanism is used should not have a significant impact on the revenue requirements. The problem with the internal or unsegregated funding method is the lesser level of assurance that funds will be available to pay for decommissioning than the other mechanisms because this method depends on financing internal to the licensee, and therefore, is vulnerable to events that undermine the financial solvency of a utility.

The NRC has considered the use of all of these methods, and in particular internal reserve, in several documents. These include NUREG-0584, Revs. 1-3, "Assuring the Availability of Funds for Decommissioning Nuclear Facilities,"[7] NUREG/CR-1481, "Financing Strategies for Nuclear Power Plant Decommissioning,"[8] and NUREG/CR-3899, "Utility Financial Stability and the Availability of Funds for Decommissioning"[9]. In addition, the Commission held a meeting soliciting public and industry views of decommissioning on September 18, 1984 and the NRC staff has reviewed comments in the area of financial assurance submitted on NUREG-0586, "Draft Generic Environmental Impact Statement on Decommissioning Nuclear Facilities" and submitted in response to the proposed rule on decommissioning (50 FR 5600)[10]

These reports and meetings and public comments considered several factors regarding availability of funds for public utilities in the United States. One factor is that utilities are large, very heavily capitalized enterprises whose rates are comprehensively regulated by the State Public Utility Commissions (PUC) and the Federal Energy Regulatory Commission (FERC). This factor permits the utilities to charge reasonable rates subject to reasonable regulation and rules. In addition, the Commission has taken action recently in the promulgation of 10 CFR 50.54(w) to set requirements to establish onsite property damage insurance for use after an accident. Although these insurance proceeds would not be used directly for decommissioning, they would reduce the risk of a utility being hit by a large demand for funds after an accident. Most utilities are now carrying insurance well in excess of $1 billion. Other factors considered are the long time period before decommissioning takes place during which time reasonable assurance of funds for decommissioning must be maintained, as well as concerns regarding utility solvency and potential problems regarding availability of funds which may occur as a result of bankruptcy.

Before publication of the proposed rule, the NRC evaluated the adequacy of various funding methods in light of financial problems encountered by some utilities which, faced with lower growth in electricity demand than they projected and rapidly increasing costs of construction, had been forced to cancel nuclear plants in advanced stages of construction and the ramifications these conditions, as well as issues related to bankruptcy, could have on a utility's ultimate ability to pay for decommissioning. Details of this evaluation are contained in NUREG/CR-3899, (Ref. 9) prepared by an NRC consultant, Dr. J. Siegel of the Wharton School, University of Pennsylvania.

Based on the results of NUREG/CR-3899 in which it is indicated that internal reserve can be a valid funding method and on the considerations discussed in the Supplementary Information to the Proposed Rule, the proposed decommissioning

rule permitted a range of options, including internal reserve, for providing assurance that sufficient funds are available for decommissioning. However, the Supplementary Information to the proposed rule noted that the regulatory approach for assuring funds for decommissioning had been particularly difficult to resolve and specifically requested additional information and comments in this area. In particular, the Supplementary Information stated that:

> "More specifically, Commissioners Asselstine and Bernthal continue to be concerned about the vulnerability of the internal funding mechanism for decommissioning funds, particularly where the funds are used to purchase assets or reduce existing debt."

Based on this concern, Commissioners Asselstine and Bernthal requested "public comments on the need to consider the possibility of insolvency and its impact on the continued availability of decommissioning funds."

Although commenters did not generally refer specifically to the separate request for comment by Commissioners Asselstine and Bernthal, a number of comments, noted above, were received in this area. Those who disagreed with the inclusion of internal reserve in the rule cited problems with liquidity of the internal reserve and with the future financial viability of utilities with resultant problems in providing decommissioning funds, and stated that the level of assurance is inadequate. In contrast, other commenters agreed with the use of internal reserve citing the fact that the likelihood of instability and insolvency is remote, that utilities have investments, cash flow, and annual earnings which are large in comparison to decommissioning cost, and that the internal reserve does provide reasonable assurance.

As part of the review of the comments, NRC has had NUREG/CR-3899 updated to consider the current situation in the utility industry. This analysis is contained in NUREG/CR-3899, Supplement 1, (Ref. 9) which reviewed six utilities which have been subject to severe financial distress. Based on the analysis, NUREG/CR-3899, Supp. 1 indicates that, since NUREG/CR-3899 was published in 1984, the financial health of the nuclear utilities has improved, with the exception of Public Service of New Hampshire (PSNH), and that from a financial standpoint, use of internal reserve currently provides sufficient assurance of funds for decommissioning. The basis for this conclusion is the fact that the likelihood of future crises developing, although not impossible, is extremely remote; that the total market value of the securities of each of the six utilities studied substantially exceeds its decommissioning costs; that it is not necessarily true that bankruptcy of a utility is tantamount to default on decommissioning obligations; and the potential that the costs of decommissioning would be recognized as a prior obligation with regard to creditors.

Despite these conclusions, Supplement 1 notes that PSNH has said that, unless it undergoes financial restructuring and gets the rate increase it is seeking, it probably would become the first major utility to seek protection under the Bankruptcy Act in nearly 50 years.* In addition, Supplement 1 notes that if PSNH's Seabrook plant becomes operational, the prospects for PSNH greatly improve although bankruptcy still cannot be precluded as a possibility due to

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*Subsequent to the preparation of the analysis of NUREG/CR-3899, Supplement 1, PSNH filed a petition in bankruptcy under Chapter 11 of the U.S. Bankruptcy code.

the potential for large rate hikes and resultant defections from its electric system. Hence Supplement 1 concludes that internal reserve should not be allowed for Seabrook until the financial prospects of the utility are clarified and the viability of the corporation insured.

In addition, Supplement 1 noted that it is imperative that, in the case of the sale or other disposition of utility assets, no monies are distributed to any security holders until a fund is established to assure payment for decommissioning. Supplement 1 also recommended changes in Federal and State bankruptcy laws relating to utilities and the inclusion in the prospectus of newly issued securities of an explicit statement of the utility's financial obligations to provide adequate funds for decommissioning. Further, Supp. 1, noted that because of changing economic and financial conditions, the NRC should conduct periodic reviews of the overall financial health of utilities with ongoing and prospective nuclear facilities. If such a review indicates the financial condition of utilities taken as a whole or individually is such that internal reserve does not provide reasonable assurance of funds for decommissioning, then additional rulemaking or other steps should be taken to insure availability of these funds.

The Commission has considered the conclusions in NUREG/CR-3899, Supplement 1, as well as the public comments received on the issue. The Commission's review in this area is confined to its statutory mandate to protect the radiological health and safety of the public and promote the common defense and security which stems principally from the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974, as amended. In carrying out its licensing and related regulatory responsibilities under these acts, the NRC has determined that there is a significant radiation hazard associated with nondecommissioned nuclear reactors. The NRC has also determined that the public health and safety can best be protected if its regulations require licensees to use methods which provide reasonable assurance that, at the time of termination of operations, adequate funds are available so that decommissioning can be carried out in a safe and timely manner and that lack of funds does not result in delays that may cause potential health and safety problems. Although the Atomic Energy Act and the Energy Reorganization Act do not permit the NRC to regulate rates or to supersede the decisions of State or Federal agencies respecting the economics of nuclear power, they do authorize the NRC to take whatever regulatory actions may be necessary to protect the public health and safety, including the promulgation of rules prescribing allowable funding methods for meeting decommissioning costs. (See Pacific Gas & Electric v. State Energy Resources Conservation & Development Commission, 461 U.S. 190, 212-13, 217-19 (1983); see also United Nuclear Corporation v. Cannon, 553 F. Supp. 1220, 1230-32 (D.R.I. 1982) and cases cited therein.)

For the foregoing reasons, the Commission continues to be concerned with the use of an internal reserve. The Commission notes the concerns expressed in NUREG/CR-3899, Supp. 1 regarding bankruptcy at PSNH as well as the changing economic and financial conditions discussed in NUREG/CR-3899, Supp. 1. The Commission also notes that many utilities are engaging in diversified financial activities which involve more financial risk and believes therefore it is increasingly important to provide that decommissioning funds be provided on a more assured basis.

In addition, to the extent that a utility is having severe financial difficulties at the time of decommissioning, it may have difficulty in funding an

internal reserve when needed for decommissioning. The Commission recognizes that the market value of the stock of those utilities studied in NUREG/CR-3899 has exceeded decommissioning cost. However, although the law in this area is not fully developed, in the event of bankruptcy there is not reasonable assurance that either unsegregated or segregated internal reserves can be effectively protected from claims of creditors and therefore internal reserves cannot be made legally secure. In addition, because of the nature of the internal reserve, the funds collected are not isolated for use for decommissioning. Instead the utility may use the funds for other unrelated purposes.

For the above reasons, the Commission concludes that the internal reserve does not provide reasonable assurance that funds will be available when needed to pay the costs of decommissioning and hence does not provide reasonable assurance that decommissioning will be carried out in a manner which protects public health and safety. Accordingly, the proposed rule has been modified to eliminate the internal reserve as a possible method of providing funds for decommissioning.

In reaching its conclusion not to permit use of internal reserve for decommissioning, the Commission believes it important not to impose inordinate financial burdens on licensees. The modification to the proposed rule is not expected to impose such a burden for several reasons. First, licensees have 2 years from the effective date of the final rule before they have to submit information regarding financial assurance. Second, the external reserve is a sinking fund accumulated over a period of time. Third, a number of states (accounting for almost 50% of power reactors) already require external funding methods. Fourth, recent changes in the tax laws allowing current deductions for external reserves may reduce the cost differential between internal reserve and external reserve.

In summary, NRC has considered the analysis of NUREG/CR-3899, Supp. 1, as well as the documents discussed above. NRC has also considered pertinent factors affecting funding of decommissioning by electric utilities such as the fact that they are regulated entities providing a basic necessity of modern life, their long history of stability, and the situation which may occur in an actual bankruptcy, and the requirements that utilities maintain over one billion dollars of property insurance which reduces one of the major threats to utility solvency. Based on these considerations, it is the Commission's conclusion that the internal reserve method currently allowed by the proposed rule does not provide a reasonable level of assurance of the availability of funds and that even in the unlikely event of utility bankruptcy, there is not reasonable assurance that a reactor will not become a risk to public health and safety.

Whatever funding mechanism is used, its use requires establishing the cost required for decommissioning a facility. This cost should be included as part of financial provisions submitted by an applicant prior to facility commissioning. To minimize administrative effort while still maintaining reasonable assurance of funding, for certain facilities the financial provisions may be based on setting aside an amount which is at least equal to amounts prescribed in the NRC regulations. These amounts vary for the different facilities covered by the regulations.

As information on decommissioning costs become more definitive in time, due to technology improvements, enhanced decommissioning experience, and inflation/deflation cost factors, a licensee's funding provisions should be updated. In this way, it is expected that the decommissioning fund available at the time of

facility shutdown will not differ significantly from actual costs of decommissioning.

It is difficult to accurately estimate what the projected costs for the various funding mechanisms will be at the time of decommissioning. Based on Battelle cost analyses[3,11] presented in this EIS, for the generic PWR and BWR 1175 MWe reactors, decommissioning costs have been estimated at approximately $105 and $135 million respectively. These estimates do not include the costs of demolition of nonradioactive systems or structures beyond that necessary to terminate the NRC license or the cost of site restoration. This results in a cost of a few tenths of a mill (0.1 cent) per kilowatt-hour when averaged over the expected 30-year reactor operating life. The $105 million cost, while not insignificant, is only a small amount compared to PWR operating capital, perhaps comparable to the cost of a full core reload. Furthermore, whichever funding mechanism used should not have a significant impact on the cost to consumers. One study[8] has estimated that the difference in cost between the various funding mechanisms would result in less than a 1% difference in the total bill of a representative utility customer.

In summary, the NRC objective of protecting the public health and safety requires that there be reasonable assurance of funds for decommissioning. There should not be any significant financial burden on the applicant in providing a funding mechanism for decommissioning costs either through prepayment, surety bonds, a sinking fund, insurance, or some combination thereof.

2.7 Management of Radioactive Wastes and Interim Storage

During the decommissioning of a nuclear facility radioactive waste which was generated during the facility operating lifetime must be disposed of at waste disposal sites. These wastes include equipment and structures made radioactive both by neutron activation and by radioactive contaminants, include radioactive wastes resulting from chemical decontamination of the facility, and include miscellaneous cleaning equipment.

Disposal of these wastes is covered by existing NRC and other applied Federal and State regulations and is beyond the scope of the rulemaking action supported by the EIS. Disposal of spent fuel will be via geologic repository pursuant to requirements set forth in NRC's regulation 10 CFR Part 60. Disposal of low-level wastes is covered under NRC's regulation 10 CFR Part 61. Because low-level wastes cover a wide range in radionuclide types and activities, 10 CFR Part 61 includes a waste classification system that establishes three classes of waste generally suitable for near-surface disposal: Class A, Class B, and Class C. This classification system provides for successively stricter disposal requirements so that the potential risks from disposal of each class of waste are essentially equivalent to one another. In particular, the classification system limits to safe levels the concentrations of both short- and long-lived radionuclides of concern to low-level waste disposal. The radionuclides considered in the waste classification system of 10 CFR Part 61 include long-lived activation products such as Ni-59 or Nb-94, as well as "intense emitters" such as Co-60.

Wastes exceeding Class C limits are considered to be not generally suitable for near-surface disposal, and those small quantities currently being generated are being safely stored pending development of disposal capacity. The recently