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NRC regulation of DOE facilities

External regulation of DOE sites by the NRC will mean big changes for the agencies, as well as for DOE contractors.

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The U.S. Department of Energy (DOE), its contractors, and the Nuclear Regulatory Commission (NRC) are in for major changes if the DOE follows through on its intentions announced December 20, 1996. The DOE is seeking legislation to establish the NRC as the regulatory agency with jurisdiction over nuclear health, safety, and security at a wide range of DOE facilities. At this stage, it appears that as many as 200 (though not all) DOE facilities would be affected. On March 28, 1997, the NRC officially endorsed taking over the responsibility for regulatory oversight of DOE nuclear facilities as the DOE had proposed, contingent upon adequate funding, staffing resources, and a clear delineation of NRC authority.

This legislative initiative would create profound changes in the day-to-day operation of DOE facilities and in the conduct of remediation and waste management activities at those DOE facilities undergoing closure and decommissioning. For the first time on a large scale, DOE plants, activities, and operations that have never been subjected to external, independent nuclear safety regulation would be required to comply with the requirements of an expert, seasoned, external regulator with broad enforcement powers.

To meet these new challenges, the DOE and the major contractors that operate these facilities should consider not only the "lessons learned" from the NRC's historical regulation of the commercial nuclear industry, but also the most recent, highly relevant experience of NRC regulation of DOE facilities—especially the NRC's 1996 certification of the gaseous diffusion uranium enrichment plants (GDPs).

This article first contrasts the ways in which the NRC and the DOE carry out their basic regulatory functions. Next, it describes the NRC's current authority over DOE facilities and the status of the DOE's initiative to expand that authority. Then, it discusses the basic changes and impacts that can be expected in the regulation of DOE facilities. The article next describes key lessons learned from the recent transition of the GDPs from DOE oversight to NRC regulation and the major regulatory issues that arose in that transition. Finally, some general strategies are suggested for resolving issues likely to arise as the NRC assumes regulatory authority over DOE facilities.

Regulatory functions

The NRC was formed in January 1975. The regulatory arm of the Atomic Energy Commission and several additional functions were separated to form this independent agency. In the ensuing years, NRC's infrastructure grew to include the following regulatory functions:

- *Standard Setting*—Primarily including regulations, policy statements, regulatory guides, and Standard Review Plans.
- *Licensing*—Of reactors and facilities under 10CFR50, fuel cycle facilities under 10CFR40 and 10CFR70, and gaseous diffusion plants under 10CFR76.
- *Inspection*—A formalized program for inspection of nuclear plants, fuel facilities, and all other NRC licensees.
- *Enforcement*—Routine actions, as well as the investigation of possible wrongdoing by licensees.
- *Office for Analysis and Evaluation of Operational Data (AEOD)*—Investigation of accidents and serious events, as well as the routine analysis of operational data.
- *Safety Research*—A broad research program to confirm the adequacy and safety margins in the NRC's regulatory system. The NRC has licensed many facilities while depending heavily on technical judgment. Subsequent research was required for confirmation of those

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Over the past 20 years, the DOE has focused on development, production, basic research, and, now, remediation of its sites. The DOE system of self-regulation evolved along a very different path from that of the NRC. The comparisons in the table illustrate differences that will affect the transition to NRC regulation from the DOE self-regulatory system now in place. From this table, it is apparent that the DOE and its contractors will have to adapt to a regulatory system that is very different from the one to which they have grown accustomed.

Regulatory basis

Although most of the facilities comprising the DOE complex have never been licensed or regulated by the NRC, there have been exceptions. On the day the NRC was created in 1975, licensing of the DOE's Clinch River Breeder Reactor was already under way, and the NRC soon issued its construction permit. The NRC currently has regulatory authority over the construction and operation of the high-level radioactive waste repository to be created under the Nuclear Waste Policy Act of 1982, as amended, and over various other high-level waste storage facilities and demonstration reactors under Section 202 of the Energy Reorganization Act of 1974.

Under Section 202, for example, the NRC is presently reviewing two DOE license applications for Independent Spent Fuel Storage Installations (ISFSIs) at the Idaho National Engineering and Environmental Laboratory site and at Public Service Company of Colorado's Fort St. Vrain nuclear power plant, near Platteville, Colo. The most recent and complete application of NRC regulations to DOE facilities is the NRC's certification, last year, of the GDPs in Paducah, Ky., and Portsmouth, Ohio, under the authority of the Energy Policy Act of 1992.

A "step change" in the scope of the NRC's authority over DOE facilities is now planned. In January 1996, the DOE's Advisory Committee on External Regulation of DOE Nuclear Safety concluded that safety at the DOE's nuclear facilities should be externally regulated and that existing agencies, rather than newly created ones, should be the responsible regulators. The Advisory Committee, however, did not recommend whether the external regulator should be the NRC, the Defense Nuclear Facilities Safety Board (DNFSB), or some other agency.

Therefore, at the request of former DOE Secretary Hazel O'Leary, an internal DOE Working Group on External Regulation was formed to provide recommendations for implementing the Advisory Committee's findings. The Working Group's report, issued in December 1996, concluded that the NRC was best suited to take over that responsibility, and proposed a 10-year process for transitioning all DOE nuclear facilities to NRC regulation. The DOE has now announced its intention to seek legislation that would implement those recommendations.

NRC lessons learned

There are at least five basic "hallmarks" of prior NRC regulation of the commercial nuclear industry that will affect the performance, as well as the cost and complexity, of the safety requirements at DOE facilities under NRC jurisdiction. These are:

1. *More rigorous technical standards*—The NRC has a well-established framework of detailed technical standards governing licensing and regulation of facilities under its jurisdiction, as well as a track record of expertise in applying those standards. DOE facilities are already subject to a series of DOE Orders, quality assurance and radiation control rules under the Price-Anderson Amendments Act, DNFSB recommendations, and requirements imposed by the Environmental Protection Agency (EPA), and several other federal and state agencies. The technical standards to be applied by the NRC to newly regulated DOE facilities will likely draw from the existing DOE, DNFSB, and other agency requirements, and will likely go beyond them in many cases. Recent experience with major NRC materials licensees and the GDPs suggests that the NRC's regulatory efforts will be

heavily influenced by its experience in commercial reactor and major fuel cycle facility regulation—experience that will inexorably impose an increasing level of scrutiny and discipline on the DOE and its contractors.

2. *More rigorous enforcement regime*—The NRC has a robust and mature enforcement regime. NRC requirements generally are not viewed as “goals” to be met over time through development of action plans, implementation plans, or schedules. Instead, strict compliance is expected and rigorously enforced. This expectation of strict compliance is likely to be extended to include existing DOE technical standards and DOE responses to DNFSB recommendations. Thus, to the extent that these incorporated DOE Orders, regulations, or other requirements may not have been fully implemented at DOE facilities, the NRC will expect full compliance and likely will take enforcement action where compliance is not achieved.

3. *Expectation of continuous performance improvement*—The NRC imposes pressure for continuous improvement of performance, above and beyond the specific requirements in the NRC regulations. This pressure is applied through direct sources such as the NRC’s “Watch List” process and the Systematic Assessment of Licensee Performance (SALP) program, as well as less direct sources such as the NRC inspection staff’s continuous oversight. This is done because the NRC’s experience has been that licensees who pursue an operating philosophy of minimal compliance with regulations and a barely adequate level of safety eventually become complacent, with a resulting decline in performance to unacceptable levels.

4. *Increased public scrutiny*—NRC regulation creates new avenues for expanded public scrutiny of nuclear safety-related activities. Increased attention can be expected from the media, Congress, and state and local governments, as well as national and local interest groups. New avenues for public involvement and participation include: (a) opportunities for formal hearings on license applications and amendment requests, (b) opportunities for judicial review of final decisions, (c) petitions seeking orders to revoke, suspend or amend licenses under 10CFR2.206 of the NRC’s regulations, (d) mandatory opening of NRC/licensee meetings, (e) public docketing of all relevant licensee communications and correspondence, and (f) the basic deliberative process used by the NRC, which often involves publication of draft positions for public comment. The NRC publishes regulatory decisions and their bases routinely.

5. *Heightened focus on regulation of management*—The NRC has traditionally held the holder of the license or certificate accountable for safe operation. This has been the case for commercial facility regulation, as well as for the GDPs and DOE facilities such as the canceled Clinch River Breeder Reactor. Holding the DOE or its contractors responsible for the license will have profound implications for both the DOE and its contractors, because the NRC expects licensee management to have an effective self-assessment program. Such a program includes a comprehensive in-house oversight function and a rigorous root cause and corrective action program. The DOE will have to reevaluate the roles and responsibilities of its line management functions, as well as the DOE staff regulatory functions and the safety functions of its contractors. NRC will expect key licensee managers to understand and embrace this concept of vigorous self-assessment. Perhaps the most profound implication for the DOE and its contractors will be the NRC practice of holding senior licensee managers individually accountable for the safety performance of the licensed facility. This will be true for the DOE and its contractors.

Regulation of GDPs

The recent experience with the NRC’s assumption of regulatory oversight over the GDPs is highly relevant for several reasons. First, it represents a first-of-a-kind transition of major DOE facilities to the NRC regulatory system. Second, the transition process has progressed from initial development of applicable NRC regulatory standards, through the “license” application process, to NRC assumption of regulatory authority in March 1997. This provides unique insights into the overall transition process.

Many of the more difficult regulatory issues that emerged during the transition process to NRC regulation of the GDPs have generic implications for future DOE regulation. Some of these are:

Definition and use of the facility's authorization basis

A definition and understanding of a nuclear facility's "Authorization Basis," or, in NRC parlance, its "licensing basis," is essential to the efficient operation, maintenance, and modification of such a facility. At many DOE facilities today, the authorization basis may be ill-defined or not fully documented, or all parties may not agree on the precise documents, analyses, and approvals that comprise the authorization basis. Further, the authorization basis for facilities that are set for closure are often the old production-oriented Final Safety Analysis Reports (FSARs) augmented by an array of Unreviewed Safety Question Determinations (USQDs) and Justifications for Continued Operation (JCOs). This can be a particular problem, as it was with the GDPs, in managing plant changes and commitment changes and in determining when prior approvals of an outside regulator are required. At the GDPs, this issue arose prior to the full transition to NRC regulation and during the period when the DOE was carrying out an interim NRC-style regulatory oversight program, pending NRC assumption of oversight. With the NRC's certification of the GDPs, a new authorization basis was established.

Design basis and configuration control

For the most part, DOE facilities were designed and constructed prior to the implementation of NRC design criteria and configuration control requirements. Generally, industrial standards of the time were applied with varying degrees of rigor. Consequently, the design bases may have been lost or incomplete, and modifications may not have been controlled to current NRC standards and expectations. This will present problems for an NRC reviewer with modern reactor or fuel cycle design or operations experience and expectations.

Safety and accident analysis requirements

Another significant issue that will arise in licensing DOE facilities is the status of the plants' existing accident analyses and the efforts by both the DOE and contractors to upgrade and better document those analyses. The accident analyses in existence for many DOE facilities do not meet current NRC standards. For example, some Safety Analysis Reports (SARs) date back to the early 1980s and do not contain the detailed and documented analyses of specific accident scenarios and consequences found in NRC-regulated commercial reactor SARs.

The NRC has been developing the concept of an "Integrated Safety Assessment," under which all hazards at a facility, including chemical and occupational hazards, are integrated into a single analysis. One of the most significant outgrowths of this initiative has been a new emphasis on controls to mitigate or prevent worker exposures during accidents. Although reactor accident analyses do not typically result in specific controls to ensure that worker exposures do not exceed specific limits under accident conditions, DOE facilities may be required to adopt specific "worker protection" requirements to address accident conditions. While worker exposures are controlled within the requirements of 10CFR20, it can be a very difficult task to demonstrate that particular workers engaged in the wide range of activities at a particular nuclear facility will not receive an accident exposure in excess of a prescribed quantitative limit. This issue has not been resolved fully with respect to NRC-licensed fuel cycle facilities, and it can be expected to be a major issue in connection with NRC licensing of DOE facilities in general.

Consistency of current practices with DOE requirements

One of the problems facing the NRC as it assumes regulatory oversight of the DOE is that the DOE sites are not uniformly in compliance with current DOE requirements. Since

the NRC will expect full compliance, each DOE site will be faced with the need to come into compliance with current DOE requirements while simultaneously preparing to meet any new NRC requirements. Thus, the DOE and its contractors will see the transition as not simply a handoff from DOE to NRC regulation, but rather as a substantial backfitting of requirements.

Backfit issues

With the transition to NRC regulation will come considerable pressure to "backfit" DOE facilities to new standards and interpretations, necessitating significant changes in existing plant operations, facilities, practices, and procedures. Some reasonable cost-benefit balancing must be applied to these proposed changes before they are imposed as regulatory requirements. This issue arose in connection with the GDPs. In that case, although the NRC adopted a rule requiring a cost-benefit balancing for certain NRC-imposed plant changes, it interpreted the rule not to apply until after the initial NRC certification process was completed. Thus, plant and program changes undertaken as part of the initial certifications were not evaluated under the backfit rule. For other DOE facilities, it will be important to clearly establish backfit protection and to assure it is applied to the initial NRC licensing of these facilities.

Shared site issues

Portions of the GDP sites were leased to the United States Enrichment Corporation (USEC) to operate the enrichment facilities, but some portions remain under DOE control and are not part of the operations certified by the NRC. This dual or "shared" site arrangement created a number of coordination issues that required resolution as part of the transition process. Essentially, the problem involved the development of regulatory "boundaries," both physical and administrative, so that the NRC, the DOE, and USEC could have a clear and consistent agreement on responsibilities for safe operation, responsibilities for regulatory oversight, and the rules governing particular portions of the plants and particular activities. Some of the specific issues that arose were allocation of site-wide emergency response and security responsibilities, development of a uniform radiation protection program, environmental monitoring and compliance duties, and responsibilities for waste management.

This issue is not unique to the GDPs. For example, WNP-2, the operating Washington Public Power Supply System (WPPSS) nuclear power plant, is on the Hanford, Wash., DOE site. At several DOE sites, private companies lease and operate portions of DOE-owned facilities. The NRC traditionally has insisted on clear lines of accountability for the safe operation of nuclear facilities. These shared site arrangements have the potential to cloud the question of accountability, and, therefore, the resolution of shared site issues at the GDPs will be relevant for other DOE sites.

Management control and oversight

Most DOE facilities are operated by contractors that are responsible for safe operation and regulatory compliance under several different contractual models. While the DOE holds ultimate responsibility for safety and compliance, it relies on a contractor, which operates the plants under DOE direction and control. The liability of DOE contractors is established by the specific contracts in place, as well as the DOE's application of the Price-Anderson rules.

The different contractor "models" that exist at DOE facilities are relatively unfamiliar to the NRC, whose licensees typically operate their own facilities and are directly and exclusively responsible for safety and compliance. The NRC, therefore, will be concerned that the license holder have full and effective management control and oversight over all contractors, and that the license holder have a sufficient onsite presence to carry out that responsibility.

Recommendations

The experience with NRC regulation of commercial and DOE facilities suggests several key elements of a strategy for a smoother transition to NRC regulation:

- *Avoid linkage between operations and the transition*—Continued operation of the particular DOE facility or continued implementation of the contractor's "mission" at the particular site should not be dependent upon effecting the transition to NRC oversight on any particular schedule. Such a linkage imposes additional pressure to promptly accede to agency positions, even if such positions will produce considerable costs at a later date. Much can be done initially through legislation to avoid this result.
- *Create a clear statutory basis for NRC regulation*—The statutory basis for NRC regulation of DOE facilities should include the requirement that the NRC establish generic performance-based regulations different from 10CFR70. This generic regulation would include a mechanism (such as a plan for achieving compliance) to permit a facility to come into compliance with NRC requirements over a reasonable period of time as an essential tool for facilitating an orderly transition to NRC regulation. Some new NRC requirements will be easy to implement; others will take time and considerable effort. A compliance plan provides a basis and agreed-upon framework for allowing continued operations as the transition to NRC regulation is completed. It will be important to attempt to avoid unnecessary statutory or regulatory deadlines that inhibit the ability of the DOE and its contractors to develop cost-effective means for meeting NRC regulatory requirements. In this regard, the compliance plans for each license should include negotiated implementation schedules.
- *Allocate costs and risks fairly*—Legislation can be very effective in fairly apportioning the costs and risks of this new transition process among the NRC, the DOE, and contractors. The costs and risks of transitioning to NRC regulation should be evaluated and well-understood early in the process. Significant considerations are: (a) costs of coming into compliance with DOE standards, (b) the NRC licensing process itself, (c) facility and programmatic upgrades to meet current or new NRC standards, (d) continued compliance efforts after the transition to NRC regulation, and (e) NRC enforcement activities.
- *Establish a workable regulatory transition model*—It may be beneficial to avoid any type of special interim DOE regulatory oversight arrangements. Transition could occur under the DOE's existing regulatory system. It is possible that three quasi-nuclear regulators could be operating at the same time—the DOE, the DNFSB, and the NRC. The process for DOE regulatory functions to become the "in-house" safety oversight function, and for transition from DNFSB oversight to NRC regulation should be defined in the statutes.

The transition

The transition from DOE oversight to external NRC regulation will be complex. In addition to the basic issues described above, other issues, such as the roles of the Environmental Protection Agency and the Occupational Safety and Health Administration, the implementation of National Environmental Policy Act and Price-Anderson Act requirements, financial assurance for decommissioning, and hearings and public participation rights, will emerge and require resolution. Some of these issues will have added complexity as a result of the wide range of DOE facilities transitioning to NRC regulation, as well as the wide range of activities that are taking place even within a single DOE site or within a specific facility.

The lessons learned from the commercial nuclear industry and previous NRC regulation of DOE facilities should be carefully considered early on in the legislative process, in the development of NRC regulations, and in the negotiation of contracts with the DOE. The evaluation of burdens, costs, and liabilities and their allocation among all parties should drive much of the early planning.

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**Regulatory
Function**

DOE Comparison

Standard Setting	DOE has a few binding regulations (Quality Assurance, Radiological Protection), but most of its standards are in the form of DOE Directives and Orders, which are not legally binding except through contracts. NRC has a full set of binding regulations and a wide range of interpretive guidance used to judge compliance.
Licensing	DOE has an emerging Authorization Agreement Process, but it is not really comparable in scope to NRC's licensing process.
Inspection	DOE has an inspection program that is similar to NRC's. In addition, the Defense Nuclear Facilities Safety Board (DNFSB) has a vigorous oversight inspection function at some sites.
Enforcement	DOE has an emerging enforcement program under the Price-Anderson Amendments Act, but it does not yet have the scope or the experience of NRC's program.
AEOD	DOE has elements of event investigation and operating analysis, but it is not as systematic as the NRC's, nor is it focused in a separate organization.
Safety Research	DOE has an extensive and highly expert research program, but very little of it is focused on facility safety. The NRC's program is focused on health and safety.

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