

## LOW-LEVEL RADIOACTIVE WASTE DISPOSAL LICENSING AND REGULATIONS IN PENNSYLVANIA

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### ABSTRACT

Pennsylvania will implement its Low-Level Radioactive Waste Policy Amendments Act responsibilities through the regional compacting process. As a host state, it has the duty to establish disposal capacity for low-level wastes generated within the Appalachian Compact. The Pennsylvania Department of Environmental Resources is developing a comprehensive oversight program to regulate, license and permit all activities associated with disposal facility development and operation. Lessons learned, public involvement initiatives and results, and implementation concerns are discussed within the context of developing this oversight program.

### BACKGROUND

The Commonwealth of Pennsylvania has selected the regional compacting approach for meeting the responsibilities mandated under the Low-Level Radioactive Waste Policy Amendments Act of 1985 (PL 99-240). It has joined with the states of Delaware, Maryland and West Virginia to form the Appalachian States Low-Level Radioactive Waste Compact. Party states and host state responsibilities and identification of Pennsylvania as the initial host state for the Compact is established in the Appalachian States Low-Level Radioactive Waste Compact Act (Compact Act).

At the time that Pennsylvania was designated as the host state, it did not have statutory authority for discharging host state responsibilities. That changed in February of 1988 when Governor Casey signed the Low-Level Radioactive Waste Disposal Act into law. This Act provided the Commonwealth authority for implementing its duties under the Compact Act and it charged Pennsylvania's Department of Environmental Resources with the duty of regulating the disposal of low-level radioactive waste (LLW) in a manner that protects the environment and public health and safety.

Pennsylvania still needs to assume regulatory authority before it actually can begin regulating LLW disposal activities. Initially, regulatory authority over all nuclear materials resides with the U.S. Nuclear Regulatory Commission (NRC); states can assume regulatory authority from the NRC. Section 274 of the Atomic Energy Act and NRC policy stipulates the process for assumption of authority from the NRC. Two types of authorization (agreements) can be obtained: a full agreement, which enables states to assume regulatory control over by-product, source, and small quantities of special nuclear materials; and a limited agreement, which enables states to assume regulatory control over a specific program (for example, LLW disposal). In either case however, the state must demonstrate that it has compatible legislation and regulations, and has a radia-

tion control program that can adequately protect public health and safety.

Pennsylvania will be requesting a limited agreement to regulate LLW disposal activities, although it initially planned to pursue full agreement status. The primary reason for the change in program consideration is due to the difference in staffing demand between a limited and full agreement. Under the proposed limited agreement, only one license will be issued. Assumption of a full agreement will include inheriting approximately 1,000 licenses distributed among many users throughout the Commonwealth. Implementing a program to regulate this magnitude of licenses would require a significant number of staff. The Department had begun staffing its radiation control program to accommodate the workload associated with 1,000 licenses however, at the same time another issue, radon, began to surface. Consequently the staff that was originally scheduled for the agreement program had been detailed to address radon as a special project. That project addresses the regulation of the radon certification program and research projects on radon.

### LLW Program Foundation

The background discussion on agreement state authorization highlights the requirement for a radiation control program that can provide adequate protection of public health and safety. Program staff and comprehensive regulations provide the foundation for a strong radiation control program.

### Staffing

A review of a regulatory program for LLW disposal suggests a staffing demand that is dynamic in time. A LLW disposal program can be divided into three major phases: pre-operations; operations; and post operations. Generally, the regulatory staffing needs will change as the program progresses through these three phases. Pre-operation is the shortest lived phase but it requires the greatest diversity in resources. This is due to the fact that pre-operation includes activities such as siting, design, and public involvement.

Operations encompasses a greater duration of time (approximately 30 years) however program activities are highly focused. This is the phase when essentially all activities are directed at regulating facility operations for the purpose of protecting health and safety. Post operation consumes the most amount of time but it is designed to require the least amount of regulatory activity and staff demand. This is attributed to the assumption that pre-operational and operational activities are conducted in a manner that promotes long-term site stability. Consequently the only types of activity that should occur at the site would be site up keep and maintenance.

The Department has structured its staffing plan in response to the dynamic nature of this project. It has a core of full time, permanent staff that are augmented by contractor support. Personnel that comprise the core staff were principally recruited to regulate disposal facility operations. In addition to the management and administrative staff this core group includes health physicists, nuclear engineers, a civil engineer, and a hydrogeologist.

Due to the nature of the pre-operation phase, there will be many short term activities that require highly specialized staff. The Department recognized that such short-term activities could not be overlooked but it also recognized that budget could not be provided to support permanent, full time staff after these activities were completed. It is the reason why the Department chose to augment its core staff with contractor support. This type of support provides a mechanism for retaining specialized skills over a specified period of time. Actual skill areas that the Department chose for augmenting its in-house capabilities include public involvement support, GIS/computer support, and project management support. Although outside resources will be used, all decision making will be retained by the core staff.

### Regulations

A state that is seeking regulatory authorization from the Nuclear Regulatory Commission (NRC) must adopt regulations that are generally compatible to the applicable regulations promulgated by NRC. For example, Pennsylvania is pursuing a limited agreement to regulate LLW disposal activities, therefore it must have regulations that are compatible with 10 CFR 61. However, opinion at the state level demands that states go beyond the guidelines issued by the federal government and recent legislation enacted by states reflects this opinion. Consequently state regulators are faced with the task of promulgating regulations that are more stringent than federal regulations while remaining compatible with federal regulations.

The Low-Level Radioactive Waste Disposal Act legislation enacted by the Pennsylvania General Assembly fits the trend being established by the states. Since the Pennsylvania Law named the Department of Environmental Re-

sources (Department) as the agency responsible for establishing the LLW regulatory program, it was the Department's duty to create unique solutions for implementing concepts embodied in the Law. This included development of solutions for concepts such as a disposal facility release goal of zero; providing institutional control for the hazardous life of the waste; and rebuttable presumption.

The Department began its implementation by analyzing the compatibility guidelines for 10 CFR 61 to determine where it had flexibility to incorporate more restrictive regulatory requirements. NRC has established policy guidelines on levels of compatibility within regulations. Compatibility levels range from regulatory sections that require adoption of language that is verbatim to regulatory sections without specified guidelines. There is an interim guideline that specifies some sections must meet the minimum concepts contained in the federal regulations but they can also be more stringent than the federal regulations.

An initial draft of the LLW regulations was prepared following completion of the compatibility analysis. Input for the draft was obtained from two principle sources. The entire regulation, with the exception of the siting and design requirements, was based on the Suggested State Regulations model. Siting and design requirements were generated from siting and design criteria that the Department prepared in conjunction with its Public Advisory Committee on LLW.

The draft regulation was evaluated against the Pennsylvania LLW Disposal Act to determine if additional requirements had to be incorporated. The regulation was revised based on the evaluation, published as an official draft regulation, and circulated for public comment.

The public comment period identified two items that because of their importance would require further attention by the Department. The items, zero release goal and institutional control were mandated by legislation and their direct application could have affected Commonwealth compatibility with 10 CFR 61. Consequently the Department had to develop a creative approach for establishing achievable standards while complying with both the intent of the law and the compatibility requirements.

The first time the "zero release disposal facility" concept became an issue was during the public comment period on the draft regulations. The design section of the draft regulations included a requirement that the design goal for the facility be zero release while the performance objectives included annual dose standards (25 millirems - whole body, 75 millirems - thyroid, and 25 millirems - any other organ) for any member of the public. At public meetings and public hearings, individuals suggested that the Department will ignore the zero release goal and enforce the dose standards



cited in the performance objectives. The Department's response during the meetings and hearings was: current technologies can not guarantee a zero release facility; the regulations do not allow the operator to arbitrarily release materials up to the established standards; and the performance objective for protection of the general population is a Nuclear Regulatory Commission (NRC) compatibility item, failure to comply with NRC's requirements may result in denial of agreement state authorization.

After the public comment period the Department considered the comments on "zero release goal" and prepared a strategy for resolving the issue. First, the Department would send a formal request to the NRC asking it to revise performance objective 61.41 (protection of the general population) to specify a zero release standard. Then anticipating a negative response from NRC, the Department would identify additional sections of its draft regulations that could be amended to further promote the goal of zero release. The Department implemented its strategy; NRC responded negatively to the request and the Department proceeded to revise its draft regulations.

The Department clarified its position on zero release through making programmatic and technical changes to the draft regulations. At the program level the Department clarified that the performance objectives establish the minimum overall level of safety that the facility must meet. Furthermore, it stated that operation within those levels are adequate to protect public health and safety. It reaffirmed its commitment to the goal of zero release by: reiterating that the disposal facility shall have a design goal of zero release; and adding that construction, operation and closure activities be planned and implemented in a manner that contributes to the goal of zero release.

The most direct technical requirement addressing the goal of zero release is contained in the monitoring plan requirements. It specifies that, for any off-site measurement that exceeds radiation levels, the operator shall initiate actions to identify and abate the source of the off-site radiation.

When viewed collectively, the technical requirements establish that the disposal facility functions as a system comprised of waste packages, engineered disposal units and the disposal site all of which are overseen by multiple monitoring systems. Because there are redundant barriers and monitors built into this system, there is little reason to expect contamination to reach the off-site environment. Consequently an off-site radiation dose of zero is considered achievable.

The second issue pertains to institutional control. Pennsylvania Law specifies that a custodial agency provide for institutional control (continued observation, maintenance, and care) of the disposal facility following transfer

of control from the disposal facility operator to the custodial agency. The law further specifies that institutional control shall continue for the hazardous life of the waste. Commonwealth law defines hazardous life as the time period required for the radioactive materials within a given container or package to decay to maximum permissible concentrations as defined by federal law or by standards established by the state, whichever is more restrictive.

The definition of hazardous life establishes a scenario in which custodial agency care could be required for tens-of-thousands of years, based on consideration of the half-lives of some radionuclides contained in typical low-level waste. However, the provision that enables the state to establish a hazardous life standard does provide flexibility for establishing a specific institutional control period.

The approach for institutional control and establishing a hazardous life standard also became an issue during the comment period on the regulations. Some individuals considered that the standard should be based on the longest-lived radionuclides contained in the waste while others recommended that the standard be more in line with low-level waste streams.

One of the Department's duties under the Law, includes creation of a waste classification system that takes curie concentration, toxicity and hazardous life into consideration. The Department decided to adopt the Nuclear Regulatory Commission's waste classification system which is based on waste stream considerations and base a portion of its hazardous life standard on this waste classification system. The system established that the hazardous life of low-level wastes is: Class A waste - 100 years; Class B waste - 300 years; and Class C and mixed waste - 500 years. The rest of the hazardous life standard is based on a demonstration by the custodial agency that public health and safety will be protected. It establishes that the hazardous life of the waste is the amount of time it takes for the disposed waste to decay to levels that demonstrates unrestricted use of the site would result in a dose to a member of the public using the site that is no greater than the dose from the natural background radioactivity in the soil prior to the site being used as a disposal facility.

In demonstrating that the site can be released for unrestricted use (license termination), the custodial agency can use technical data collected throughout the life of the facility. This includes: referencing the facility design and its expected performance; showing acceptable past performance, based on actual data collected from disposal unit and environmental monitoring programs; and predicting future facility performance, based on at least 35 years of monitoring actual material components of the disposal facility. The approach provides the custodial agency with complete flexibility for deciding when to demonstrate that

unrestricted use of the disposal site will have no adverse effect on public health and safety.

In addition to the two items mentioned above, the Department revised other regulatory requirements. The low-level radioactive waste regulations were published as final in October, 1989.

The Department learned several lessons throughout its endeavor to promulgate regulations that meet state law and federal compatibility requirements. Perhaps the most critical lessons learned pertain to: public involvement; and addressing new or complex issues.

The lesson for public involvement is that involvement must be meaningful and that meaningful means a commitment to listen to the public's comments and shape program decisions based on those comments. Public involvement was applied at two levels during regulation promulgation. The first level of involvement was directed at "a public" defined as the Department's public advisory committee. The committee and the Department worked in conjunction to develop siting and design criteria and these criteria were eventually incorporated into the regulations as the siting and design requirements. The second level of involvement was directed at the general public through the public comment period on the draft regulations. Through these two efforts the Department demonstrated its commitment to public involvement and involved parties were able to see how their input was incorporated in the regulations development process.

The second lesson pertains to the approach for addressing new or complex issues. The key for solving these issues rests in treating them with creativity and candor. The Department has learned that this is accomplished through understanding all facets of an issue and working closely with all parties involved before attempting resolution. Then legislation or regulations need to be reviewed to identify the level of flexibility permissible, a series of options within the flexibility range established, and finally the approach selected.

#### Summary of Agreement State Efforts

The Department is proceeding to secure regulatory authority (limited agreement status) from the NRC. At present implementing legislation has been enacted by the Pennsylvania General Assembly, a core staff and technical assistance contractor have been retained to regulate LLW disposal activities and LLW management and disposal regulations have been promulgated. With completion of a LLW program description, the Department will be prepared to enter agreement state discussions with the NRC.

There are some concerns regarding actual acquisition of agreement authority. These concerns center around a formal finding by NRC that Pennsylvania's regulations are

compatible with its 10 CFR 61 counterpart, and the fact that Pennsylvania will be the first state to seek limited agreement authorization. However, both parties are participating in informal meetings to eliminate these concerns. Meeting topics have included discussion of both the intent and content of the LLW regulations and discussions to achieve consensus on the scope of activities that will be regulated under a limited agreement.

#### **APPROACH FOR PROGRAM IMPLEMENTATION**

The Department will apply a global approach when implementing its LLW program. This approach consists of overseeing disposal facility activities and generator, carrier and broker activities relevant to waste management.

Regulatory oversight of disposal facility activities will begin with review of the license application and issuance of the facility license. The Department recognizes that the quality of its regulatory program and application review can have a significant impact on disposal operations and protection of public health and safety. Therefore, it will prepare a policy on regulatory quality assurance and it will be the LLW program staffs' responsibility to implement the policy. The policy will focus on developing procedures for actions that affect regulatory activities including; review of all regulatory work products, selection and training of personnel, control of all instruments used in a regulatory capacity, control of computer software, and establishment of a document control system. The Department considers that implementing the quality assurance function at the application review phase will strengthen its position on the licensing decision.

Upon license issuance, disposal activities will be overseen by inspectors who will enforce license conditions, regulatory requirements, and requirements of law. The Department will rely on a full-time site inspector to oversee all of the day to day activities and that individual will receive support from LLW program staff at headquarters. LLW program staff will also become involved in periodic program and license reviews, and in conducting an independent monitoring program. It should also be noted that additional full-time inspectors will be assigned to the disposal site. The Low-Level Radioactive Waste Disposal Act provides the host municipality and host county the opportunity to each hire two inspectors. These inspectors will be required to receive training from the LLW program and conduct inspections in accordance with a memorandum of understanding with the Department. However, they will have shut-down authority in the event of an immediate threat to public health and safety.

Disposal site regulatory responsibility will continue through the Long-Term Care Period. LLW program staff will be responsible for conducting the licensing review re-

quired to transfer the license from the operator to the custodial agency. Staff will continue its facility inspection and independent monitoring program during the Long-Term Care Period, however the frequency will diminish.

The global approach means the oversight function will also be extended to LLW generators, carriers and brokers. It is the Department's intent to extend this oversight beyond Pennsylvania's borders and include all generators, carriers and brokers within the Compact. Oversight would be conducted through agreements with or implementation by sister agencies in the other party states (Delaware, Maryland, West Virginia).

The mechanism for employing oversight is a permit that will be required to access the disposal facility. A permitting system will be administered by the Department and include: an application process; an annual fee to support the system; and an inspection and enforcement program. Inspection, at the generator, carrier or broker facility, is the segment that will require participation by the party states' regulatory agencies. Enforcement will only be implemented at the disposal facility.

A permit system that includes provisions for inspection and enforcement serves two purposes. First, inspections of waste and waste packages at the source allows identification of potential problems before the waste is shipped for disposal. Second, enforcement at the disposal facility, which will have penalties as severe as permit suspension and denial of disposal access, is probably the most effective method for ensuring individuals comply with waste classification and packaging requirements. In addition, the permitting system will allow greater flexibility for enforcing regulatory decisions and allowing continued disposal site access since penalties can be assessed to individuals. Finally, the public is likely to have greater input to the permitting process be-

cause the permit system will be less structured and formal than the disposal facility licensing system.

#### **Future Areas of Concern: Global Approach**

There will be several areas of concern as the states proceed to establish additional LLW disposal capacity. One of Pennsylvania's concerns pertains to defining its boundaries of regulatory jurisdiction. As mentioned previously, Pennsylvania will be the first state requesting limited regulatory authority from NRC. This limited authority will create some "gray" areas where NRC and Commonwealth responsibilities will overlap.

Regulatory oversight of generator, carrier and broker activities is probably the best example of overlapping responsibilities. These individuals hold NRC licenses and they will remain under NRC oversight. However, these individuals will also ship LLW for disposal and their waste characterization and waste packaging activities will come under Commonwealth regulatory authority. The "gray" area is introduced when Pennsylvania implements the permitting system. Clearly, generators', carriers', and brokers' waste characterization and packaging activities will come under the scrutiny of both NRC and Pennsylvania.

Both NRC and Pennsylvania recognize that this item and perhaps other similar items must be resolved so that the regulated community understands its responsibilities. The established solution must contain elements that serve the needs of both regulatory agencies without imparting conflicting requirements on the individuals that are regulated.

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