Texas Low-Level Radioactive Waste Disposal Compact Commission

Contingency Plan Addendum

Options for the Disposal of In-Compact Radioactive Wastes (Non-Nuclear Power Generated)

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Options for the Disposal of In-Compact Radioactive Wastes

In-compact generators of Class A, B, and C low-level radioactive wastes (LLW) have a robust disposal option at the Compact Waste Facility (CWF) operated by Waste Control Specialists (WCS) in Andrews County, Texas. Class A, B, and C Low-Level Wastes meeting waste acceptance criteria can be sent to the CWF for permanent disposal. The CWF has a radioactive material license from the Texas Commission on Environmental Quality (TCEQ), and WCS is approved to construct the facility in eight phases to hold a total volume of 9,000,000 cubic feet and an activity of 3,890,000 curies. Seventy per cent of the licensed capacity is allocated to the in-compact party states of Vermont and Texas. The remaining 30% can originate from outside the compact as imported wastes from other states and territories with the approval of the Texas Low-Level Radioactive Waste Disposal Compact Commission (TLLRWDCC). The first shipment received at the CWF was a shipment of waste from the University of Vermont in April of 2012. The CWF is currently in Phase 1A.

The original concept for the CWF was that it would be used primarily for Class A waste with lesser volumes of Class B, and Class C materials. Generators of LLW today however have numerous disposal options for specified Class A waste streams. For example, the very lowest tier of Class A LLW may be sent to the Resource Conservation and Recovery Act (RCRA) facility at WCS. Mixed Wastes (hazardous mixed with radioactive) are prohibited at the CWF and must be exported to a hazardous waste disposal facility. Radioactive liquids used in biomedical research such as scintillation cocktails with extremely low activities may be sent out-of-compact for incineration because WCS cannot accept liquids and incineration is considered an appropriate and safe way to manage this waste stream.

At present, the CWF is an invaluable resource for the disposal of Class B and C for both in-compact and out of compact generators. There are only two other LLW facilities accepting these classes of wastes, but they are closed to states and territories not in their compacts. If a contingent event occurs at the Compact Waste Facility, it will seriously impact the disposal of these waste classes not only in Texas and Vermont, but also in the other 34 states and territories that may use the WCS Compact Waste Facility once they have obtained authorization from the Compact Commission to do so.

Contingent Event Options for Disposal of LLW (Non-Nuclear Power)

Class A Waste:

- Class A waste streams have a wide variety of disposal options. Most solid LLW and low activity sealed sources may be exported to Energy Solutions in Clive, Utah. The Clive facility uses shallow land burial as authorized under Utah Radioactive Material License No. UT2300249. Export permits would have to be granted by the TLLRWDCC. The Clive facility is limited to Class A materials and accepts waste from most states and territories**. This option would allow the disposal of much of the Class A wastes generated in-compact and would be the primary pathway to disposal if the CWF was unavailable and the materials were not acceptable for disposal at a RCRA disposal facility.**
- In Texas, biomedical research or clinical/*in vitro* laboratory materials such as liquid scintillation cocktail (LSC) or animal carcasses containing low activities of H-3, C-14, and I-125 with concentrations less than 0.05 µCi/g may be discarded without regard to the radioactivity content since it is so low. These wastes may, however, still may be considered biohazardous or hazardous materials which would determine the acceptable disposal pathway. The complete rule is found in the Texas Radiation Control rules at 25 TAC §289.202(fff).
- The Texas Department of State Health Services (DSHS) issues radioactive material licenses. With agency approval, licensees may discard a limited number of short-lived radionuclides under 25 TAC §289.202(ggg) (7) at a Type 1 Municipal Solid Waste landfill with strict conditions such as concentration limits and annual activity limits. The radionuclides discarded using this provision have half-lives measured in days.
- Applicable to in-compact states, LSC and animal carcasses with higher activities may be exported for incineration at an approved incineration facility once an export petition has been obtained from the TLLRWDCC.
- DSHS also allows the disposal of water-soluble/non-hazardous liquids through discharge into the sanitary sewage system [25 TAC §289.202(gg)]. This method is allowed for only extremely low activity liquids with strict radioactivity limits.
- DSHS may also allow decay-in-storage for radioactive wastes with short half-lives. After the materials have undergone significant decay and meet criteria, they may be disposed of in accordance with radioactive material license conditions. [25 TAC§289.202(fff)(1)(B) and (3)(C)] These materials are often short-lived radionuclides used for medical patient diagnosis and treatment.
- Sealed sources in testing devices may also be classified as Class A wastes when the sources are no longer useful. If the activities are low enough, the sealed sources may be sent Clive, UT for disposal. In many cases, however, *the manufacturer of the device or source capsule will accept the device or source capsule for disposal or recycling.* This is an important and safe way to remove the device from use. More manufacturers are adopting a “cradle to grave” concept and including in the price not only the cost of producing the device but also future disposal. However, if the device contains Am-241/Be, it is a neutron emitter and has strict limits for disposal at a commercial disposal facility due its LLW class. These “orphan sources'' are recovered by the Department of Energy’s Off-Site Source Recovery Program. Some devices also

contain Ra-226 which due to waste acceptance criteria at the US Ecology disposal facility limits the disposal options.

- The use of a RCRA facility such as the RCRA cell at WCS is an option for the disposal of the lowest concentrations of what has been termed "Very Low-Level Wastes" – the lowest tier of Class A wastes. This is permitted by License Condition 192 to TCEQ Radioactive Material License R04100 issued to Waste Control Specialists and as exempted by 30 TAC §336.5(a).

Class B and Class C Low-Level Waste:

- Class B and Class C LLW requires a greater degree of isolation in a disposal cell than does the lower-activity Class A materials.
- Currently, most Class B/C LLW generated in the Texas-Vermont compact are sent to WCS or in the case of irradiated reactor hardware, simply stored in spent fuel pools at reactor facilities. Some of the larger sources may be accepted into the **Off-Site Source Recovery Program** (OSRP). The OSRP is a U.S. government activity sponsored by the National Nuclear Security Administration's Office of Global Material Security and is managed at Los Alamos National Laboratory (https://osrp/lanl.gov). The initial proposed use of the program included Greater than Class C (GTCC) LLW, but that has been expanded to accept Class C radioactive sealed sources that pose a public safety and national security threat. The radioactive materials were originally transuranic sources but with the expanded policy, recovery of beta/gamma emitting sources were included. Thus, a limited number of in-compact Class C sealed sources may be eligible for acceptance into the OSRP disposal program. The Department of Energy takes ownership of the OSRP materials. The OSRP consolidates some sources at Nuclear Sources and Services Incorporated in Houston which are ultimately transported to the Nevada Test Site for disposal/storage.
- As previously stated, manufacturers of devices containing sealed sources will often accept the device or the source back from the user on request, most often after the sources have decayed to the point where the device is no longer useful. This is an effective way to remove the radioactive material from a licensee's inventory of sealed sources. Return-to-manufacturer is used for all classes of LLW but is especially beneficial for Class B and C LLW since these classes have fewer options for disposal. Licensees are encouraged to consider the purchase of radionuclide devices from manufacturers who are marketing the "cradle to grave" approach since this would more likely assure acceptance of the device for eventual disposal. The weakness in this disposal method is that acceptance by the manufacturer is not guaranteed, and there is a concern that the manufacturer might terminate its operation.
- The Nuclear Regulatory Commission published its final version of its **Concentration Averaging Branch Technical Position** in 2015 (CA BTP). This Branch Technical Position provides guidance for the implementation of concentration averaging allowed by 10 CFR 61.55(a)(8). The averaging is over the volume or weight of the waste. Greater volumes or masses could result in lower radioactive waste concentrations if the activity is constant. The NRC states that the CA BTP has the potential to provide greater flexibility for disposal of certain types of LLW, particularly sealed sources, ion exchange resins, and irradiated hardware. The NRC has issued

guidance regarding the use of this method of LLW classification, and states that this is a risk-informed performance-based regulatory approach. (https://www.nrc.gov/waste/llw-disposal/llw-pa/llw-btp.html)

- If the disposal of Class B and C LLW is not an option, then the wastes must be stored onsite or transferred to another licensee for long-term storage. Following the closure of the Barnwell, South Carolina LLW facility in 2008 and prior to the opening of the CWF in 2012, storage was the only option available in many cases. If a contingent event closes the CWF in Andrews County, waste that would have gone to the facility will have to be stored. Storage of LLW is not a new concept: a major Texas university system only recently closed its LLW storage facility in West Texas. Southwest Research Institute in San Antonio is building a new state-of-the-art storage building to accommodate Class B and Class C sealed sources and devices. Some oil and gas service companies, geotechnical testing companies, and radiographers have storage pits or warehouses to house their inactive devices. Efforts are often made to reduce the volume of stored radionuclides by removing the sealed source capsules from the devices and placing them into shielded storage containers.
- Decay-in-storage can be used for all classes of LLW if the radionuclides in question have short half-lives. For example, Ir-192 (half-life 74 days) is used for such diverse purposes as High Dose Rate (HDR) brachytherapy for treatment of breast or prostate cancer, industrial radiography, or tagging sand used in oil and gas fracking operations. The small volume, but high activity, sources can be stored for a length of time that would allow them to decay to Class A or below levels. Many of the radionuclides used for medical purposes have shorter half-lives and would support this method of disposal.

Greater than Class C (GTCC) Wastes:

- GTCC wastes may be produced in the form of sealed or encapsulated sources when the sources or devices in which the sources are housed are no longer useful. Examples:
    - Medical irradiators for blood products and research
    - Medical sources producing gamma beams for external radiotherapy or “radiosurgery”
    - Large activity sources containing Cs-137, Co-60, or Ir-192 used for industrial applications such as blood or product sterilization and food preservation
    - Oil and gas exploration devices containing Am-241/Be (curie quantities)
- GTCC disused sources can be sent to the OSRP for disposal by the Department of Energy if they meet DOE criteria for acceptance.
- Some of the devices such as the radiosurgery devices and oil and gas multiphase meters can have the sources removed/replaced and the old sources returned to the manufacturer for disposal.
- The Office of Radiological Security (under the National Nuclear Security Administration) has the “Cesium Irradiator Replacement Project” which will pay for the disposal of a medical irradiator if the user is willing to switch to a non-radionuclide alternative. The program will not only pay for cesium irradiator’s disposal, but also up to 50% of the cost of the new x-ray irradiator. This program is supported by the US Congress as a part of the country’s global threat reduction effort.

- The nuclear power industry may also produce GTCC which must be stored. Examples include irradiated hardware, spent ion-exchange resins, or filters whose radioactive concentrations exceed that of Class C LLW.

Summary and Recommendations:

- Much of the LLW volume produced in Texas can be classified as Class A. Class A LLW has multiple options for disposal.
- The State of Vermont currently has three non-nuclear power radioactive material licensees with curie possession limits thus limiting the amount of LLW generated in this Compact state.
- Medical and academic generators of LLW would be minimally impacted, at least initially, by a contingent event which would close the Compact Waste Facility. Long-term storage of Class B and C LLW may become a security issue.
- Generators should be encouraged to dispose of their LLW and GTCC waste materials in a timely manner. This is a best practice and reduces the threat of misuse of higher activity sources. The Texas Department of State Health Services – Radiation Control Program has a rule in place which requires the disposal of radioactive materials which have not been in use for 24 months or longer. [25 TAC §289.252(x)(11)]. If the CWF is closed, consideration must be given to authorizing waivers to this rule for generators who have no disposal options.
- The Source Collection and Threat Reduction Program (SCATR) is supported by a cooperative agreement between the Conference of Radiation Control Program Directors (CRCPD) and the DOE/NNSA. If a discrete radiation source meeting specified criteria has a path for disposal at a commercial LLW facility, SCATR may help with the disposal costs if funding is available. This program supports the concept of disposing of disused radiation sources in a timely manner.
- The Disused Sources Working Group of the Low-Level Waste Forum provides recommendations for the management and disposal of sealed sources no longer deemed useful. (www.disusedsources.org/recommendations-of-the-dswg/)
- Waste generation should be minimized if possible, and treatment/volume reduction techniques applied.
- **Class B and most of the Class C LLW would not have disposal options**. If the CWF is unable to accept such wastes, the threat of Class B and C LLW should be considered, and efforts made to have agencies such as the NNSA consider broadening the classes of LLW accepted for disposal through one of the federal programs. This is a matter of state and national security.

Examples of Class A, B, C LLW If Sources Sent for Disposal:

Industrial Sources: Class A or C

Troxler Soil Moisture/Density Gauge (8 mCi Cs-137, 40 mCi Am-241)

Topside Flow Meters – Class A (10 mCi Ba-133, 50 mCi Cs-137)

Subsea Flow Meter (20 mCi Ba-133, 300 mCi Cs-137)

Radiography (Co-60 up to 100 Ci, Ir-192 up to 150 Ci)

Tank Gauges (Cs-137, 2 to 3 Ci)

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