LOW-LEVEL WASTE ADVISORY COMMITTEE

DRAFT MINUTES
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
LOW-LEVEL WASTE ADVISORY COMMITTEE (LLWAC) MEETING

September 29, 2023

Attendance

LLWAC Members, Alternates, and Legislative Staff

Ernest Hanna, Pennsylvania Chamber of Business and Industry
Marc Pawlowski, Constellation Energy Generation, LLC
Jesse Sloane, Pennsylvania Society of Professional Engineers
Justina Wasicek, Sierra Club, Pennsylvania Chapter
Craig Benson, Pennsylvania Farm Bureau
Brian Lorah, Penn State College of Medicine
James Wheeler, Pennsylvania State Association of Township Supervisors
Lara Renz Paciello, University of Pittsburgh Graduate School of Public Health
Emily Eyster, PA Senate
Jeffrey Ivicic, PA Senate
Evan Franzese, PA House of Representatives
James Barnhart, Pennsylvania Chapter League of Women Voters
Glendon King, PA House Republican Research Department, Executive Director
Aaron Wilmot, Pennsylvania State University
Ian Irvin, Executive Director of the Citizens Advisory Council at DEP
Matthew Osenbach, Alternate for Senator Yaw
Holly Fishel, Pennsylvania State Association of Township Supervisors
Grant Gulibon, Pennsylvania Farm Bureau

Department of Environmental Protection (DEP) Staff

Dwight Shearer, Bureau of Radiation Protection (BRP)
Stephanie Banning BRP
Rich Janati (BRP's LLWAC Liaison)
Molly Adams (BRP)
Michelle Foster (BRP)
Martin Felion, BRP
Michael Carter, BRP
Courtney Torres, BRP
Ryan Bankert, BRP
Bryan Werner, BRP
Stefanie Muzic, BRP
David Baracco, BRP
Wade DeHaas, BRP
Nicholas Pistory, (Bureau of Regulatory Counsel)

Valerie Shaffer (Executive Assistant, WARR)

Others Present

David Hess, Member of the Public
Caroline Paterno, Member of the Public

Public Comment

There was no public comment.

Committee Business

Election of Officers

The LLWAC members voted unanimously to re-elect William Ponticello as Chairperson and James Wheeler as Vice-Chairperson.

Approval of the Meeting Minutes

The LLWAC members voted unanimously to approve the minutes of the September 30, 2022 annual meeting.

Next Annual Meeting

The committee decided to hold its next meeting on September 27, 2024 with an alternate date of October 4, 2024.

Status of LLRW Compacts and Update on Commercial LLRW Disposal Facilities

Mr. Janati provided an update on the status of low-level radioactive waste (LLRW) compacts, commercial LLRW disposal facilities, and recent national developments involving management and disposal of LLRW.

There are currently four (4) commercial LLRW disposal facilities in the United States. These facilities are Barnwell in South Carolina; the EnergySolutions facility in Clive, Utah; the Richland facility in Washington; and the Waste Control Specialists (WCS) facility in Texas.

1. The Barnwell facility accepts all classes of LLRW from the three members of the Atlantic Compact (Connecticut, New Jersey, and South Carolina). As of July 1, 2008, this facility no longer accepts LLRW from outside the Atlantic Compact.

2. The EnergySolutions Clive facility accepts Class A waste from all states except those in the Northwest and Rocky Mountain Compacts. The facility also provides for disposal of bulk waste and large components such as steam generators from the nuclear power plants. This facility is not a regional facility and is regulated by the State of Utah. The Utah Department of Environmental Quality is currently conducting a regulatory review

for disposal of large quantities of depleted uranium and Class A radioactive sealed sources at this facility. EnergySolutions is also seeking approval for license renewal of Class A waste, licensing of a federal cell, and an exempted waste cell.

EnergySolutions request to seek approval for disposal of Class A radioactive sealed sources is significant because large quantities of these sources are being stored on site by various generators. The approval of this request would be positive news from a national security standpoint because there will be an additional facility available for disposal of this type of waste.

They are also interested in licensing a disposal cell for federal waste mainly from the Department of Energy (DOE), because DOE has a lot of depleted uranium (DU) and they could send it to this facility for disposal. The decision to seek approval for disposal of DU is mainly driven by economic considerations.

3. The Richland facility is a regional facility and accepts all classes of LLRW but only from the Northwest and Rocky Mountain Compacts.

4. The WCS facility is a regional facility for the Texas Compact (Texas and Vermont) and accepts all classes of LLRW from both commercial and federal facilities. In April 2012, the Texas Commission on Environmental Quality authorized WCS to accept waste and begin disposal activities. Additionally, the Texas Compact Commission has established rules for the importation and exportation of LLRW into and out of the Texas region. The annual limit on radioactivity for out-of-compact waste is 275,000 Ci, but there is no annual limit on volume for out-of-compact waste. About 70% of licensed capacity is for in-compact waste and about 30% is for out-of-compact waste. Disposal of large quantities of DU and Greater-Than-Class C (GTCC) waste is being considered by WCS.

The WCS facility is constructing a new cell. This new cell is expected to be in operation as of February 2024. Without constructing this new cell, they would be at capacity for at least two years up to a maximum of five years, depending on the volume of waste that could be sent from states in the Texas Compact and other states as well. The new cell will give them storage at a minimum of eight years and possibly up to 15 years.

As far as license renewal, an application has been submitted and is expected to be approved by September of 2024. There should not be any significant issues for renewing this license.

Mr. Pawlowski stated that although the WCS facility has no limit on volume for imported waste, they do have a conditional process in the application stating if there is a delay in the construction of the new disposal cell within the Texas Compact, the LLRW generators will continue to have access to adequate disposal capacity. We would have to provide advanced notice for shipments if the volume would equal more than 2,500 ft^3.

Mr. Janati stated the Texas Compact Commission has established a conditional curie (Ci) limit of 15,000 Ci on imported waste. Mr. Pawlowski stated if we want to ship extremely high activity shipments, such as irradiated hardware, they will conditionally approve it at

the beginning of the year. However, prior to shipping, the curie content would need to be validated for the waste and approved prior to shipment. Mr. Pawlowski stated this has always been the process and it has never been an issue.

Mr. Shearer asked considering the political season that the country is experiencing, if one or the two facilities that we currently have access to, particularly the WCS facility in Texas, decide to close what type of lead time would they give Pennsylvania, as the host state, to restart the siting process for a disposal facility? Mr. Janati said it is unknown at this time how much notice would be given if that were to happen, but from previous experience it would be around 1-2 years. Mr. Pawlowski said when Barnwell facility in South Carolina decided to close to the out-of-compact waste, the nuclear utilities had about two years or so of lead time. He said he is hoping that the utilities will have at least one year or preferably two years lead time. Mr. Janati said a survey of the nuclear power plants in Pennsylvania found that they have the capacity to store on site the higher concentration of waste, namely Class B and C waste, for up to 5 years. He also stated the NRC has the authority to grant emergency access to a commercial disposal facility for generators of LLRW who have lost access to such facilities.

Mr. Wheeler asked if Pennsylvania could join a different regional compact that possessed a disposal facility if Pennsylvania lost access to the current facilities that accept Class B and C waste. Mr. Janati responded that there would always be an option as long as the other compact is willing to join our compact.

Mr. Barnhart asked if the Nuclear Regulatory Commission (NRC) has done any studies on the national capacity. Mr. Janati said he is not aware of any such studies, but the NRC does track and publishes the amount of LLRW that is disposed of at the commercial LLRW disposal facilities annually.

In response to a question regarding management and disposal of high-level radioactive waste and spent nuclear fuel, which falls outside the scope of the advisory committee's mandate, both Mr. Janati and Mr. Sloan provided a brief overview of the DOE's Consent-Based Siting Process. This process calls for active participation and engagement of the Communities through a series of steps. Ms. Wasicek asked if the communities that are being selected were within the state of Pennsylvania. Mr. Janati stated that it is unknown at this time, and we will find out after a plan has been implemented and discussions take place within the interested communities. Mr. Sloan stated that currently no one is talking to any communities about being a hosting site. The consent-based siting awards that were made in the past year were meant to engage in understanding and establishing the process for defining what is consent and what it would mean to the communities such as educating about waste management topics and building relationships. This is purely a research effort at this point. Communities will not be asked to host a site until later stages of the process. There is a link on DOEs website that provides additional details on this process: https://www.energy.gov/ne/consent-based -siting.

Review of Appalachian Compact LLRW Generation Information

Mr. Janati provided background information on the DOE's Manifest Information Management System (MIMS). MIMS contains information on LLRW disposal at the current commercial LLRW disposal facilities. Mr. Janati said DEP has significantly reduced the regulated community's administrative LLRW reporting requirements by obtaining the appropriate disposal information from the MIMS database and directly from the commercial disposal facilities.

Mr. Janati discussed the waste disposal information for calendar year 2022. The Appalachian Compact disposed of 66,705 ft^3 of LLRW, with 48,241 ft^3, coming from Pennsylvania, 18,462 ft^3 from Maryland, and 2 ft^3 from Delaware. Most of Pennsylvania's waste was mostly generated by the industry and nuclear utilities. Maryland's waste was mostly generated by industry, nuclear power plants, and the government. Most of the class A waste generated within the compact was shipped to the EnergySolutions Clive Facility in Utah. Mr. Janati also provided information on the radioactive waste generated in the compact. The compact generated about 846.5 of LLRW. Pennsylvania generated 818.6 Ci of waste and Maryland generated 27.9 Ci of waste. Both Delaware and West Virginia generated less than 0.1 percent Ci.

Mr. Janati provided a brief discussion of waste disposal trends in the compact for the period of 2002 to 2022. The Barnwell disposal facility in South Carolina stopped accepting waste from outside the Atlantic Compact in July 2008, resulting in the storage of Class B and C wastes, mainly by the nuclear utilities, for about 5 years. Beginning in 2014 and through 2022, the reported volume and radioactivity also includes Class B waste that was shipped to the WCS facility in Texas. In 2016, the Safety Light facility in PA started cleanup effort under the Environmental Protection Agency's Superfund Program, which generated large quantities of Class A waste. The cleanup continues but currently there is not much LLRW being generated by this facility.

Mr. Janati provided a brief discussion of radioactivity of waste for the period of 2002 through 2022. From the years 2002 through 2008, the activity level of waste being shipped was very high due to the availability of the Barnwell facility to our compact. The nuclear power plants in the compact shipped large quantities of high activity irradiated components and reactor cleanup resins to Barnwell in 2007 and 2008, knowing that they will no longer have access to this facility.

The shipment of radioactive waste has been relatively low after the closure of the Barnwell facility to our compact beginning in 2009. We began shipping waste to the WCS facility in 2014 and we have been able to ship Class B and C wastes that contain higher activity to this facility. In 2018, the reported activity is very high because of a shipment of irradiated reactor components from a nuclear power plant in PA to the WCS facility in Texas.

Mr. Janati presented a pie chart showing that in 2022, about 61% of the compact's LLRW by volume was disposed at the Clive facility in Utah and about 39% by volume was disposed at the WCS facility in Texas. In comparison, about 58% of the compact's LLRW radioactivity was disposed at the Clive facility and about 42% of radioactivity was disposed at the WCS facility. Mr. Janati stated that these statistics show us that our generators are sending some of their higher concentrations of waste to the WCS facility.

Mr. Hess, the former Secretary of the PA DEP, asked if there had been any updates on the waste from shale gas operations, specifically fracking operations. He said that last year, PA DEP had highlighted the trend of waste being shipped by shale gas operations. Mr. Janati responded by saying that waste from shale gas operations is considered TENORM (Technologically Enhanced Naturally Occurring Radioactive Material), and that the compact definition of LLRW does not include TENORM. To avoid confusion, we no longer include TENORM with the LLRW data. While the actual amount of TENORM waste sent to various landfills is not available at this time the Texas Facility reported that about 138,000 ft^3 or 1.8 Ci was shipped from PA in 2022. For more information on TENORM generation and disposal, it was recommended that the interested party contact the PA DEP's Solid Waste Program. Mr. Janati committed to sharing PA TENORM disposal trends specifically for commercial LLRW disposal facilities through email.

TMI-2 Decommissioning Update and PA DEP's Oversight Activities

Mr. Werner presented updates and projections for the TMI-2 decommissioning process. The presentation was from the viewpoint of DEP's BRP, which does not have regulatory authority over the radiological license activities of the decommissioning. The NRC is responsible for both operating and decommissioning reactors. BRP is responsible for maintaining a comprehensive nuclear safety program and environmental monitoring program for nuclear plants in PA as required by the Radiation Protection Act (Act 147). Each nuclear plant in PA is assigned a dedicated BRP staff and they monitor the activities of the plants.

Three Mile Island is a two-unit plant facility; however, each unit is owned by a different company. Unit 1 is owned by Constellation Energy Generation and has been shut down since 2019. After being shut down the fuel was moved to the Independent Spent Fuel Storage Installation (ISFSI) pad and the final movement was in December of 2022. It is expected that Unit 1 will remain in SAFSTOR until 2075 and the license will be terminated in 2079.

Unit 2, the unit that experienced the worst commercial nuclear plant accident in the US, is owned by TMI-2, which is a subsidiary of EnergySolutions. TMI-2 partnered with Jingoli to help manage the decommissioning and construction projects at the site. Over the last year, they transitioned from planning, preparation, and license amendments to an active decommissioning status. The current phase of decommissioning, known as Phase 1b, calls for the recovery of the fuel-bearing material and source-term reduction, which is expected to last into 2029. While around 99% of the fuel has been removed, there are still pockets of highly radioactive material that fused to various portions of the plant This remaining material is highly radioactive in the facility and it needs to be completely removed in order to reduce the amount of radiation workers receive and to make decommissioning efforts less complex in the long-term.

TMI-2 will have its own ISFSI pad that will be located adjacent to the Unit 1 ISFSI pad, and eventually removed and transported to another site by DOE. That process will use casks and create long-term storage that is protective of the material until DOE can take possession of it. The amount of LLRW being disposed from TMI-2 is likely to increase over the next several years as a result of this decommissioning phase. The first shipment of LLRW from TMI-2 was sent on August 14. Mr. Werner included several photos in his presentation pointing out various projects being completed and showed examples of how the technology of robotics and drones have significantly improved the safety and efficiency of the decommissioning process. Photos

and videos of the decommissioning process, as well as meeting dates and locations can be found at https://www.tmi2solutions.com/. Once the fuel debris is removed and this phase is completed, the remaining structures will be treated as a standard decommissioning, which various subsidiaries of EnergySolutions have a great deal of experience.

Ms. Wasicek asked if the ISFSI pad was in a building on the island. Mr. Werner stated that the ISFSI pad was outside of the buildings and on the south side of TMI-2. The removal of the stored fuel will be dependent on DOE providing a facility for the fuel and transporting it there, making the timeline for completing this indefinite. Mr. Janati added that there are several nuclear plants that have been decommissioned, but their spent nuclear fuel remains on site within an ISFSI pad. Ms. Wasicek requested a chart with the timelines for TMI-1 SAFSTOR and the current TMI-2 decommissioning projects. Mr. Werner committed to providing her with that information.

The Radiological Environmental Monitoring Program is being used to continually monitor Unit 1 and Unit 2. Unit 1 is considered to be in long-term SAFSTOR and will not be decommissioned anytime soon. Unit 2 does not pose the same risks as an operating plant it terms of an off-site release. Passive radiation dose measurements are used to test and monitor the radiological conditions. Nine locations are being monitored, with most of them being co-located within TMI-1's dosimetry. Initially, monthly checks were completed to establish a baseline and then we proceeded to quarterly checks. We monitor for increases in radiation doses as radioactive waste is packaged and stored and we monitor the perimeter of the site as well. Both DEP and the operating utilities are required to monitor gaseous and liquid effluents. They also monitor for particulate and iodine that can be found in the soil. Sediment and soil samples are taken for radiological deposition. The BRP staff participate in daily calls with the TMI-2 Solutions staff in order to remain up to date on all decommissioning activities. Monthly meetings are held with NRC staff in order to give and receive updates. We receive good insight from NRC staff about their oversight and inspection activities from these calls. The facility has also set up a decommissioning nuclear safety review board that acts as an independent body and can provide expertise. Members of this board consist of industry leaders of past practices as well as previous NRC staff that hold expertise in reactor operations. A community advisory panel for TMI-2 holds meetings twice a year that we attend and provide updates on nuclear safety oversight activities. BRP has also facilitated interactions among TMI-2 and other parts of DEP. This is done to assist TMI-2 in obtaining relevant permits related to water, waste, and air.

Mr. Shearer reminded the group that BRP is 100% funded by fees and penalties collected from its regulated community. Fees are paid by dentists, hospitals, utilities, etc. The ISFSI pad for the fuel from TMI-2 will be a new form of revenue for DEP. He also stated that our Environmental Surveillance section within BRP is paid by a combination of those funding sources and from power plant utilities and the fees of the ISFSI pad. The decommissioning of TMI-2 becomes a direct chargeback at an hourly rate.

Mr. Barnhart asked if some of the TMI-2 facility waste might be GTCC waste, and if so, will it be treated as spent nuclear fuel and be kept it in a storage cask to be dealt with it in the future. Mr. Werner replied that the plan is to store the GTCC waste in casks with the remainder of the ISFSI material adjacent to the TMI Unit 1 ISFSI pad. Roughly, 14 casks are anticipated to be in use.

Management of Operational LLRW at Constellation

Marc Pawlowski from Constellation Energy Generation, LLC presented on what normal day-to-day operations look like at a nuclear plant. Constellation's vision is to be on the forefront of developing clean energy for the country moving forward. Constellation has the largest nuclear fleet in the country operating 21 reactors and one decommissioned reactor across 12 sites. Constellation separates the management of high-level waste, which is considered spent nuclear fuel, and low-level waste and we also have a standardized process for the management of both liquid and solid radioactive waste. The NRC requires that we have a process control program to lay out how we are managing all waste, from handling it on site to processing it, packaging it, and transporting it to its ultimate disposal. Constellation uses this process for its entire fleet. Our nuclear fleet tries to be standardized and consistent with our operations in order to achieve the greatest efficiency. Constellation has a standard set of liquid radwaste processing and solid radwaste generation parameters and these are monitored and trended monthly. We also have a standardized approach to waste packaging of common waste streams and fleet procedures for shipping of LLRW to ensure regulatory compliance and achieve cost savings within the fleet. We have a lot of oversight, and we monitor them closely to ensure they are managed properly.

Similar waste types are binned together to create "waste streams". Constellation trends the waste stream radioisotopes over a multi-year period to ensure they are representative of plant operation and can detect potential changes to the waste classification or required disposal packaging. Mr. Pawlowski then explained the differences between Pressurized Water Reactors (PWRs), and Boiling Water Reactors (BWRs) and the waste disposal processes involved for each one. Mr. Pawloski described liquid radwaste processing for both PWRs and BWRs. He said PWRs make more routine liquid effluent releases as a part of their operation. The purpose of the liquid processing is to reduce the activity to As Low As Reasonably Achievable prior to discharging it. BWR's process liquid radioactive waste to produce reactor-quality water for reuse in the plant. Discharges are possible but not common at most of the plants. It is also important that the fuel is clean and does not contain leakages. The industry has a great track record with fuel reliability. Our vendors have worked closely with us to try and minimize fuel issues. The fuel needs to stay intact is to avoid the workers receiving too much radiation in the plant.

Mr. Pawloski also described dry radioactive waste processing at Constellation. He stated Constellation's philosophy is to minimize the volume of dry active waste. The nuclear fleet procedures establish guidelines for materials used in the plant to reduce unnecessary waste generation. He also described irradiated metal processing at the BWRs. This type of waste is typically stored in the spent fuel pool when space is available. There are two pathways for managing this waste stream; on site storage in the spent nuclear fuel pool or disposal at a LLRW disposal facility once the waste has been characterized and classified. Burial sites require the water to be less than one percent of the volume of the disposal package. We have an intermediate storage facility where the waste is stored to allow for the technical staff to do the radiological characterization to determine the final overall activity for that package. When we dispose of anything at a burial site, it is on a package-by-package basis.

Once the work is completed, we go through a normal review process with the burial site to get approval and coordinate transportation to the burial site. The waste packages are then placed

inside a Department of Transportation-approved or NRC-approved shipping cask. Type A or Type B casks are used for the transport to either Clive, Utah or the WCS in Texas for ultimate disposal. He stated Constellation's fleet of Type A and Type B casks include seven Type A casks capable of shipping 14 drums and one Type B cask capable of shipping 10 drums or packages.

Constellation uses a multi-tiered approach for oversight of its radioactive waste. It has a high-level performance indicator that sends readings to the facility. Constellation then uses that data to compare itself and its processes against others in the industry.

Mr. Pawloski stated there is a high-level performance indicator that gets reported to the executives in our company that monitor the total waste each of our plants generated. There are department-specific performance indicators that monitor the more specific aspects to radioactive waste. Constellation uses EPRI's Radbench Program to compare the nuclear fleet's performance to the rest of the industry and takes that into consideration during the goal setting process. Mr. Pawloski described the fuel channel disposal approach used at Constellation. He stated they do not have any spent fuel components, simply metals and they sent the material to the lab for analysis and it resulted in a lower activity of Niobium concentration and was determined to be Class B waste upon shorter lived nuclides. Constellation shifted its strategy to dispose of fuel channels separate from other irradiated metal waste. They are processed into an individual disposal package and then transferred to an on-site storage facility to allow decay of short-lived radionuclides because it costs more to dispose of Class B and C waste. Once the waste becomes Class A waste, it gets shipped to a disposal facility.

There are many components at a nuclear plant that need replaced at some point or another, and the components being removed can be recycled and reused as shielding in the plant since the base materials are just metal. A committee member asked the cost to dispose of LLRW. Mr. Pawlowski responded that the cost of management and disposal of LLRW at Constellation amounts to tens of millions of dollars. Mr. Pawloski stated Constellation does not take shortcuts and we process and dispose of all waste properly, regardless of the cost. Another audience member inquired as to whether the components being recycled were being reused at nuclear power plants. Mr. Pawlowski stated that various components throughout the facility, except for the core, can be examined, recycled, and reused in the facility as appropriate.

Public Comment

There was no public comment.

Adjournment

The meeting was adjourned at approximately 12:35 p.m.