NUCLEAR REGULATORY COMMISSION STAFF'S

SAFETY EVALUATION REPORT

OF

CONTINGENCY STORAGE OF

LOW-LEVEL RADIOACTIVE WASTE

AT

PENNSYLVANIA POWER AND LIGHT COMPANY

SUSQUEHANNA STEAM ELECTRIC STATION

DOCKET NO. 30-19311

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1.0 INTRODUCTION AND GENERAL DESCRIPTION OF THE FACILITY

By letter dated August 5, 1981, the Pennsylvania Power and Light Company (PP&L) and the Allegheny Electric Cooperative (AE) (hereinafter, referred to as the applicant or PP&L) applied to the Nuclear Regulatory Commission (Commission or NRC) for a byproduct material license, pursuant to 10 CFR Part 30, for the interim onsite storage of low-level radioactive waste (LLRW) generated from operation of the Susquehanna Steam Electric Station (SSES) (Ref. 1). When the application was received, the NRC published a notice in the Federal Register on October 8, 1981 (46 FR 49975). In accordance with 10 CFR 51, environmental impacts have been assessed separately and are addressed in the NRC staff's (the staff) Environmental Impact Appraisal (EIA) (Ref. 2).

This report documents the staff's safety review of onsite storage of LLRW generated at the SSES for four years. Our radiological safety review for a byproduct material license issued under 10 CFR Part 30 was based on the information given in the application (Ref. 3) and revisions thereto. The application is available for inspection in the NRC's Public Document Room at 1717 H. Street, N.W., Washington, DC and in the Local Public Document Room at the Osterhout Free Library, 71 South Franklin Street, Wilkes-Barre, PA 18701. The application is filed in the Dockets for the Reactor Operating License Nos. 50-387 and 50-388.

We reviewed the design and operation of the LLRW Holding Facility to determine if NRC's safety requirements have been met. Many procedures to be used for operating the holding facility are in use at the SSES and have been previously reviewed by the staff for the reactor operating license. Therefore, those procedures were not reviewed again for this report. References to these procedures are specifically noted throughout this evaluation. If a byproduct material license is granted, the facility must operate in accordance with the terms of the license and NRC's regulations and will be subject to NRC's inspection program.

1.1 Background

The applicants own Units 1 and 2 as tenants in common; PP&L owns ninety percent and AE owns ten percent. PP&L has absolute authority and discretion for the management, operation, and maintenance of the SSES. PP&L also has the authority to act on AE's behalf in pursuit of required authorizations, permits and licenses from the NRC.

The two units at Susquehanna are boiling water reactors. Each is designed to produce up to 3293 megawatts thermal power; net 1050 megawatts electrical power. The NRC issued a license for low power operations at Unit 1 on July 17, 1982. Unit 2 is scheduled to be licensed in 1983.

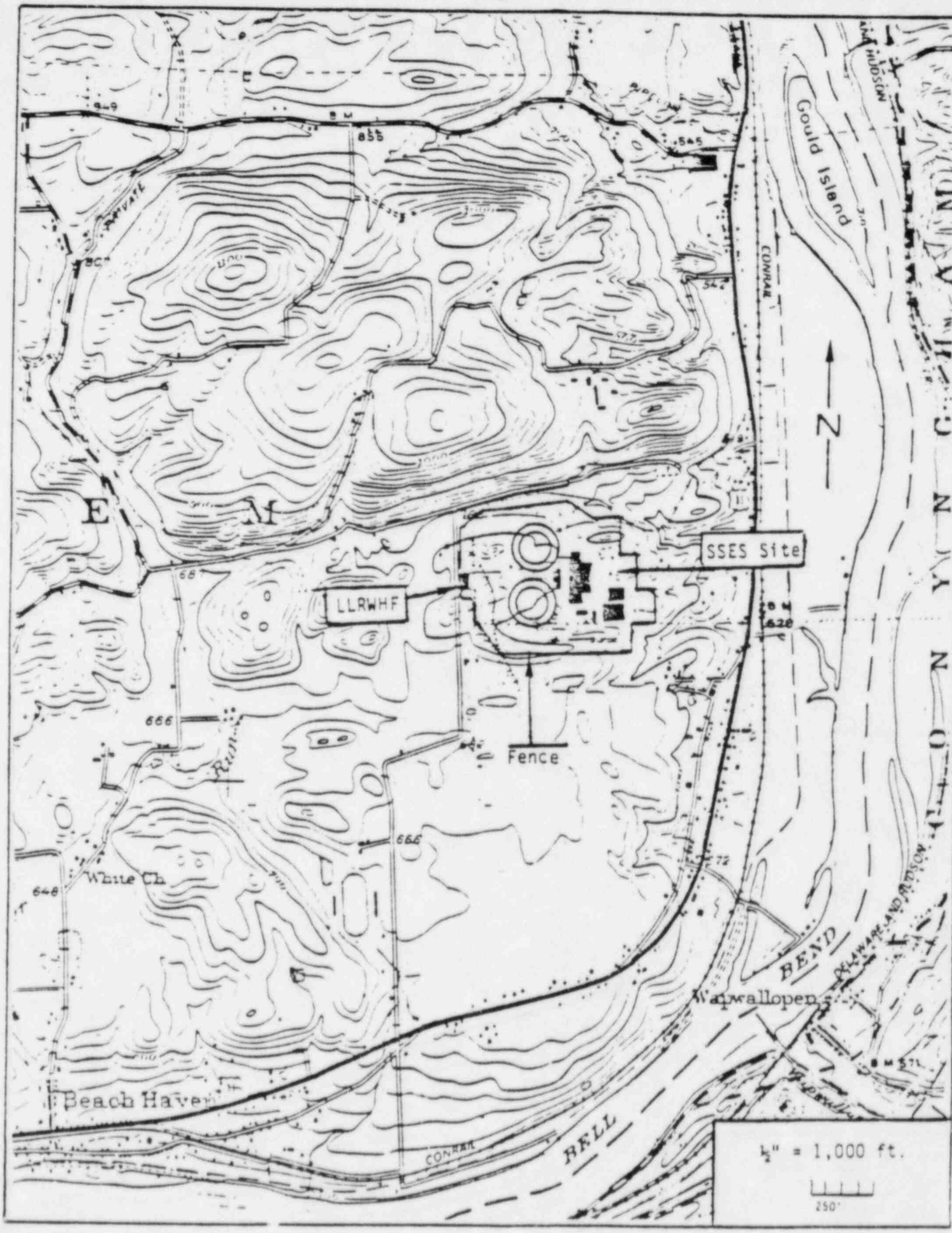
Operation of the reactors results in the generation of LLRW. This waste consists of ion exchange resins, evaporator concentrates, filter treatment sludges, filter cartridges and miscellaneous contaminated material. These wastes are shipped to Chem-Nuclear Systems, Inc.'s (CNSI) commercial radioactive waste disposal site in Barnwell, South Carolina. In recent years, there have been significant restrictions on the amount of LLRW that this site will accept for disposal. Also, there is uncertainty about the availability of the other disposal sites at Beatty, Nevada and Hanford, Washington. Additional LLRW disposal sites, established as a result of the Low-Level Waste Policy Act (Public Law 96-573) will not be available for several years.

1.2 General Description of the Facility

The onsite LLRW Holding Facility is situated on one hectare (ha) (2.5 acres) about 300 meters (m) (1000 ft) west of the cooling towers for the SSES Units 1 and 2 (see Figure 1) and about 23 m (75 ft) inside the western perimeter restricted-area fence.

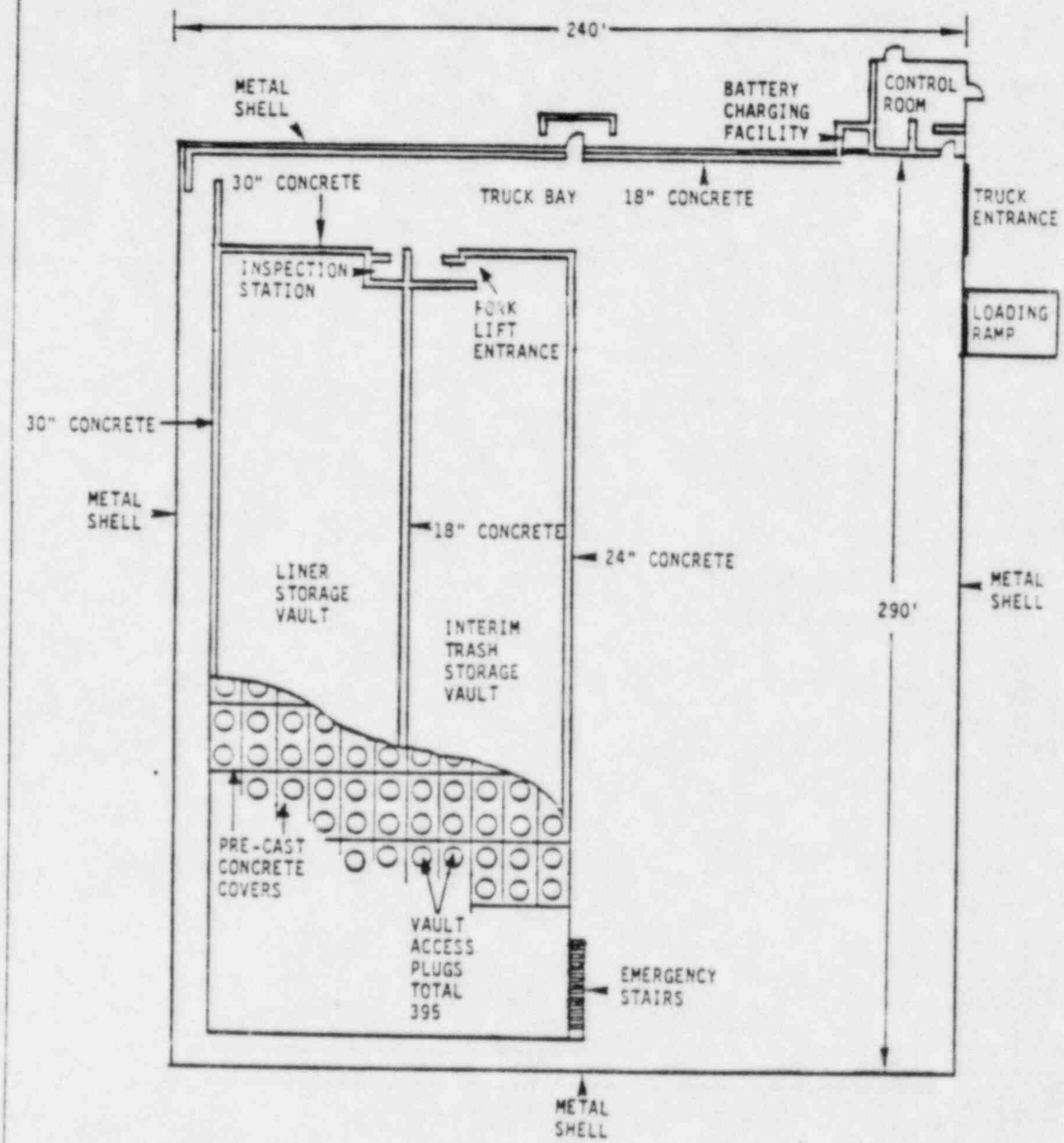
The holding facility is a structural steel frame building which has uninsulated metal siding and roofing to provide weather protection. The 73 m x 88 m (240 ft x 290 ft) building is 12.8 m (42 ft) high and encloses a system of reinforced concrete waste storage vaults. Initially, two concrete vaults in the western half of the building will hold solidified LLRW and trash drums. The eastern half will be open and unoccupied. Later, an additional concrete vault can be constructed to accommodate additional trash storage. A truck bay extends along the north side of the building. A control-room is located at the northeast corner of the building. Adjacent to the control-room western wall there is a battery charging and parking area for a forklift truck (see Figures 2 and 3).

The reinforced concrete vault walls are 5.2 m (17 ft) high and 0.8 m (2.5 ft) thick along the north, west and south sides; 0.6 m (2.0 ft) thick along the east side. A 0.5 m (1.5 ft) thick wall divides the two vaults. These vaults are covered with precast concrete panels 0.5 m (1.5 ft) thick which are supported by a structural steel framing system. Each panel has one or two circular plugs (395 total) which are individually removed while LLRW liners are stored or retrieved. If additional trash storage is required, an additional concrete vault will be constructed in the eastern half of the building. This trash storage vault will have concrete walls 7.3 m (24 ft) high and 0.8 m (2.5 ft) thick. A poured-in-place concrete slab, 0.3 m (1 ft) thick, will cover the trash storage vault.



SSES Location - Local

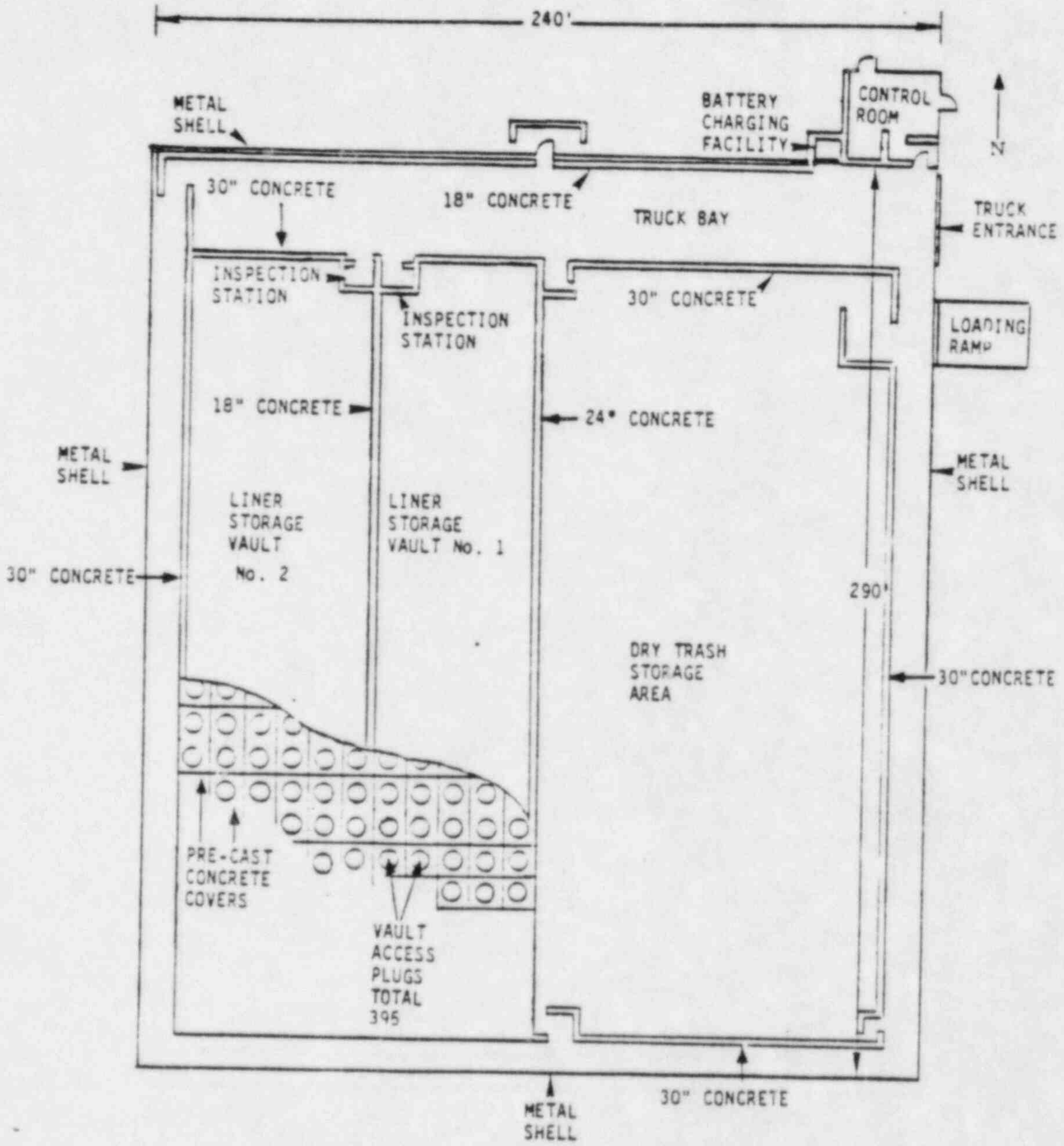
Figure 1



1. This drawing is not to scale
2. No structural steel is shown
3. All concrete is reinforced

Initial Configuration

Figure 2



1. This drawing is not to scale
2. No structural steel is shown
3. All concrete is reinforced

Final Configuration

Figure 3

The concrete shield wall on the northside of the truck bay is 0.5 m (1.5 ft) thick and 4 - 7.0 m (11-23 ft) high. The control room is shielded on the south and west sides by 0.5 m (1.5 ft) thick concrete walls.

A container inspection station is located at the northern end of each solidified waste storage vault. Here, inspections required by 49 CFR 170 and the container integrity monitoring program will be performed. These stations have remote operating capabilities and shielding for persons conducting such inspections. During the interim period when dry trash is stored in the western vault, a labyrinth opening, to allow forklift access, will be in place of the inspection station. When the vault is required for solidified waste storage, the opening will be converted to an inspection station.

A curb located inside the metal shell, but outside the storage vaults, will contain liquids, such as rainwater or fire sprinkler water, that may be introduced into the building. The curb is designed to contain all fire protection water released if the sprinklers are activated for one-half hour. The facility is also equipped with a system of floor drains to collect spilled liquids. All drains lead to a collection sump located in the truck bay at the buildings outer edge. The sump has a liquid detection device which alarms at the LLRW Holding Facility control room and at the SSES reactor control room. There is no permanent pumping equipment installed at sump or pipes leading to the main SSES plant. Any collected liquids will be pumped to portable tanks for processing and disposal.

Electrical power is supplied to the LLRW Holding Facility by PP&L in accordance with the latest issue of the National Electric Code. The power is distributed to the various systems at appropriate voltages from the control room. If power is lost there is no backup. However, the emergency exit lights, fire alarms and the annunciator systems have battery power.

The Holding Facility Heating Ventilation and Air Condition (HVAC) system removes noxious or irritating fumes and maintains area design temperatures. Ceiling-mounted fans remove heat and fumes from the trash storage vaults, and roof-mounted exhaust fans vent the air above the vaults. The control room system provides both temperature control and positive room air pressure. The battery charging station HVAC system removes hydrogen gas produced by battery charging and maintains room temperature. The sprinkler valve house has a heater to protect against freezing. A wall-mounted exhaust fan removes vehicle fumes from the truck bay. Wall-mounted exhaust fans also remove heat produced by high intensity lighting from each inspection station. The ventilation systems in the storage areas, battery charging station and truck bay are automatically shut down in case of a fire.

The Communication System at the LLRW Holding Facility consists of (1) a telephone in the control room and (2) main plant intercommunications paging stations and speakers in the control room, off-loading area and inspection stations. Additional public address speakers are located in the interim and final trash storage areas, and in the truck bay so that paging and alarms can be heard when the facility is full.

1.3 Summary of Principal Review Matters

Our review of the application considered the principal matters summarized below:

- Because the facility is on the SSES site and the site characteristics were previously reviewed by the staff for the reactor licenses, we evaluated only new information about population density, geology, seismic potential and flood potential applicable to the LLRW Holding Facility.

- We evaluated the applicant's design criteria and compared it with Commission guidance issued on November 10, 1981 (Ref. 4).

- We evaluated the applicant's proposed operations and program for radiation protection at the LLRW Holding Facility. Because the facility is on the reactor site and operated by the same personnel, many programs and procedures existing at the SSES will be used for the operation of the LLRW Holding Facility; and therefore no additional review was performed. Those programs, procedures and items previously reviewed by NRC include: the health physics program, the environmental monitoring program, the security procedures, the emergency procedures, the PP&L organizational structure, the technical qualifications of PP&L, the training and experience of its personnel, and the quality assurance program.

- We evaluated the applicant's information on the potential for accidents and their likely maximum radiological consequences.

2.0 SITE CHARACTERISTICS

2.1 Introduction

The staff review and evaluation of site characteristics is provided in the "Safety Evaluation Report related to the operation of Susquehanna Steam Electric Station, Units 1 and 2" (Ref. 5). The Safety Evaluation Report (SER) is available for public inspection at the NRC's Public Document Room at 1717 H. Street, N.W., Washington, DC and at the Local Public Document Room at the Osterhout Free Library, 71 South Franklin Street, Wilkes-Barre, PA. The following information is a description of the SSES site.

2.2 Description

The Susquehanna Steam Electric Station is located on a 435 ha (1075 acre) tract of land, on the west bank of the Susquehanna River in Luzerne County, PA. The site is located northeast of Berwick; about 32 km (20 mi) southwest of Wilkes-Barre. The LLRW Holding Facility and the SSES reactors are on a terrace 62 m (204 ft) above anc 1220 m (4000 ft) west of the river.

2.3 Demography

Because steep sloping terrain and present land use limits human habitation, the population around the SSES is low. Approximately 2420 people live within 4.8 km (3 mi) of the plant. The nearest residence is 400 m (1300 ft) from the facility.

2.4 Climate

Eastern Pennsylvania has hot, humid summers and cold winters with considerable amounts of snow. The annual average precipitation is about 880 mm/yr distributed uniformly throughout the year. The average annual temperature is 9°C. Average monthly temperatures range from -3°C in January to 22°C in July. The prevailing winds are from the West and Southwest and average about 7.3 km/hr (4.5 mph).

Storm systems moving over the United States cause precipitation in the area. Thunderstorms may be expected to occur an average of 31 days per year. From 1955 through 1967 winds of 26 m/s were reported on eight days and hail 20 mm in diameter or larger was recorded on five days. Between 1871 and 1977, 10 hurricanes passed within 80 km (50 mi) of the Susquehanna site. Tornado occurrence at a point in the site area has been calculated to be 4.6E-4 per year with a recurrence interval of 2200 years (Ref. 6). Freezing rain and glaze are common in winter. Ice storms occur about once a year, but accumulations of 13 mm or more are expected only slightly more frequently than one year in two.

2.5 Hydrology

The Susquehanna River is the principal hydrologic feature near the site. The LLRW Holding Facility is more than 914 m (3000 ft) from the river at 213 m (700 ft) above Mean Sea Level (MSL). This elevation is more than 61 m (200 ft) above the river; 36.6 m (120 ft) above the Probable Maximum Flood elevation (Ref. 5). Thus, the integrity or operation of the LLRW Holding Facility will not be threatened by floods.

Ground water near the site is obtained from several Devonian formations and from unconsolidated deposits. The ground water lies 2.1 to 7.9 m (7 to 26 ft) below the surface and flows north to a bedrock valley then towards the Susquehanna River. Although there are 185 wells within 3.2 km (2 mi) of the site, none are located along this path. The estimated ground water travel time to the Susquehanna River is 8.8 years.

2.6 Geology and Seismology

The regional and local geological features of Northeastern Pennsylvania are described in the SSES EIS and have been evaluated by the staff (Ref. 6). Except for local site grading before construction, these basic features are unchanged.

Seismically, the region is relatively free from earthquake activity. No capable faults exist within 8 km (5 mi) of the station. The maximum expected earthquake intensity would be II-VII on the Modified Mercali Scale. The site is within Zone I seismic region.

3.0 PRINCIPAL DESIGN CRITERIA AND COMPLIANCE

3.1 Introduction

The Commission, based on its Policy Paper SECY-81-383, issued Radiological Safety Guidance for Onsite Contingency Storage Capacity (Ref. 4). This guidance sets forth general criteria applicable to the design and operation of such waste storage facilities. In this section we discuss the applicability of the guidance to the PP&L's design criteria and their compliance with that criteria. The staff's review and evaluation of PP&L's design criteria and compliance with that criteria is described below.

3.2 Facility Design Criteria

In Attachment 1, Section XI of the application, PP&L presents the SSES LLRW Holding Facility Technical Concept. It includes the general, system, and civil design criteria. The application lists those Federal and State Codes and Industry Standards which apply to the building design. These codes and standards are listed in Appendix A of this report. PP&L has also described protection against the maximum effects of flooding, winds and precipitation described in Section 2 of this report.

Based on our review of the application, we conclude PP&L has provided adequate criteria for protection against environmental conditions and natural phenomena, that satisfies Commission guidance.

3.3 Waste Handling System

In Section V of Attachment 1 to the application, PP&L has described the design and operation of the cranes used to handle the shielded LLRW containers and vault shield cover plugs. The bridge-type crane is equipped with two hoists. The main hoist has a 30-ton capacity and is used for handling the shield bell and LLRW containers. The second, a girder-mounted monorail hoist has a 10-ton capacity. This hoist is used for handling the vault shield cover plugs. The largest container, when filled with LLRW solidified with cement, and its shield bell would not exceed the capacity of the 30-ton bridge crane hoist. Similarly, a vault shield cover plug does not exceed the capacity of the 10-ton monorail hoist. The bridge crane is equipped with three closed circuit television cameras and lighting to allow remote handling of the shielded radwaste containers and vault shield cover plugs. Should there be a motor or electrical power failure during storage operations, the bridge crane can be returned to a safe position in the truck bay with the use of a winch.

Both the main and monorail hoists have electrical interlock systems that permit the raising and lowering of the loads in the vault using only the microdrive systems. These microdrive systems limit the maximum hoist movement to 16 cm/min (6 in/min), thus preventing impact loads and achieving position accuracy of $\pm$ 1.3 cm (0.5 in).

Based on our review and evaluation of the crane design as described above, we conclude the bridge crane is adequately designed to assure safe operation in transferring waste containers in and out of the storage vaults.

3.4 Fire Protection System

Pursuant to Commission Guidance (Ref. 4), the applicant's design should incorporate good engineering features and capabilities for early detection, prevention and mitigation of accidents such as fires.

Spontaneous combustion of trash waste is unlikely, and resins solidified with cement are not considered combustible. All LLRW is packaged in noncombustible steel containers and stored in vaults constructed of noncombustible materials. However, because the trash drums are stacked on wooden pallets, the facility has vehicle access and the building is occupied during waste handling evolutions, PP&L has installed a fire protection system. The fire protection system, described in Section VIII, Attachment 1 of the application, consist of detection, alarm and suppression subsystems.

The fire detection systems has three types of smoke detectors. An infra-red type smoke detector system is provided in the interim trash storage vault and, later, in the final trash storage vault. Conventional photoelectric type smoke detectors are mounted on the ceiling in the control room. The truck bay will have either a photoelectric or ionization type detectors.

The alarm system used at the LLRW Holding Facility is an extension of the system in use at the SSES. The system provides both normal and emergency backup power supply. All fire alarm circuits from the holding facility control room panel are electrically supervised against opens and short circuits. Electronic, supervisory features are also provided for (1) the smoke detectors, (2) low air pressure in the sprinkler system, (3) low air temperature in a valve house and (4) off-normal position of water supply valves to the sprinkler systems. The system incorporates separate alarm zones for all sprinkler systems water flow switches, infra-red beam receivers, photoelectric smoke detectors and supervisory circuits. The control panel in the control room has lighted zone annunciation and an alarm bell. A 100 db horn is located in the storage area. All signals received by the control room panel circuits are retransmitted to the SSES reactor control room via multiplex circuits from the plant central processing unit. In the event of a fire, the fire detection system will automatically shut down the Holding Facility ventilation system and the SSES fire brigade will respond to the alarm.

The holding facility is equipped to fight fires according to NFPA #13 standards. A dry-type sprinkler fire suppression system, located in the interim trash vault, truck bay, control room, and final trash storage vault, is designed to discharge 0.25 gpm/ft^2 over the most remote 3000 ft^2 area. The sprinkler heads have fuseable links rated at 286°F. When the links melt because of high heat, air pressure in the pipes is released allowing the pipes to fill with water and discharge at the designed rate. Fifty psi air pressure is maintained in the dry pipe system through the automatic filling system at each valve. Water to the sprinkler system is supplied from the existing fire protection system at the SSES by a 25.4 cm (10 in) morter-lined iron water line capable of providing a minimum 1500 gmp at 100 psi. Fire hydrants are equally spaced at 91 m (300 ft) intervals around the building perimeter.

Based on the evaluation of the above information, we conclude PP&L's fire protection measures for the LLRW Holding Facility are acceptable.

3.5 <u>Industrial Security System</u>

According to the Commission guidance, the preferred location for the additional storage facility is inside the plant protected area. If not, then on the plant site. Both a physical security program and restricted area for radiation protection purposes should be established.

The LLRW Holding Facility is located just west of the cooling tower within the SSES restricted area security fence and is under routine surveillance by plant security patrols. Access to the Holding Facility is administratively controlled by the use of a locked door. Outside area lighting at the facility is provided as part of the total site lighting system.

3.6 <u>Container Integrity</u>

Commission guidance addresses several items that should be considered to ensure that container integrity is sufficient to allow handling during transportation and disposal without container breach. In Section XI of Attachment 2 of the application, PP&L discusses the type of waste, waste form and the types of containers to be used.

Two types of LLRW are to be stored in the holding facility; dry active waste (DAW) and solidified waste. The DAW is contaminated material which has a small amount of radioactivity dispersed in large volumes of inert substances and has no free-standing water. DAW generally consist of such items as paper, HEPA and cartridge filters, rags, clothing, small equipment and other dry miscellaneous "trash" materials. The DAW is stored in steel drums or boxes. The containers are placed on pallets for easy handling by a forklift, for stacking, and for preventing contact with water that may inadvertently spill into the storage vault floor. The solidified waste consists of wet dewatered evaporator bottoms, resins and sludges that have been immobilized with cement, inside a steel liner. The solidified wastes contain less than 0.5 percent free standing water.

Based on our review of the above information and discussion in Section 4.3.2 of this report, we conclude the applicant has adequately addressed the Commission guidance and provided for container integrity for the period of storage.

For periods beyond the license term, no expected conditions are known that would cause degradation of container integrity that could not be identified in a timely manner by the container and facility monitoring programs (see Section 4.3.2). Should preventive actions be necessary, PP&L should be capable of repacking the LLRW at the SSES radwaste building.

3.7 Quality Assurance

To ensure safe operation, PP&L has a quality assurance (QA) program for the SSES. This program conforms to the requirements of 10 CFR Part 50 Appendix B. Since all applicable practices and procedures used at the SSES will also be used for the operation of the LLRW Holding Facility, so too will PP&L's QA program. In its application, PP&L identified those equipment, systems and structures important to the safe operation of the holding facility which will be included in the QA program.

4.0 FACILITY OPERATIONS

4.1 Organizational Structure and Staff Qualifications

The operation of the LLRW Holding Facility will be an integral part of the SSES operations. As such, all personnel required for storage activities will be furnished by PP&L without any reorganization of the management and operating staffs. There are no special personnel qualification requirements for the operation of the LLRW Holding Facility in addition to those already imposed for operation of the SSES. The NRC staff has previously reviewed the PP&L organizational structure and staff qualifications. The NRC found PP&L capable to operate the SSES. Based on the above information and the applicant's experience, we conclude that PP&L's organization is adequate to conduct LLRW storage operations in accordance with regulatory requirements and license conditions.

4.2 Training and Experience

Pursuant to 10 CFR 30.33(a)(3), the applicant must be qualified by reason of training and experience to safely handle the byproduct material for the purpose requested. The applicant under the requirements of 10 CFR Part 50.57 has been found technically qualified to engage in activities authorized by the SSES Operating License. The Superintendent of the Plant has ultimate responsibility for all station activities including radiation safety. He delegates his authority for radiation safety to the health physics supervisor. The training and experience of the plant health physicist meets the requirements set forth in Regulatory Guide 1.8. The staff previously reviewed PP&L's SSES management and operating staff qualifications and found them satisfactory. Based on the above information, we conclude that the training and experience of personnel is adequate to conduct LLRW storage operations in accordance with regulatory requirements and license conditions.

4.3 Normal Operating Procedures

4.3.1 Waste Handling Operations

The facility is designed to provide segregated storage of the dry trash and solidified LLRW. Initially two vaults designed for solidified waste will be used. One of these vaults will be modified slightly with a labyrinth opening, for access by a forklift to permit storge of dry trash waste. This initial or interim storage of trash in a solidified waste vault will continue until either the solidified waste vault or the interim trash storage vault becomes half full. At that time, construction will begin on the additional vault for trash storage in the eastern half of the facility. When the final trash storage vault is completed, all the trash stored in the interim trash storage vault will be transferred to the final trash storage vault. The labyrinth opening and emergency exit of the interim trash vault will be closed, and the vault finished into a second solidified waste storage vault.

All containers of LLRW are decontaminated to the standards for 49 CFR 173.397 and meet applicable burial site criteria for disposal before being placed in the holding facility.

Containers of cemented waste are placed under a shield bell and onto a flat bed truck at the SSES solidification facility for transit to the LLRW Holding Facility. After the flat bed truck arrives at the facility and is in position in the truck bay, the 30-ton bridge crane hoist and electric power are connected to the shield bell. Then by remote operation from the control room, the shield bell, with the LLRW container inside, is lifted by the crane and moved over the storage vault towards its intended storage location. At the storage location, the 10-ton monorail hoist is used to lift the vault ceiling shield cover plug. Then the bridge crane is manuevered to place the shield bell into the position vacated by the shield cover plug. The waste container is then lowered into its storage position by a chain hoist inside the shield bell. After the shield cover plug is replaced the shield bell is returned to the truck bay. The procedure is reversed to retrieve a container for inspection or offsite shipment for disposal.

Fifty-five gallon steel drums containing trash are placed on pallets and loaded onto a truck at the SSES radwaste building and transported to the holding facility. At the holding facility the LLRW is unloaded and maneuvered into the interim or final trash storage vault using a battery-operated forklift.

Waste within the storage vaults will be further segregated, as practicable, to take advantage of the self-shielding properties of the waste material. In the trash vault, containers having contact dose rates of 30 mrads/hr or less will be stored on the top layer and those with higher contact dose rates stored underneath. Similarly, in the solidified waste storage vault those containers with a contact dose rate of 3 rads/hr or less will be placed next to the vault walls and on the top layer.

4.3.2 Monitoring Operations

Several monitoring operations will be performed in connection with the LLRW Holding Facility to ensure public health and safety. Waste containers will be monitored to ensure integrity, to identify conditions that may result in container breech and to prevent release of radioactive material. Radiation monitoring will be performed to ensure worker protection during storage operations.

Container Integrity

Pursuant to NRC guidance concerning container integrity, the applicant has established a monitoring program to ensure container integrity and to identify conditions that may result in container breach. One percent of the solidified waste containers in storage longer than one year will be inspected quarterly. A container will be moved out of its storage location to the inspection station where it will be visually inspected for deterioration, leakage or other conditions which might preclude shipment and disposal without repackaging. Inspections required by 49 CFR Part 170 can also be performed at these stations before the waste is shipped offsite for disposal.

Because of the nature of dry trash wastes, and precautions to prevent container contact with water, corrosion is expected to be minimized. Also, there is no reason to believe that this type of waste in steel containers cannot be adequately stored for four years without loss of container integrity. Therefore, there will be no integrity monitoring program for the trash containers. At the time of removal and before shipment offsite, the containers will be inspected to determine if they are acceptable for transportation and receipt at the disposal site. If problems occur, PP&L has the capability to repackage the waste at the SSES radwaste building.

Facility Monitoring

The holding facility will be monitored to ensure early detection of unexpected conditions. In addition to routine security patrols inside the SSES security fence, the facility is equipped with automatic detection and alarm systems for fire, water in the sump and high radiation.

Radiological and Environmental Monitoring

In addition to area radiation monitors installed throughout the LLRW Holding Facility, all other radiation monitoring for compliance with 10 CFR Part 20 will be performed by the SSES health physics staff in accordance with existing procedures established under the reactor operating license. No special environmental radiation monitoring for the holding facility is necessary since the existing program for the SSES provides monitoring that encompasses storage operations.

4.4 Emergency Plans

PP&L has emergency plans in effect for the SSES which will cover any situation arising at the LLRW Holding Facility.

4.5 Records

Pursuant to 10 CFR Part 30, the licensee must keep records showing receipt, transfer and disposal of byproduct material. These records are being maintained as part of the SSES operating license records.

4.6 Conclusion

Based on the above information, we have reasonable assurance that the applicant can conduct LLRW storage operations in accordance with regulatory requirements and license conditions to ensure public health and safety and minimize danger to life or property.

5.0 RADIATION PROTECTION

PP&L has described its radiation protection program in Attachment 3 of its application. We have reviewed the information on radiation protection to assure that it meets the requirements of 10 CFR Part 20 and 40 CFR Part 190. A discussion of our evaluation follows.

5.1 Design Basis

The LLRW Holding Facility was designed to provide radiation protection based on the levels of radioactivity in LLRW generated by SSES operations. The level of radioactivity was the design-basis radioactivity spectra given in the SSES Final Safety Analysis Report (FSAR). Four years of waste accumulation from both reactors was assumed.

PP&L's radiological assessments were based on LLRW generation rates of BWRs similar to Susquehanna SES. Although some fluctuations in annual rates may occur, use of these values for assessment purposes is not expected to cause any significant under-estimations in dose calculations. The source term used by PP&L for design and assessment purposes was 11,680 Ci, the maximum radioactivity in storage at the end of four years (8,670 Ci RWCU, 2,993 Ci CCD, and 17 Ci dry trash). The following summarizes the approximate isotopic breakdown of the total radioactivity after four years accumulated waste.

Radionuclide	Percent of Radioactivity
Fe-55	12
Co-58	9
Co-60	8
Sr-89	5
Sr-90	4
Y-90	4
I-131	25
Te-132	3
Cs-137	4
Ba-La-140	7
Other mixed fission and Activation Products (71 radionuclides)	19

We find these assumptions acceptable for radiation dose assessment purposes.

5.2 Health Physics Program

The health physics program for the LLRW Holding Facility is the same that is used for the SSES. The superintendent of the plant has the responsibility for station activities, including radiation safety. The superintendent of the plant delegates his authority for radiation safety to the health physics supervisor who administers the health physics program. The health physics foreman's responsibility is to assure that all work is conducted in accordance with health physics procedures and Radiation Work Permits (RWPs). RWPs specify the protection and monitoring requirements necessary to perform specific jobs.

The occupational radiation monitoring program for waste storage operations is an extension of the personnel monitoring procedures existing for the SSES. In general, the program consists of the use of area radiation monitors, health physics surveys, self-reading pocket dosimeters and Thermo Luminescent Dosimeters (TLD) and/or film badges. The area radiation monitors provide a continuous readout of area radiation levels at selected locations within the facility. Gamma radiation sensors are strategically located in the interim and final trash storage areas, the control room and the truck bay. Radiation levels detected by the sensors are sent to indicators located on the control panel in the facility control room. All indicators have alarm functions and are grouped to generate a "Facility Radiation High" alarm in the facility control room and a LLRWHF "trouble" alarm in the SSES reactor control room. When needed, area monitoring in the facility can be supplemented by health physics surveys. The surveys are performed by technicians using portable instruments. Self-reading pocket dosimeters allow workers to keep track of their accumulated exposures. TLD badges worn by workers are the official means of dose accounting as required by 10 CFR Part 20.

The radiological environmental monitoring program required for the SSES reactor operating license encompasses the LLRW Holding Facility. The SSES reactor operating license technical specifications contain the requirements for the radiological monitoring program.

Based on this information and the administrative control procedures established as part of the SSES reactor operating license, we conclude the applicant has an adequate health physics program.

5.3 Occupational Exposures

Storing LLRW onsite at the SSES necessarily results in some exposure of personnel to external ionizing radiation. This exposure may occur at various times and locations within the LLRW Holding Facility during waste handling operations.

The highest dose rates to which a worker will be exposed are about 110 mrem/hr and 40 mrem/hr. These rates are the maximum estimated dose rates at the surface of a shield bell with a RWCU container inside and with a CD container inside. A worker would encounter these dose rates when connecting or disconnecting the shield bell's electrical supply line. Each operation takes approximately 2.5 minutes. The annual occupational dose resulting from the connect/disconnect operation for 40 RWCU containers and 180 CD containers is about one person-rem.

Depending on the amount and type of waste handled, personnel exposures will vary from operation to operation. Based on the integrity monitoring requirements and the need to store 220 solidified waste containers and 4000 drums of dry trash, PP&L has estimated the collective occupational dose to be about 4.3 person-rem/yr.

Besides the annual occupational doses received as a result of routine storage operations, construction workers will be exposed to radiation while completing the final trash storage vault. PP&L estimated the collective dose to workers to be about one person-rem. When the final trash storage vault is completed, the trash containers stored in the interim trash vault will be transferred to the final trash vault. The one-time occupational dose for this operation is to be about 4.1 person-rem.

All workers involved in LLRW Holding Facility operations and construction, will come under the same radiation protection and monitoring requirements that govern SSES operations. These procedures or standard practices for personnel radiation protection are consistent with 10 CFR Part 20, include provisions for maintaining exposures as low as reasonably achievable (ALARA) and have been previously approved as requirements for the SSES reactor operating license.

Based on our review of PP&L's application, the designed engineering safeguards and PP&L's adherence to administrative control procedures, we conclude that PP&L can ensure all exposures are maintained within the requirements of 10 CFR Part 20 and at levels which are ALARA.

5.4 Environmental Radiological Assessment

Storage of LLRW onsite will necessarily result in increased levels of radiation in the nearby area. Under the terms and conditions of a Part 30 license the licensee must abide by the radiation protection provisions of 10 CFR Part 20. Because the management of LLRW is considered to be an integral part of the operations involved in generating electricity under the uranium fuel cycle (as defined in 40 CFR Part 190), the licensee must also conform to EPA's Environmental Radiation Protection Standards for Nuclear Power Operations, 40 CFR Part 190.

A detailed radiation dose assessment is contained in the Environmental Impact Appraisal for the Contingency Storage of Low-Level Radioactive Waste at PP&L Susquehanna Steam Electric Station (Ref. 2). This assessment shows the estimated doses in unrestricted areas conform to the requirement of 10 CFR Part 20. The annual dose to the nearest resident from normal operations of the LLRW Holding Facility is estimated to be 1.1 mrems. The assessment also shows that when the dose from storage operations is combined with the dose from SSES operations, the total annual dose is within the requirements of 40 CFR Part 190.

5.5 Conclusion

Based on the our review and evaluation as described above, we conclude PP&L can provide an adequate radiation protection program that meets the requirements of 10 CFR Part 20 and 40 CFR Part 190.

6.0 ACCIDENT ANALYSIS

As part of our safety review for storage of LLRW onsite at Susquehanna, we reviewed those accidents PP&L assessed in its application. Radiological consequences offsite were considered for the following postulated types of accidents: (1) fire in the trash storage vault, (2) earthquake, (3) tornado and (4) handling and storage accidents.

6.1 Fire in the Trash Storage Vault

As previously discussed in Section 3.1, resins solidified in cement have been found to be noncombustible and the possibility of spontaneous combustion of trash in a steel container is considered to be unlikely. However, a trash fire would be the accident that could result in a significant airborne radioactive release.

The radiological consequences of a hypothetical worst case fire that could result in offsite releases of radioactivity were evaluated as follows:

(1) The maximum 17.4 Ci of radioactivity in the trash after four years accumulation is assumed to be involved in a fire of unspecified cause.

(2) The isotopic composition of the radioactivity in the trash is that given in PP&L's application, Attachment 1, Table 3.

(3) A maximum of 1.5 percent of the radioactivity in the trash vault is assumed to be released over a one hour period.

(4) No credit is taken for mitigating effects of the fire suppression system.

(5) Atmosphere dispersion factors were calculated based on NRC Regulatory Guide 1.145 (Ref. 7), a windspeed of 2 m/s, and Pasquill diffusion stability Category G. They are:

at 23 m (75 ft) X/Q = 3.7E-1

at 400 m (1300 ft) X/Q = 1.3E-3

(6) Breathing rate of 1.2 m^3/h (Re. 8)

(7) Inhalation dose conversion factors were taken from NUREG-0172 (Ref. 9) and immersion dose conversion factors from NUREG/CR-1918 (Ref. 10).

An individual standing at the western perimeter fence, the exclusion area boundary, for the duration of the postulated fire would receive a fifty-year dose commitment of about 1.6 rem to the whole-body and thyroid, and about 24 rem to the bone.

The nearest resident would receive a fifty-year dose commitment of about 6 mrem to the whole body and thyroid and about 84 mrem to the bone.

6.2 Earthquake

The LLRW Holding Facility is not a Category I seismic structure (that is, one whose failure would not release significant amounts of radioactivity and is not required for reactor shutdown). The design for this nonseismic Category I structure is based on the Uniform Building Code for seismic zone one. If an earthquake greater than the one for which the building is designed occurs, the supporting structures would fail, causing the facility to cave-in. Because the waste is in a solid form, it would be expected to remain underneath the caved-in sections of the facility. Therefore, no significant release of radioactivity to the environment would occur.

6.3 Tornado

The LLRW Holding Facility is designed for 36 m/s (80 mph) wind loads in accordance with American Society of Civil Engineers Paper No. 3269. Because the facility is not designated a Category I structure, it was not designed to withstand the SSES design basis tornado. If a design basis tornado were to strike the site, the metal roof and siding of the facility would be blown away and the structural steel framing would probably be deformed. The structural strength of the steel framing, girts and purlins would hold the structure together and prevent them from becoming missile hazards. Some deformation and localized damage to the storage vault concrete walls may occur, but they would retain their structural integrity. A 3 psi pressure drop is expected to raise two or three solidified waste storage vault shield plugs off the vault roof. This would allow the pressure inside and outside the vaults to equalize, thus preventing further damage to the concrete vault roof. In the trash storage vault there are labyrinth openings which would allow pressure differentials to equalize. The maximum uplift force predicted will not damage the trash storage vault concrete slab roof. However, when the outside atmosphere pressure returns to normal, the pressure change inside the vault lags behind creating downward forces on the roof that could cause it to collapse. By this time there would be insufficient upward forces to lift trash containers up and over the vault walls. Because the waste is in solid form inside steel containers, it would remain within the concrete walls of the holding facility. Therefore, no significant releases of radioactivity to the environment would occur.

6.4 Handling and Storage Accidents

In Section 4, Attachment 3 of its applicaton, PP&L analyzed several accidents that could occur during the course of storage operations and which involve handling of waste containers. These handling and storage accidents include drops, collisions and system failures. With these types of accidents the principal concern is from direct exposure to radiation due to a loss of shielding. If shielding panels are damaged they could be replaced quickly with spares. If a container of solidified LLRW is dropped or damaged in a collision, radioactivity releases would be small because the waste is solidified in cement and inside a steel container. These types of accidents would not create airborne radiation hazards and would not cause significant radioactivity releases to the environment.

6.5 Conclusions

On the basis of the above discussion, the postulated accident having the greatest potential for release of radioactivity to the environment is a fire involving all the LLRW in the fully loaded trash storage vault. All other accidents would have no significant release of radioactivity to the environment. The whole-body and thyroid doses to a maximumly exposed individual at the exclusion area boundary would be about 1.6 rems. The nearest resident would receive 6 mrem whole-body and thyroid doses. Because of the steel containers and the fire protection and suppression system, the doses from any potential fire are expected to be much lower than evaluated here. The doses from potential accident at the onsite LLRW Holding Facility are only a fraction of the guidelines in 10 CFR Part 100 and are within Commission Guidance (10 percent, i.e., no more than a few rem whole-body dose) (Ref. 4). Accordingly, we conclude the applicant has adequately considered the potential for accidents at the SSES LLRW Holding Facility and has adequately analyzed their credible offsite consequences.

7.0 CONCLUSIONS

Based on our evaluations of the application for a byproduct material license as set forth above, we have concluded that:

(1) The application for byproduct material license dated August 5, 1981, and the revised application dated September 23, 1982, for the Susquehanna Steam Electric Station, meets the standards and requirements of the Atomic Energy Act of 1954, as amended (Act) and the Commission's regulations set forth in 10 CFR Chapter 1 and is for a purpose authorized by the Act; and

(2) Construction of the LLRW Holding Facility at the SSES has proceeded and there is reasonable assurance that it can be completed, in conformity with the application, the provisions of the Act, and the regulations of the Commission; and

(3) The LLRW Holding Facility will be operated in conformity with the application, the provisions of the Act, and the rules of the Commission; and

(4) The applicant's proposed equipment and facilities are adequate to protect health and minimize danger to life and property; and

(5) The applicant is qualified by reason of training and experience to conduct the activities authorized by the license in accordance with regulations of the Commission set forth in 10 CFR Chapter 1 in such a manner as to protect health and minimize danger to life and property; and

(6) There is reasonable assurance (a) that the activities authorized by the license can be conducted without endangering the health and safety of the public, and (b) that such activities will continue to be conducted in compliance with the regulations of the Commission set forth in 10 CFR Chapter 1; and

(7) The issuance of the license will not be inimical to the common defense and security or to the health and safety or the public.

8.0 REFERENCES

1. Letter (with enclosures) from N. W. Curtis, PP&L, to Director, Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, dated August 5, 1981. Available in U.S. Nuclear Regulatory Commission's Public Document Room for inspection and copying for a fee.

2. U.S. Nuclear Regulatory Commission, "Environmental Impact Appraisal, Contingency Storage of Low-Level Radioactive Waste at Pennsylvania Power and Light Susquehanna Steam Electric Station, Docket No. 30-19311," (To Be Published).

3. Letter (with enclosures) from B. D. Kenyon, PP&L, to L. C. Rouse, U.S. Nuclear Regulatory Commission, dated September 23, 1982, PLA-1307. Available in U.S. Nuclear Regulatory Commission's Public Document Room for inspection and copying for a fee.

4. Letter (with enclosure) from W. J. Dircks, U.S. Nuclear Regulatory Commission, to All Holders of and Applicants for Operating Licenses and Construction Permits, (Generic Letter 81-38), dated November 10, 1981. Available in U.S. Nuclear Regulatory Commission's Public Document Room for inspection and copying for a fee.

5. U.S. Nuclear Regulatory Commission, "Safety Evaluation Report, Related to the Operation of Susquehanna Steam Electric Station, Units 1 and 2, Docket Nos. 50-387 and 50-388, Pennsylvania Power and Light Company, Allegheny Electric Cooperative, Inc.," NUREG-0776, April 1981. Available in U.S. Nuclear Regulatory Commission's Public Document Room for inspection and copying for a fee.

6. U.S. Nuclear Regulatory Commission, "Final Environmental Statement Related to the Operation of Susquehanna Steam Electric Station, Units 1 and 2, Docket Nos. 50-387 and 50-388, Pennsylvania Power and Light Company, Allegheny Electric Cooperative, Inc," NUREG-0564, June 1981. Available in the U.S. Nuclear Regulatory Commission's Public Document Room for inspection and copying for a fee.

7. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.145, "Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Plants." Single copies are available from the U.S. Nuclear Regulatory Commission, Division of Technical Information and Document Control, Washington, D.C., 20555.

8. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.3, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Boiling Water Reactors." Single copies are available from the U.S. Nuclear Regulatory Commission, Division of Technical Information and Document Control, Washington, D.C., 20555.

9. Hoenes, G. R. and J. K. Soldat, Battelle Pacific Northwest Laboratories, "Age Specific Radiation Dose Commitment Factor For A One-Year Chronic Intake," NUREG-0172, November 1977. Available for purchase from National Technical Information Service, Springfield, VA, 22161.

10. D. C. Kocher, Oak Ridge National Laboratory, "Dose-Rate Conversion Factors for External Exposure to Photons and Electrons," U.S. Nuclear Regulatory Commission's Report, NUREG/CR-1918, August 1981. Available for purchase from National Technical Information Service, Springfield, VA, 22161.

APPENDIX:

Codes and Standards Applicable to the Facility Design

1. 10 CFR 20, Standards for Protection Against Radiation.

2. 10 CFR 30, Rules of General Applicability to Domestic Licensing of Byproduct Material.

3. Occupational Safety and Health Standards, Department of Labor, Volume 36, No. 105 of Federal Register.

4. Uniform Building Code (UBC) 1976 revision.

5. American Institute of Steel Construction (AISC). "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings" - 1969 revision.

6. American Institute of Steel Construction (AISC). "Manual of Steel Construction " - 1970.

7. American Iron and Steel Institute (AISC). "Specification for the Design of Cold-Formed Steel Structural Members" - 1968.

8. American Concrete Institute (ACI). "Building Code Requirements for Reinforced Concrete" - (ACI 318-77) and Recommended Practice for Concrete Formwork - (ACI 347-68).

9. American Welding Society (AWS). "Structural Welding Code" - AWS D1.1-72.

10. Regulations of the Commonwealth of Pennsylvania as follows:

    a) Standard specifications of the Department of Transportation (PennDOT) for 1970 with respect to roads and bridges.

    b) Regulations of the Department of Environmental Resources - with respect to water supply, sewage, and erosion control.

    c) Department of Labor and Industry and regulations. Current issue (at the time of design) for:

       Construction and Repairs.
       Plant Railways.
       Excavation.
       Railings, Toeboards, Openshided Floors, Platforms, and Runways.
       Ladders.
       Protection from Fire and Panic.
       Miscellaneous Hazards and Conditions of Employment.
       Cranes, Booms, and Hoists.

d) Pennsylvania State Police Department, Bureau of Fire Protection - regulations for storage, handling, and use of flammable and combustible materials.

11. Safety and Health Regulations for Construction. Department of Labor, Volume 36, No. 75 of Federal Register.

12. American Concrete Institute (ACI, Concrete Masonry Structures Design and Construction! low, ACI 531.70.

13. American Society for Testing Materials (ASTM), Structural Steel, ASTM A 36-74.

14. American Society for Testing Materials (ASTM), High Strength Bolts for Structural Steel Joints Including Suitable Nuts and Plain Hardened Washers, ASTM A 325-74.

15. Metal Building Manufacturers Association (MBMA), Recommended Design Practices Manual, dated 1974.

16. 49 CFR 170, Transportation.

17. PP&L Procedure SP-12 - Quality Requirements for Fire Protection and Bechtel Systems.

18. NFPA Standards (includes National Electric Code).

19. ANSI C33.98 - Electrical Metallic Tubing Safety Standard.

20. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

21. ANSI C80.4 - Fittings for Rigid Metal Conduit and Electrical Metallic Tubing.

22. ASTM A 525-73 Steel, Zinc Coated (Galvanized) by the Hot Dip Process.

23. NEMA TC-2 Electrical Plastic Tubing (EPT) and Conduit EPC-40 and EPC-80.

24. NEMA TC-7 Plastic Utilities Duct for Underground Installation.

25. UL-1 Flexible Metal Conduit.

26. UL-6 Rigid Metal Electrical Conduit.

27. UL-514 Electrical Outlet Boxes and Fittings.

28. UL-797 Electrical Metallic Tubing.

29. 40 CFR 190, Environmental Radiation Protection Standards for Nuclear Power Operations.

30. PP&L Dwg. D-184172, Rev. 0; LLRW Holding Facility, Test Bore Holes, Location and Description.

31. Factory Mutual Standards.

32. Reg. Guide 1.69, Concrete Radiation Shields for Nuclear Power Plants.

33. Reg. Guide 7.1, Administration Guide for Packaging and Transporting Radioactive Material.

34. 10 CFR 71 - Packaging of Radioactive Material for Transport.

35. ANSI/ANS 55.1-1979, Solid Radioactive Waste Processing Systems for Light Water Reactor Plants.

36. 10 CFR 50 Appendix R - Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979.

37. NRC BTP (Generic Letter 81-38) - Radiological Safety Guidance For Onsite Contingency Storage Capacity.

38. Reg. Guide 8.8, Information Relevant to Insuring that Occupational Radiation Exposure at Nuclear Power Plant Stations will be as Low as is Reasonably Achievable.

39. Reg. Guide 8.10, Operating Philosophy for Maintaining Occupational Radiation Exposure as Low as is Reasonably Achievable.

40. Branch Technical Position 9.5.1 Appendix A - Guidelines for Fire Protection for Nuclear Power Plants.