PROPOSED CHANGE RTS-203 TO THE
DUANE ARNOLD ENERGY CENTER
TECHNICAL SPECIFICATIONS

The holders of license DPR-49 for the Duane Arnold Energy Center propose to amend Appendix A (Technical Specifications) to said license by deleting current pages and replacing them with the attached, new pages.

The Low-Level Radwaste Processing and Storage Facility (LLRPSF) is being built in accordance with 10 CFR 50.59.

Section 3.15 of the DAEC Technical Specifications, which documents effluent monitoring requirements, was not in effect at the time the LLRPSF design package was initiated. Therefore, this change was not initiated at that time.

This change will incorporate into the Technical Specifications the normal range radiation monitor located in the ventilation exhaust stack of the new Low-Level Radwaste Processing and Storage Facility (LLRPSF) at DAEC. This monitor provides protection as required by 10 CFR 50, Appendix A, General Design Criterion 64. This change will implement an additional control and has no potential to adversely affect the health or safety of the public.

The following list of proposed changes is in the order in which they appear in the Technical Specifications. The List of Affected Pages is presented following this list of changes.

1) Page 3.15-7a is added to incorporate, into Table 3.15-1, an entry for the LLRPSF Exhaust Vent Monitoring System.

2) Page 3.15-8a is added to incorporate, into Table 3.15-1, an action statement (#33) for the LLRPSF exhaust vent monitor.

3) On page 3.15-9, entry 5 is added to Table 4.15-1 to incorporate the LLRPSF Exhaust Ventilation Monitoring System.

4) On page 3.15-11, Table 4.15-2 is changed to add the LLRPSF Vent to the lists of Gaseous Release Types in items B and C.

5) On page 3.15-13, the LLRPSF vent is added to the list of areas where detectors are located. Several sentences are reworded to clarify that there are no required isolation functions initiated by these monitors.

LIST OF AFFECTED PAGES

3.15-7a
3.15-8a
3.15-9
3.15-11
3.15-13

TABLE 3.15-1, continued

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

Instrument@	Minimum Channels Operable	Applicability#	Function	Action
6. LLRPSF Exhaust Vent Monitoring System (R7)				
a. Noble Gas Activity Monitor	1	*	Monitor activity concentration, alarm	33
b. Iodine Sampler Cartridge	1	*	Collect iodine sample	31
c. Particulate Sampler Filter	1	*	Collect particulate sample	31
d. Effluent Flow Measuring Device	1	*	Measure air flow	26
e. Sample Flow Measuring Device	1	*	Measure air flow	26

LLRPSF = Low-Level Radwaste Processing and Storage Facility

TABLE 3.15-1
(Continued)

TABLE NOTATION

ACTION 33 With no channel OPERABLE, effluent releases via this pathway may continue provided a grab sample is taken at least once per day and is analyzed for radioactivity or principal gamma emitters within 24 hours.

TABLE 4.15-1

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL FUNCTIONAL TEST	REQUIRED MODE #
1. Offgas Hydrogen Monitor	D**	N.A.	Q(4)	M	**
2. Offgas Stack Monitoring System					
a. Noble Gas Activity Monitor	D*	M	R(3)	Q(2)	*
b. Iodine Sampler Cartridge	W*	N.A.	N.A.	N.A.	*
c. Particulate Sampler Filter	W*	N.A.	N.A.	N.A.	*
d. Effluent Flow Measuring Device	D*	N.A.	R	Q	*
e. Sample Flow Measuring Device	D*	N.A.	R	Q	*
3. Reactor Building Vent Monitoring System					
a. Noble Gas Activity Monitor	D*	M	R(3)	Q(2)	*
b. Iodine Sampler Cartridge	W*	N.A.	N.A.	N.A.	*
c. Particulate Sampler Filter	W*	N.A.	N.A.	N.A.	*
d. Effluent Flow Measuring Device	D*	N.A.	R	Q	*
e. Sample Flow Measuring Device	D*	N.A.	R	Q	*
4. Turbine Building Exhaust Ventilation Monitoring System					
a. Noble Gas Activity Monitor	D*	M	R(3)	Q(2)	*
b. Iodine Sampler Cartridge	W*	N.A.	N.A.	N.A.	*
c. Particulate Sampler Cartridge	W*	N.A.	N.A.	N.A.	*
d. Effluent Flow Rate Monitor	D*	N.A.	R	Q	*
e. Sample Flow Measuring Device	D*	N.A.	R	Q	*
5. LLRPSF Exhaust Ventilation Monitoring System					
a. Noble Gas Activity Monitor	D*	M	R(3)	Q(2)	*
b. Iodine Sampler Cartridge	W*	N.A.	N.A.	N.A.	*
c. Particulate Sampler Cartridge	W*	N.A.	N.A.	N.A.	*
d. Effluent Flow Rate Monitor	D*	N.A.	R	Q	*
e. Sample Flow Measuring Device	D*	N.A.	R	Q	*

TABLE 4.15-2

RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM

Gaseous Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (LLD)[a] (μCi/ml)
A. Offgas Stack, and Reactor Building Vent	M[b] Grab Sample	M[b]	Principal Gamma Emitters	1×10^{-4} [e]
	Q[g] Grab Sample	Q	H-3	1×10^{-6}
B. Offgas Stack, Reactor Building Vent, Turbine Building Vent, and LLRPSF Vent	Continuous[d]	W[c] Charcoal Sample	I-131	1×10^{-12}
	Continuous[d]	W[c] Particulate Sample	Principal Gamma Emitters (I-131, Others)	1×10^{-11} [e]
	Continuous[d]	Q Composite Particulate Sample[f]	Sr-89, Sr-90	1×10^{-11}
			Gross Alpha	1×10^{-11}
C. Offgas Stack, Reactor Building Vent, Turbine Building Vent, and LLRPSF Vent	Continuous	Continuous	Radioactive Noble Gas gamma activity	1×10^{-6}

3.15.1 and 4.15.1 BASES

1. Radioactive Gaseous Effluent Instrumentation

The radioactive gaseous effluent instrumentation is provided to monitor the release of radioactive materials in gaseous effluents and, as appropriate, to control potential releases. Instrumentation for monitoring the concentration of potentially explosive gas mixtures in the main condenser offgas treatment system is also provided. The presence of instruments for monitoring both radioactive and explosive gaseous effluents is depicted in ODAM Figure 3-1. The OPERABILITY and use of these instruments implements the requirements of 10CFR Part 50, Appendix A, General Design Criteria 60, 63, and 64.

Reactor building exhaust ventilation shaft radiation monitors initiate isolation of the reactor building normal ventilation and start standby gas treatment when a high trip point is reached.

DAEC is equipped with a radioactive gaseous effluent monitoring system which includes detectors at the offgas stack (R3), the reactor building vent (R4), the turbine building vent (R5), and the LLRPSF vent. A remote indication and control unit located near each detector displays the detector reading and, whenever the setpoint is exceeded, an indicator light. The data are also routed to a control computer and a control room display and, except for the LLRPSF vent detector, do not cause a trip to isolate the ventilated area. The LLRPSF vent detector does isolate the LLRPSF ventilation system. However, the isolation function is not required by regulation but is provided as an engineering design conservatism. In the event the control computer and/or control room display fail to function or are voluntarily taken out of service, each remote indication and control unit is designed to acquire data for up to 30 hours. It is intended that each affected remote indication and control unit display be observed at least once per 24 hours (in which case the affected channel remains OPERABLE).

If an alarm trip setpoint is exceeded at the same time the control computer and/or control room display are neither functioning nor in service, alarm annunciation will still occur in the control room. In the event the detector reading and the indication of exceeding the monitor setpoint are not provided at either the control room or the remote indication and control unit, then the affected channel is not OPERABLE and DAEC will either perform the appropriate ACTION or will provide an alternate monitoring system. This permits DAEC to retain the GE gaseous monitoring system as an alternate system for normal effluent monitoring when the Kaman system is temporarily inoperable. When used as an alternate monitoring system, the GE system is subject to the requirements stated in Specifications 3.15.1 and 4.15.1 and to LLD requirements stated in Table 4.15-2, Item C.

LOW-LEVEL RADWASTE PROCESSING AND STORAGE FACILITY (LLRPSF)

Background

NRC Generic Letter 81-38 transmitted to all holders of operating licenses provides guidance for onsite storage of low-level radioactive waste (LLRW). The letter indicates that proposed increases in storage capacity for LLRW are to be evaluated under the provisions of 10 CFR 50.59. If 1) existing license conditions do not prohibit increased storage, 2) no unreviewed safety questions exist, and 3) the proposed increased storage capacity does not exceed the expected radioactive waste generated for 5 years, the additional capacity may be provided and need only be reported to the NRC annually.

The facility operating license and technical specifications for the DAEC do not prohibit increased onsite radioactive waste storage capacity. In addition, the proposed storage does not exceed the expected amount of radioactive waste generated at the DAEC for 5 years.

Design Basis

The storage portion of the LLRPSF has been designed to provide interim onsite storage (up to 5 years) for dewatered/solidified resins and dry active wastes (DAW) produced at DAEC until they can be shipped to a permanent disposal facility. The processing portion of the LLRPSF has been designed to process DAW, oil, laundry, contaminated tools, and used respirators.

The LLRPSF has been designed to protect against the release of radioactive substances to the environment. Seismic loads used in the design of the LLRPSF conform to Uniform Building Code (UBC) Zone 1 criteria. Wind loadings used are those described in DAEC Updated Final Safety Analysis Report (UFSAR) Section 3.3.

The LLRPSF design is such that radioactive substances would be safely contained by design features such as curbs to contain possible spilled resins, and sump systems which pipe floor drains into the existing radwaste system. Additionally, the storage portion of the LLRPSF is situated on a waterproof membrane to prevent leakage into the ground from normal operation.

The storage portion of the LLRPSF is designed to protect stored resins and DAW against the effects of the probable maximum flood (PMF) in accordance with DAEC UFSAR Section 3.4 criteria for the existing radwaste building. Protection against the PMF is not considered necessary for the processing portion of the LLRPSF. UFSAR Section 3.4 indicates that there will be a 12-day warning before flood peak. This warning period provides time to move contaminated laundry, unpacked DAW, etc., from the processing portion of the LLRPSF into areas protected against the PMF.

Evaluation of Radiation Protection Criteria

Concerns regarding potential doses to personnel working at the LLRPSF and to others on and offsite arise from three sources. First, stored resins and DAW are a fixed source of ionizing radiation which penetrates the storage containers and the walls of the facility. Second, decontamination of materials and processing of DAW has the potential for creating an airborne source of radioactivity. Third, the sample tank containing spent decontamination fluids poses a radiological problem if any quantity of liquid radwaste were inadvertently released to the environment. Each source is discussed in the following section, along with the engineered features which have been incorporated into the LLRPSF design to reduce the radiological consequences.

1. Stored Resins and DAW

Resins and DAW stored in the LLRPSF represent a fixed source of ionizing radiation. The LLRPSF design, therefore, includes fixed shielding of the resin and DAW storage areas to limit radiation levels in accessible areas inside the building and in areas outside the building.

Shielding configurations were established on the basis of the following criteria:

a) Dose at site boundary shall be less than or equal to 5 mrem/year

b) Dose rate on LLRPSF external walls shall be less than or equal to 0.5 mrem/hr

Based on the final shielding design, offsite doses from onsite storage of resins and DAW in the LLRPSF would be less than 1 mrem/year and, therefore, would not be expected to exceed the limits of 40 CFR 190.

2. Potential Airborne Source

Ventilation exhaust from LLRPSF areas is released through a single common exhaust vent which is monitored for radioactivity. Radioactive release quantities from the common exhaust vent have been determined to be insignificant, i.e., slightly higher than background radiation. In the event exhaust activity approaches Appendix I setpoint values, the ventilation system will be isolated.

The LLRPSF is equipped with a fire detection system using detectors designed to provide an early warning alarm. The resin and DAW storage areas and other functional areas of the facility (DAW processing, hydrolasing decontamination, laundry/dry cleaning, mask cleaning areas, etc.) are provided with fire protection systems.

The ventilation system is also designed to shut down automatically upon detection of fire. After a fire is extinguished automatically or manually, the ventilation system can be manually restarted and smoke exhausted through a HEPA filter.

The LLRPSF is thus designed to control the release of airborne radioactivity to the environment consistent with 10 CFR 50 Appendix I - Release Limits, even following a fire.

3. Potential Liquid Source

Floor drains in the resin and DAW storage areas are routed to a storage area sump, and then into the floor drain sludge tank 1T-62B in the existing radwaste system.

The processing of laundry and other contaminated equipment is not expected to produce large quantities of contaminated water that would need to be processed through DAEC's liquid radwaste system. However, provisions are made to collect and sample liquids in the processing area. Because of the low contamination of the tools, DAW, and laundry that will be processed in the facility, the radioactivity in the sample tank is expected to be at or below DAEC release limits. The sample tank provides the capability to monitor radioactivity in the floor drains prior to discharge. Floor drains in the processing area (DAW processing, hydrolasing decontamination, laundry/dry cleaning, mask cleaning areas, etc.) are routed to the processing area sump and the hydrolasing decon area sump and then into the 4,000 gallon capacity sample tank located in the LLRPSF for temporary holdup. This tank does not receive any liquid water from the liquid radwaste system. This sample tank provides the capability to collect the discharge from floor drains from various areas in the processing portion of the facility for sampling, prior to discharge into either the environment or the floor drain collector tank in the existing radwaste system.

Upon reaching a pre-set water level alarm point in the sample tank, a representative grab sample from the tank will be analyzed to determine if the liquid from the sample tank can be discharged to the environment, consistent with 10 CFR 50 Appendix I - Release Limits. If it cannot, the liquid batch from the sample tank will be transferred to the floor drain collector tank in the existing radwaste system for processing. Liquid release from the sample tank to the environment is controlled by the valve in the discharge line that is administratively controlled.

Evaluation Based on Accident Conditions

The LLRPSF has been designed to meet the same seismic criteria as the existing radwaste building, that is, Uniform Building Code Zone 1 criteria. This is consistent with the requirements of UFSAR Section 3.2.

However, Regulatory Guide 1.143 provides guidance on seismic design for radwaste systems. The applicable section of the Regulatory Guide states that the building should be designed to withstand the operating basis earthquake. Since the LLRPSF was designed to the same requirements as the existing radwaste building, a separate analysis and evaluation has been performed to determine the effect a seismic event would have concerning radiation releases to the environment.

Performing this analysis meets the guidelines set forth in IE Circular 80-18: 10 CFR 50.59 Safety Evaluations for Changes to Radioactive Waste Treatment Systems. This circular defines criteria that should be reviewed prior to modifying a radwaste system. Among these are the seismic criteria defined in Regulatory Guide 1.143. However, this circular states that, if a modification represents a departure from the stated criteria, among the actions which can be taken is the performance of an evaluation/determination which demonstrates that the departure is acceptable. Our evaluation, which demonstrates the acceptability of our seismic design (based on UBC as opposed to Regulatory Guide 1.143), is described in the following paragraphs.

A critical concern in this analysis is the potential for liquid effluent releases to the environment, due to failures of liquid containing tanks. Three tanks are located in the LLRPSF and were evaluated for this potential failure. The tanks are a 4,000 gallon sample tank in the processing area, a 70,000 gallon surge tank in the storage portion of the LLRPSF and a 7,000 gallon resin hold tank located on the second floor mezzanine in the storage portion of the building. The guidelines for design of Liquid Waste Management Systems are outlined in Standard Review Plan (SRP) 11.2. This document references SRP Section 15.7.3 for criteria regarding postulated radioactive releases due to liquid-containing tank failures.

At this time, a 4,000 gallon sample tank will be installed. It will receive liquid only from the floor drain system in the processing area. This area is not expected to contain significant levels of radioactivity. The expected activity should be well below the expected DAEC release limits as defined by Appendix I. As stated above, the contents of the sample tank will normally be transferred to the existing radwaste system for processing. However, depending on activity level, it can be released to the environment. This is consistent with the guidelines provided in Generic Letter 81-38.

In the future, a 70,000 gallon surge tank will be installed in the north portion of the storage part of the facility. The surge tank will receive liquid from the Reactor Water Clean Up (RWCU) system, the Fuel Pool Cleanup Demineralizer, the RHR System (hydrotest), the off standard recycle from the waste demineralizer and the waste sample tanks, the radwaste collector tank and/or the floor drain collector tank. A review of these various sources indicates that the highest activity liquid that would be received in this tank is from the RWCU System.

A nonmechanistic analysis was performed on three representative RWCU samples using the DAEC Appendix I program, to determine the whole-body and critical organ doses that would result in the unlikely event that the surge tank failed and released its contents to the environment. The input for the computer analysis was taken from the samples for the RWCU. In an effort to obtain the most conservative results for each isotope listed in the samples, the highest activity for that isotope was used as the input. Based on the DAEC Offsite Dose Assessment Manual, two pathways for liquid release to the environment were assumed - water ingestion and fresh water sport fish. As stated in the UFSAR, Section 11.2.3.5, a transit time of 1000 days to the river was conservatively assumed. Therefore, the isotopes were decayed based on this transit time.

The results of the computer analysis show that the maximum individual doses are 1.3mR total body for the child and 9.3mR GI-tract for the adult. These values are below the applicable Appendix I limits of 3.0mR total body and 10mR individual organ.

Another analysis was performed of the surge tank isotope concentrations provided in the UFSAR Table 11.2-6. This list includes the contents of all liquid radwaste surge, sample and storage tanks within the existing radwaste building. The computer program was run based on the method outlined above for the new surge tank. Only those same isotopes that were present in the surge tank test case were included as input from the UFSAR. The results show that the maximum individual dose is 6.6E-02 mR total body for a child and 0.38mR GI-tract for an adult. The reason these values are considerably lower then the surge tank test case is that the activity of Co-60 is higher in the surge tank test case.

However, by summing the values together, indicating a failure of all the liquid tanks in the existing radwaste building as well as the surge tank in the LLRPSF, the doses are still below the Appendix I limits.

A separate calculation was performed to determine the offsite dose that would occur from the resin hold tank during an accident. This tank is located on the second floor mezzanine of the storage portion of the building. The calculation was based on the assumption that the shield walls normally surrounding the tank would be removed while the tank remains in an elevated position. The conclusions of the calculation show that, while the expected dose rate at the site boundary exceeds the Appendix I limits by a small amount, it is still only a small fraction of the accident dose limit defined in 10 CFR 100.

The processing area was also evaluated for potential radiation releases to the environment after an accident. It is anticipated that the amount of contaminated waste (DAW) in this area will be kept to a minimum, since the intent of the facility is to process the waste and move it to the storage area as soon as possible. Also, only a small number of 55-gallon drums of contaminated liquid will reside in the processing area at any given time. The activity level in both these areas, as well as the remainder of the processing area, is expected to be quite low. Therefore, a release from this area after an accident will not exceed the release limits defined by Appendix I.

Based on the analyses described above, the design of the facility to UBC Zone 1 seismic criteria is acceptable.

The LLRPSF is being designed and built in accordance with 10 CFR 50.59. An evaluation has been performed which concludes that no unreviewed safety questions are involved.