PROPOSED CHANGE RTS-115 TO DAEC TECHNICAL SPECIFICATIONS

I. Affected Technical Specifications

Appendix A to license DPR-49 provides the Radiological Technical Specifications for the DAEC.

Appendix B to license DPR-49 provides the Environmental Technical Specifications for the DAEC. At the present it contains Radiological Effluents.

- Specifications 2.3 and 3.3 address the Environmental Protection Conditions, Monitoring Requirements and Bases for Radiological Effluents.

- Specification 4.3 addresses the Radiological Environmental Surveillance Program and Special Studies.

- Specification 5.0 addresses the Administrative Controls as they apply to the Radiological Monitoring Requirements.

II. Proposed Changes in Technical Specifications

The licensees of DPR-49 propose the following changes in Appendix B of the Technical Specifications set forth in I above:

Revise the Table of Contents as indicated on the attached sheets. Delete Specifications 2.3, 3.3, 4.3 and 5.0 and change the number of Page "4.3-12" to "4.1-7."

The licensees of DPR-49 propose the following changes in Appendix A of the Technical Specifications:

Add definitions as indicated on sheets 1.0-11, 1.0-12, 1.0-14 and 1.0-16 through 1.0-19.

Add new limiting conditions for Operation, Surveillance Requirements and Bases for Specifications 3.14, 4.14, 3.15, 4.15, 3.16 and 4.16 which address Radioactive Liquid and Gaseous Effluents.

Revise portions of present Specification 6.1, 6.2, 6.5, 6.6, 6.7, 6.8, 6.10 and 6.11 and add new Specifications 6.13, 6.14 and 6.15 addressing Administrative Controls related to radiological effluents and changes in the Iowa Electric Light and Power Company management structure.

III. Justification for Proposed Change

This change is proposed in response to a request from the Nuclear Regulatory Commission (Mr. B. R. Grimes, Assistant Director for Engineering and Projects, Division of Operating Reactors to all Power Reactor Licensees, dated July 11, 1978). This proposed change generally follows the NRC model technical specifications.

IV. Review Procedure

This proposed change has been reviewed by the DAEC Operations Committee and Safety Committe which have found that this proposed change does not involve a significant hazards consideration.

TECHNICAL SPECIFICATIONS

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TECHNICAL SPECIFICATIONS

LIST OF FIGURES

RADIOLOGICAL EFFLUENT AND ENVIRONMENTAL

TECHNICAL SPECIFICATIONS

APPENDIX A

TO

OPERATING LICENSE DPR-49

DUANE ARNOLD ENERGY CENTER

IOWA ELECTRIC LIGHT AND POWER CO

DOCKET NO. 50-331

21. Thermal Parameters

22. Instrumentation

a. Instrument or Channel Calibration - An instrument or channel calibration means the verification or adjustment of an instrument or channel signal output so that it corresponds, within acceptable range, and accuracy, to a known value(s) of the parameter which the instrument monitors. The acceptable range and accuracy of an instrument and its setpoint are given in the design document and these setpoints are used in the Technical Specifications.

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b. Channel - A channel is an arrangement of a sensor and associated components used to evaluate plant variables and produce discrete outputs used in logic. A channel terminates and loses its identity where individual channel outputs are combined in logic.

c. Instrument or Channel Functional Test - An instrument or channel functional test means the injection of a simulated signal into the instrument primary sensor to verify the proper instrument channel response, alarm and/or initiating action.

d. Instrument or Channel Check - An instrument or channel check is a qualitative determination of acceptable operability by observation of instrument behavior during operation. This determination shall include, where possible, comparison of the instrument with other independent instruments measuring the same variable.

e. Logic System Functional Test - A logic system functional test means a test of all relays and contacts of a logic circuit to insure all compenents are operable per design intent. Where practicable, action will go to completion; i.e., pumps will be started and valves operated.

j. Logic - A logic is an arrangement of relays, contacts, and other components that produces a decision output.

1) Initiating - A logic that receives signals from channels and produces decision outputs to the actuation logic.

2) Actuation - A logic that receives signals (either from initiating logic or channels) and produces decision outputs to accomplish a protective action.

k. Primary Source Signal - The first signal, which by plant design, should initiate a reactor scram for the subject abnormal occurrence (see FSAR Subsection 14.5).

l. Source Check - A Source Check is the qualitative assessment of channel response when the channel sensor is exposed to a radioactive source.

23. Functional Tests

A functional test is the manual operation of initiation of a system, subsystem, or component to verify that it functions within design tolerances (e.g., the manual start of a core spray pump to verify that it runs and that it pumps the required volume of water).

27. Fire Suppression Water System

A fire suppression water system shall consist of a water source, pumps, and distribution piping with associated sectionalizing control or isolation valves. Such valves include yard hydrant curb valves, the first valve ahead of the water flow alarm device on each sprinkler, hose standpipe or deluge system riser.

28. Offsite Dose Assessment Manual

The Offsite Dose Assessment Manual (ODAM) is a manual containing the methodology and parameters to be used in the calculation of off-site doses due to radioactive gaseous and liquid effluents and in the calculation of radioactive gaseous and liquid effluent monitoring instrumentation alarm/trip setpoints.

29. Radiological Environmental Monitoring Manual

The Radiological Environmental Monitoring Manual (REMM) is a manual describing the radiological environmental monitoring program.

30. Gaseous Radwaste Treatment System

A Gaseous Radwaste Treatment System is any system designed and installed to reduce radioactive gaseous effluents by collecting primary coolant system offgases from the primary system and providing for delay or holdup for the purpose of reducing the total radioactivity prior to release to the environment.

31. Lower Limit of Detection

The lower limit of detection (LLD) for a radioactivity measurement system (which may include radiochemical separation) is calculated with the equation

$$LLD = \frac{4.66\ S_b}{E \cdot V \cdot 2.22 \cdot Y \cdot \exp(-\lambda \triangle t)}$$

Alternately, the lower limit of detection (LLD) using a Ge(Li) detector and spectrum analyzer may be calculated on the basis of 3 δ full-width at one-tenth of maximum. The LLD for this detector is calculated with the equation

$$LLD = \frac{9 + \sqrt{81 + 4(18)\ (\text{background counts})}}{2\ (\text{count time})} \Big/ E \cdot V \cdot 2.22 \cdot Y \cdot \exp(-\lambda \triangle t)$$

where

LLD is the lower limit of detection as defined above (as pCi per unit mass or volume)

s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute)

E is the counting efficiency (as counts per transformation)

V is the sample size (in units of mass or volume)

2.22 is the number of transformations per minute per picocurie

Y is the fractional radiochemical yield (when applicable)

λ is the radioactive decay constant for the particular radionuclide

$\triangle t$ is the elapsed time between midpoint of sample collection and time of counting (for plant effluents, not environmental samples)

The value of s_b used in the calculation of the LLD for a detection system shall be based on the actual observed variance of the background counting rate or of the counting rate of the blank samples (as appropriate) rather than on an unverified theoretically predicted variance. In calculating the LLD for a radionuclide determined by gamma-ray spectrometry, the background shall include the typical contributions of other radionuclides normally present in the samples. Typical values of E, V, Y, and t should be used in the calculation.

The background count rate of a Ge(Li) detector is determined from background counts that are determined to be within the full width of the energy band at one-tenth of the maximum height of the gamma ray peak used for the quantitative analysis for that radionuclide.

It should be recognized that the LLD is defined as a priori (before the fact) limit representing the capability of a measurement system and not as a posteriori (after the fact) limit for a particular measurement.

Analyses should be performed in such a manner that the stated LLDs will be achieved under routine conditions. Occasionally background fluctuations, unavoidably small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLDs unachievable.

32. Major Change to Radioactive Waste Treatment System

'Major Changes' to radioactive waste systems (liquid, gaseous and solid)

shall include the following:

1) Major changes in process equipment, components, structures and effluent monitoring instrumentation from those described in the Final Safety Analysis Report (FSAR) or the Hazards Summary Report and evaluated in the staff's Safety Evaluation Report (SER) (e.g., deletion of evaporators and installation of demineralizers; use of fluidized bed calciner/incinerator in place of or in combination with a solidification system);

2) Major changes in the design of radwaste treatment systems (liquid, gaseous and solid) that could significantly alter the characteristics and/or quantities of effluents released or volumes of solid waste stored or shipped offsite from those previously considered in the FSAP and SER (e.g., use of asphalt system in place of cement);

3) Changes in system design which may invalidate the accident analysis as described in the SER (e.g., changes in tank capacity that would alter the curies released); or

4) Changes in system design that could potentially result in a significant increase in occupational exposure of operating personnel (e.g. use of temporary equipment without adequate shielding provisions).

FREQUENCY NOTATION

NOTATION	FREQUENCY
S	At least once per 12 hours.
D	At least once per 24 hours.
W	At least once per 7 days.
M	At least once per 31 days.
Q	At least once per 92 days.
SA	At least once per 184 days.
A	At least once per year.
R	At least once per 18 months.
S/U	Prior to each reactor startup.
P	Prior to each release.
N A	Not applicable.

RADIOACTIVE LIQUID EFFLUENT INSTRUMENTATION

LIMITING CONDITION FOR OPERATION:

3.14.1 The radioactive liquid effluent monitoring instrumentation channels shown in Table 3.14-1 shall be OPERABLE with their alarm and trip setpoints set to ensure that the limits of Specification 3.14.2 are not exceeded.

APPLICABILITY: As shown in Table 3.14-1.

ACTION:

a. With a radioactive liquid effluent monitoring instrumentation channel alarm and trip setpoint less conservative than a value which will ensure that the limits of 3.11.1.1 are met, reset immediately to meet Specification 3.14.2, suspend the release of radioactive liquid effluents monitored by the affected channel, or declare the channel inoperable.

b. With one or more radioactive liquuid effluent monitoring instrumentation channels inoperable, take the ACTION shown in Table 3.14-1.

SURVEILLANCE REQUIREMENTS:

4.14.1.1 Each radioactive liquid effluent monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION, and CHANNEL FUNCTIONAL TEST operations during the MODES and at the frequencies shown in Table 4.14-1.

4.14.1.2 The setpoints shall be determined in accord with the method described in the ODAM.

4.14.1.3 Auditable records of the setpoints and setpoint calculations shall be maintained.

TABLE 3.14-1

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABILITY#	ACTION
1. Gross Radioactivity Monitors Providing Automatic Termination of Release			
a. Liquid Radwaste Effluent Line	(1)	At all times	18
2. Gross Radioactivity Monitors Not Providing Automatic Termination of Release			
a. Service Water System Effluent Line	(1)	At all times	20
3. Flow Rate Measurement Devices**			
a. Liquid Radwaste Effluent Line**	(1)	At all times	21
4. Radioactivity Recorders			
a. Liquid Radwaste Effluent Line***	(1)	At all times	23

Channel(s) shall be OPERABLE and in service except that outages for maintenance and required tests, checks, or calibrations are permitted.

** Pump curves may be utilized to estimate flow; in such cases, action statement 21 is not required.

***Required only if alarm/trip setpoint is based on recorder-controller.

TABLE 3.14-1
(Continued)

TABLE NOTATION

ACTION 18 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases may be resumed for up to 14 days, provided that prior to initiating a release:

1. An sample is analyzed in accordance with Specification 4.14.2.3, and;

2. A technically qualified member of the Facility Staff verifies the release rate calculations and discharge valving;

Otherwise, suspend release of radioactive effluents via this pathway.

ACTION 20 With the numbers of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue for up to 30 days provided that at least once per 24 hours grab samples are collected and analyzed for gross radioactivity (beta or gamma) at a lower limit of detection of at least 10^{-7} μCi/ml.

ACTION 21 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue for up to 14 days provided the flow rate is estimated at least once per 4 hours during actual releases.

ACTION 23 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via the affected pathway may continue for up to 14 days provided the gross radioactivity level is recorded at least once per 4 hours during actual release.

TABLE 4.14-1

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL FUNCTIONAL TEST
1. Gross Beta or Gamma Radioactivity Monitors Providing Alarm and Automatic Isolation				
a. Liquid Radwaste Effluents Line	D*	D(7)	R(3)	Q(1)
2. Gross Beta or Gamma Radioactivity Monitors Providing Alarm But Not Providing Automatic Isolation				
a. Service Water System Effluent Line	D*	M	R(3)	Q(2)
3. Flow Rate Measurement Devices				
a. Liquid Radwaste Effluent Line	D(5)*	N.A.	R	Q
4. Activity Recorders (6)				
a. Liquid Radwaste Effluent Line	D(6)*	N.A.	R	Q

TABLE 4.14-1
(Continued)

TABLE NOTATION

*During releases via this pathway.

**During liquid additions to the tank.

(1) The CHANNEL FUNCTIONAL TEST shall also demonstrate that automatic isolation of this pathway and control room alarm annunciation occurs if any of the following conditions exist:

1. Instrument indicates measured levels above the alarm/trip setpoint.

2. Circuit failure.

3. Instrument indicates a downscale failure.

4. Instrument controls not set in operate mode.

(2) The CHANNEL FUNCTIONAL TEST shall also demonstrate that control room alarm annunciation occurs if any of the following conditions exist:

1. Instrument indicates measured levels above the alarm/trip setpoint.

2. Circuit failure.

3. Instrument indicates a downscale failure.

4. Instrument controls not set in operate mode.

(3) The CHANNEL CALIBRATION shall include the use of a known radioactive source (traceable to the National Bureau of Standards radiation measurement system or acceptable non-NBS standards) positioned in a reproducible geometry with respect to the sensor and emitting beta or gamma radiation in the range measured by the channel during normal operation. CHANNEL CALIBRATION may normally be done during refueling outages.

(5) CHANNEL CHECK shall consist of verifying indication of flow during periods of release. CHANNEL CHECK shall be made at least once daily on any day on which continuous, periodic, or batch releases are made.

(6) This requirement is applicable only to systems where an alarm/trip action is performed by recorder-controller instrumentation.

(7) SOURCE CHECK shall be made at least once daily on any day on which releases are made.

RADIOACTIVE LIQUID EFFLUENT CONCENTRATION

LIMITING CONDITION FOR OPERATION:

3.14.2 The concentration of radioactive material released to the area offsite (see Figure 3.14-1) shall not exceed the concentrations specified in 10 CFR Part 20.106 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall not exceed 2×10^{-4} μCi/ml total activity.

APPLICABILITY: At all times.

ACTION:

With the concentration of radioactive material released from the site to unrestricted areas exceeding the limit, restore the concentration within the limit and notify the Commission pursuant to Specification 6.11.2.a.

SURVEILLANCE REQUIREMENTS:

4.14.2.1 The concentration of radioactive material in liquid effluents released from the site shall be monitored in accordance with Table 3.14-1.

4.14.2.2 The liquid effluent monitors listed in Table 3.14-1 shall be used to limit the concentration of radioactive material released from the site to unrestricted areas to not more than the values given in Specification 3.14.2.

4.14.2.3 The radioactivity content of each batch of radioactive liquid waste to be discharged shall be determined prior to release by sampling and analysis in accordance with Table 4.14-2. The results of pre-release analyses shall be used with the calculational methods in the ODAM to establish alarm/trip setpoints to assure that the concentration at the restricted area boundary does not exceed the limit in Specification 3.14.2.

Alternatively, pre-release analysis of batch(es) of radioactive liquid waste may be by gross β-γ counting provided the maximum permissible concentration, 1×10^{-7} μCi/ml (for unidentified emitters), is applied at the restricted area boundary.

4.14.2 The activity concentration in radioactive liquid effluents shall be determined by collection and post-release analysis of samples in accord with Table 4.14-2. Calculational methods presented in the ODAM shall be applied to these concentration measurements at least once per month to calculate the average concentration at the restricted area boundary.

TABLE 4.14-2

RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

Liquid Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (LLD)[a,g] (μCi/ml)
A. Batch Waste Release Tanks[e]	P Each Batch	P Each Batch	Principal Gamma Emitters[g,h]	5×10^{-7}[b]
			I-131	1×10^{-6}
	P One Batch/M	M[i]	Dissolved and Entrained Gases	1×10^{-5}
	P Each Batch	M[i] Composite[c,d]	H-3	1×10^{-5}
			Gross alpha	1×10^{-7}
	P Each Batch	Q[i] Composite[c,d]	Sr-89, Sr-90	5×10^{-8}

TABLE 4.14-2 (Continued)

TABLE NOTATION

a. Section 1.0, item 31 is a definition of the lower limit of detection (LLD).

b. For certain radionuclides with low gamma yield or low energies, or for certain radionuclide mixtures, it may not be possibel to measure radionuclides in concentrations near the LLD. Under these circumstances, the LLD may be increased inversely proportionally to the magnitude of the gamma yield (i.e., $5 \times 10^{-7}/I$, where I is the photon abundance expressed as a decimal fraction), but in no case shall the LLD, as calculated in this manner for a specific radionuclide, be greater than 10% of the MPC value specified in 10 CFR 20, Appendix B, Table II, Column 2.

c. A composite sample is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen which is representative of the liquids released.

d. To be representative of the quantities and concentrations of radioactive materials in liquid effluents, samples shall be collected continuously in proportion to the rate of flow of the effluent stream. Prior to analyses, all samples taken for the composite shall be thoroughly mixed in order for the composite sample to be representative of the effluent release.

e. A batch release is the discharge of liquid wastes of a discrete volume.

g. The principal gamma emitters for which the LLD specification will apply are exclusively the following radionuclides: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144. This list does not mean that only these nuclides are to be detected and reported. Other peaks which are measurable and identifiable, together with the above nuclides, shall also be identified and reported. Nuclides which are below the LLD for the analyses should not be reported as being present at the LLD level. When unusual circumstances result in LLD's higher than required, the reasons shall be documented in the semiannual Radioactive Effluent Release Report.

h. If an isotopic analysis is unavailable, gross beta/gamma measurement of batch release may be substituted for as many as 14 days provided the concentration released to the unrestricted area does not exceed 1×10^{-7} μCi/ml.

i. Analysis may be performed after release.

RADIOACTIVE LIQUID EFFLUENT DOSE

LIMITING CONDITION FOR OPERATION:

3.14.3 The dose or dose commitment to an individual from radioactive materials in liquid effluents released to unrestricted areas (see Figure 3.14-1) shall not exceed 1.5 mrem to the total body or 5 mrem to any organ during any calendar quarter.

APPLICABILITY: At all times.

ACTION:

a. With the calculated dose from the release of radioactive materials in liquid effluents exceeding the above limit prepare and submit to the Commission within 30 days from the end of the quarter during which the release occurred, pursuant to Specification 6.11.3, a Special Report which identifies the cause(s) for exceeding the limit and defines the corrective actions to be taken. This Special Report shall also include (1) the results of radiological analyses of the drinking water source, and (2) the radiological impact on the nearest down-river community drinking water supply with regard to the requirements of 40 CFR 141, Safe Drinking Water Act.

SURVEILLANCE REQUIREMENTS:

4.14.3 Dose Calculations. Cumulative dose contributions from liquid effluents shall be determined in accordance with the Offsite Dose Assessment Manual (ODAM) at least once per month in order to guide plant supervision in its operation of the radwaste system.

RADIOACTIVE LIQUID WASTE TREATMENT

LIMITING CONDITION FOR OPERATION:

3.14.4 To establish compliance with the design guides of 10 CFR Part 50, Appendix I*, liquid radwaste equipment shall be used to treat any batch of liquid waste prior to discharge when the gross beta-gamma analysis indicates a radioactivity concentration (exclusive of tritium and dissolved noble gases) of 0.01 μCi/ml or higher.

APPLICABILITY: At all times.

ACTION:

a. With radioactive liquid waste being discharged without treatment and in excess of the above limit, prepare and submit to the Commission within 30 days following the conclusion of the quarter in which the event occurred, pursuant to Specification 6.11.3, a Special Report which includes the following information:

   1. Identification of equipment or subsystems not OPERABLE and the reason for nonoperability.

   2. Action(s) taken to restore the nonoperable equipment to OPERABLE status.

   3. Summary description of action(s) taken to prevent a recurrence.

SURVEILLANCE REQUIREMENTS:

4.14.4.1 Doses due to liquid releases to unrestricted areas shall be projected at least once per month in order to guide plant supervision in its operation of the radwaste system.

4.14.4.2 Appropriate components of the liquid radwaste system shall be demonstrated OPERABLE at least once per calendar quarter unless the liquid radwaste system has been utilized to process radioactive liquid effluents during the calendar quarter.

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* See "Evaluation of the Duane Arnold Energy Center to demonstrate conformance to the Design Objectives of 10 CFR 50, Appendix I" May, 1976.

3/4.14.1 RADIOACTIVE LIQUID EFFLUENT INSTRUMENTATION

The radioactive liquid effluent instrumentation is provided to monitor and control, as applicable, the release of radioactive material in liquid effluents. The OPERABILITY and use of these instruments implements the requirements of 10 CFR Part 50, Appendix A, General Design Criteria 60, 63, and 64. The alarm and/or trip setpoints for these instruments are calculated in the manner described in the ODAM to assure that the alarm and/or trip will occur before the limit specified in 10 CFR Part 20.106 is exceeded.

3/4.14.2 LIQUID EFFLUENT CONCENTRATION

Specification 3/4.14.2 is provided to satisfy the regulation governing the maximum concentration of radioactive material in liquid effluent that may be released to an unrestricted area stated in 10 CFR Part 20.106 and the regulation requiring surveys needed to determine compliance stated in Part 20.201.

Conformance to Specification 3.14.2, when applied to the activity concentration in the river near the site boundary due to liquid effluent, would assure that the average activity concentration in liquid effluent released to the unrestricted area is no greater than about five percent of the limit specified in Part 20.106.

3/4.14.4 LIQUID WASTE TREATMENT

This specification implements the requirements of 10 CFR Part 50.36a (a)(1) that operating procedures be established and followed and that equipment be maintained and used to keep releases to the environment as low as is reasonably achievable. The OPERABILITY of the liquid radwaste treatment system ensures that the appropriate portions will be available for use whenever liquid effluents require treatment prior to release to the environment. The specification that the portions of the system which were used to establish compliance with the design objectives in 10 CFR Part 50, Appendix I, Section II be used when specified provides reasonable assurance that releases of radioactive material in liquid effluent will be kept as low as is reasonably achievable. The components in the liquid radwaste system which must either be used to process liquid waste or which must be demonstrated OPERABLE at least once per calendar quarter in order to satisfy Specification 4.14.4.2 are the floor drain demineralizer and the radwaste demineralizer.

The activity concentration, 0.01 μCi/ml, below which liquid radwaste treatment would not be cost-beneficial, and therefore not required, is demonstrated below.

The quantity of radioactive material in liquid effluent released annually from the DAEC has been calculated to be[1]

total iodines	0.11 curie
total others (less H^3)	0.25
Total	0.36 curie

[1] "Evaluation of the Duane Arnold Energy Center to demonstrate Conformance to the Design Objectives of 10 CFR Appendix I," Iowa Electric Light & Power Company, May 1976.

The population dose commitment resulting from the radioactive material in liquid effluent released annually has been calculated to be[1]

thyroid	0.164 man rem
total body	0.114
Total	0.278 man rem

Therefore, population doses are about 1.5 man rem per curie of iodine released and about 0.5 man rem per curie of other radionuclides (less H^3) released in liquids. On the basis of gross activity, the population dose is about one man rem per curie released in liquids.

The volume of liquid waste processed and intended for discharge is estimated to be:

Low Purity Waste	5700 gal/day = 1.8×10^6 gal/yr
Chemical Waste	600 gal/day = 1.9×10^5 gal/yr

Since the equipment used at the DAEC to process both streams is the same, the total volume to be processed is about 2×10^6 gal/yr.

The annual cost to operate the radwaste processing equipment, based on Dirty Waste Ion Exchange operation, has been estimated[2] (neglecting credit for capital recovery) to be $88000 per year. Thus the unit volume operating cost is about:

$$\frac{\$88000/yr}{2 \times 10^6 \text{ gal/yr}} = \$0.05/\text{gal}$$

Thus the operating cost to treat a 4000 gallon batch of chemical waste by ion exchange would be about $200. The operating cost to treat a 10000 gallon batch of floor drain waste by ion exchange would be $500.

Assuming the cost-benefit balance is $1000 expenditure per man rem reduced and assuming treatment removes all radioactivity from the liquid, then

(1) the activity concentration in a Chemical Waste batch below which treatment is not cost-beneficial is

$$C = \frac{\$200}{4000 \text{ gal} \times 3785 \frac{\text{ml}}{\text{gal}}} \times \frac{1 \text{ curie}}{\text{man rem}} \times 10^6 \frac{\mu\text{Ci}}{\text{curie}} \times \frac{1 \text{ man rem}}{\$1000}$$

$$C = 0.013 \ \mu\text{Ci/ml}$$

(2) the activity concentration in a batch of Floor Drain Waste below which treatment is not cost-beneficial is

$$C = \frac{\$500}{10000 \text{ gal} \times 3785 \frac{\text{ml}}{\text{gal}}} \times \frac{1 \text{ curie}}{\text{man rem}} \times 10^6 \frac{\mu\text{Ci}}{\text{curie}} \times \frac{1 \text{ man rem}}{\$1000}$$

$$C = 0.013 \ \mu\text{Ci/ml}$$

Liquid waste treatment with the evaporator at DAEC has been shown to be neither cost-beneficial nor necessary to comply with 10 CFR 50 Appendix I, Section II design objectives.

Consequently, liquid radwaste treatment to achieve an activity concentration below 0.01 μCi/ml in liquid effluent is not justified.

[2] Ibid., based on Regulatory Guide 1.110

RADIOACTIVE GASEOUS EFFLUENT INSTRUMENTATION

LIMITING CONDITION FOR OPERATION:

3.15.1 The radioactive gaseous effluent monitoring instrumentation channels shown in Table 3.15-1 shall be OPERABLE with their alarm setpoints set to ensure that the limits of Specification 3.15.2 are not exceeded.

APPLICABILITY: As shown in Table 3.15-1.

ACTION:

a. With a radioactive gaseous effluent monitoring instrumentation channel alarm setpoint less conservative than a value which will ensure that the limits of 3.15.2 are met, reset immediately to meet Specification 3.15.1 or declare the channel inoperable.

b. With one or more radioactive gaseous effluent monitoring instrumentation channels inoperable, take the ACTION shown in Table 3.15-1.

SURVEILLANCE REQUIREMENTS:

4.15.1.1 Each radioactive gaseous effluent monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION, AND CHANNEL FUNCTIONAL TEST operations during the MODES and at the frequencies shown in Table 4.15-1.

4.15.1.2 The setpoints shall be determined according to the method described in the ODAM.

4.15.1.3 Auditable records of the setpoints and setpoint calculations shall be maintained.

TABLE 3.15-1

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

Instrument[@]	Minimum Channels Operable	Applicability[#]	Function	Action
1. Main Condenser SJAE Off gas Pre-treatment Noble Gas Activity Monitor (R1)	1	***	Monitor Activity Concentration, alarm	25
2. Main Condenser SJAE Offgas Hydrogen Monitor (R2)	1	**	Monitor hydrogen concentration	29
3. Offgas Stack Monitoring System (R3)				
a. Noble Gas Activity Monitor	1	*	Monitor activity concentration, alarm	27
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
4. Reactor Building Exhaust Vent Monitoring System (R4)				
a. Noble Gas Activity Monitor	1	*	Monitor activity concentration, alarm	27
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
5. Upper Turbine Building Exhaust Vent Sampling System (R5)				
a. Iodine Sampler Cartridge	1	*	Collect iodine sample	31
b. Particulate Sampler Filter	1	*	Collect particulate sample	31
c. Sample Flow Measuring Device	1	*	Measure Air Flow	26

TABLE 3.15-1
(Continued)

TABLE NOTATION

@ Refer to Bases, Figure B-1 for location of effluent monitoring points R1 thru R5.

Channels shall be OPERABLE and in service except that outages are permitted for the purpose of required tests, checks, and calibrations.

* During releases via this pathway.

** During main condenser offgas treatment system operation.

***During operation of the main condenser air ejector.

ACTION 25 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, gases from the main condenser offgas treatment system may be released to the environment for up to 72 hours provided:

1. The offgas delay system is not bypassed; and
2. The offgas delay system noble gas activity monitor is OPERABLE:

Otherwise, be in at least HOT STANDBY within 12 hours.

ACTION 26 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue for up to 28 days provided the flow rate is estimated at least once per 24 hours.

ACTION 27 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue for up to 28 days provided grab samples are taken at least once per 8 hours and these samples are analyzed for gross activity within 24 hours.

ACTION 28 Deleted

ACTION 29 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, operation of the main condenser offgas treatment system may continue for up to 28 days provided gas samples are collected at least once per 4 hours and analyzed within the ensuing 4 hours.

ACTION 30 N.A.

ACTION 31 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue for up to 28 days, provided samples required in Table 4.15-2 are continuously collected with auxiliary sampling equipment.

TABLE 4.15-1

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Instrument	Channel Check	Source Check	Channel Calibration	Channel Functional Test
1. Main Condenser SJAE Offgas Pre-Treatment Noble Gas Activity Monitor	D***	M	R(3)	Q(2)
2. Main Condenser SJAE Offgas Hydrogen Monitor	D**	N.A.	Q(4)	M
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
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
Upper Turbine Building Exhaust Ventilation Monitoring System				
a. Iodine Sampler Cartridge	W*	N.A.	N.A.	N.A.
b. Particulate Sampler Cartridge	W*	N.A.	N.A.	N.A.
c. Sample Flow Measuring Device	D*	N.A.	R.	Q.

TABLE 4.15-1
(Continued)

TABLE NOTATION

* During releases via this pathway.

** During main condenser offgas treatment system operation.

***During operation of the main condenser air ejector.

(1) The CHANNEL FUNCTIONAL TEST shall also demonstrate that automatic isolation of this pahtway and control room alarm annunciation occurs if any of the following conditions exist:

1. Instrument indicates measured levels above the alarm/trip setpoint.
2. Circuit failure.
3. Instrument indicates a downscale failure.
4. Instrument controls not set in operate mode.

The CHANNEL FUNCTIONAL TEST demonstrating control room alarm annunciation shall be performed at least once quarterly. The CHANNEL FUNCTIONAL TEST demonstrating isolation shall be performed at least once per reactor operating cycle, normally during a refueling outage.

(2) The CHANNEL FUNCTIONAL TEST shall also demonstrate that control room alarm annunciation occurs if any of the following conditions exist:

1. Instrument indicates measured levels above the alarm setpoint.
2. Circuit failure.
3. Instrument indicates a downscale failure.
4. Instrument controls not set in operate mode.

(3) The CHANNEL CALIBRATION shall include the use of a known radioactive source (traceable to the National Bureau of Standards radiation measurement system or other acceptable non-NBS standards) positioned in a reproducible geometry with respect to the sensor and emitting beta and/or gamma radiation in the range measured by the channel during normal operation.

(4) The CHANNEL CALIBRATION shall include the use of standard gas samples containing a percentabe of hydrogen to verify the accuracy of the monitoring channel.

RADIOACTIVE GASEOUS EFFLUENT CONCENTRATION

LIMITING CONDITION FOR OPERATION:

3.15.2 The concentration of radioactive noble gas in air offsite (ref. Figure 3.14-1) due to gaseous effluents shall not exceed the concentration limit specified in 10 CFR Part 20.106.

APPLICABILITY: At all times when monitors are required.

ACTION:

With the concentration exceeding the limit in 3.15.2, decrease the release rate to comply with the limit and notify the Commission pursuant to Specification 6.11.2.a.

SURVEILLANCE REQUIREMENTS:

4.15.2.1 The release rate of radioactive noble gas shall be monitored according to Specification 3.15.1.

4.15.2.2 A radioactive noble gas effluent monitor shall cause automatic alarm when the concentration at monitoring point R3 or R4 exceeds the monitor alarm setpoint, determined as specified in the ODAM.

AIR DOSE FROM NOBLE GASES IN GASEOUS EFFLUENT

LIMITING CONDITIONS FOR OPERATION:

3.15.3 The air dose in unrestricted areas (see Figure 3.14-1) due to noble gases released in gaseous effluents shall not exceed 5 mrad for gamma radiation and 10 mrad for beta radiation during any calendar quarter.

APPLICABILITY: At all times when monitors are required.

ACTION:

a. With the calculated air dose from radioactive noble gases in gaseous effluents exceeding either of the above limits prepare and submit to the Commission within 30 days following the end of the calendar quarter during which the release occurred pursuant to Specification 6.11.3, a Special Report which identified the cause(s) for exceeding the limit and defines the corrective actions to be taken.

SURVEILLANCE REQUIREMENTS:

4.15.3.1 The release rate of noble gases in gaseous effluents shall be determined by the calculational method described in the ODAM.

4.15.3.2 Dose Calculations Cumulative dose contributions during each quarter shall be determined in accord with the Offsite Dose Assessment Manual (ODAM) at least once every month in order to guide plant supervision in its operation of the radwaste system.

DOSE FROM RADIOIODINES, RADIOACTIVE PARTICULATE FORM AND RADIONUCLIDES OTHER THAN NOBLE GASES IN GASEOUS EFFLUENT

LIMITING CONDITIONS FOR OPERATION:

3.15.4 The dose to an individual from radioiodines, radioactive materials in particulate form, and radionuclides (other than noble gases) with half-lives greater than 8 days in gaseous effluents released from the site (see Figure 3.14-1) shall not exceed 7.5 mrem to any organ during any calendar quarter.

APPLICABILITY: At all times when monitors are required.

ACTION:

a. With the calculated dose from the release of radioiodines, radioactive materials in particulate form, or radionuclides other than noble gases in gaseous effluents exceeding the above limit, prepare and submit to the Commission within 30 days following the end of the calendar quarter during which the release occurred pursuant to Specification 6.11.3 a Special Report which identified the cause(s) for exceeding the limit and defines the corrective actions to be taken.

SURVEILLANCE REQUIREMENTS:

4.15.4.1 The release rate of radioactive materials, other than noble gases, in gaseous effluents shall be determined by sampling and analyses specified in Table 4.15-2.

4.15.4.2 Dose Calculations Cumulative dose contributions during each quarter shall be determined in accordance with the ODAM at least once every month in order to guide plant supervision in its operation of the radwaste system.

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. Containment Purge	P Each Purge[c] Grab Sample	P Each Purge[c] Q	Principal Gamma Emitters[f] H-3	1×10^{-4}[b] 3×10^{-6}
B. Offgas Stack, and Reactor Building Vent	M[c] Grab Sample	M[c]	Principal Gamma Emitters[f] H-3	1×10^{-4}[b] 3×10^{-6}
C. Offgas Stack, Reactor Building Vent, and Upper Turbine Building Vent	Continuous[e]	W[d] Charcoal Sample	I-131 I-133	1×10^{-10} 1×10^{-9}
	Continuous[e]	W[d] Particulate Sample	Principal Gamma Emitters[f] (I-131, Others)	1×10^{-10}
	Continuous[e]	M Particulate Sample	Gross α	1×10^{-11}
	Continuous[e]	Q Composite Particulate Sample	Sr-89, Sr-90	1×10^{-11}
D. Offgas Stack and Reactor Building Vent	Continuous	Continuous	Radioactive Noble Gas gamma activity	1×10^{-6}

TABLE 4.15-2 (Continued)

TABLE NOTATION

a. Section 1.0, Item 31 is a definition of the lower limit of detection (LLD).

b. For certain radionuclides with low gamma yield or low energies, or for certain radionuclide mixtures, it may not be possible to measure radionuclides in concentrations near the LLD. Under these circumstances, the LLD may be increased inversely proportionally to the magnitude of the gamma yield (i.e., $1 \times 10^{-4}/I$, where I is the photon abundance expressed as a decimal fraction), but in no case shall the LLD, as calculated in this manner for a specific radionuclide, be greater than 10% of the MPC value specified in 10 CFR 20, Appendix B, Table II, Column 1.

c. Analyses shall be performed following an increase of more than 50% in the steady state release as indicated by a noble gas activity monitor, after factoring out the effect due to a change in reactor power.

d. Sample media shall be changed at least once per 10 days and the analysis completed within 48 hours after changing (or after removal from the sampler). Analyses shall also be performed following an increase of more than 50% in the steady state release as indicated by a noble gas activity monitor, after factoring out the effect due to a change in reactor power. When samples collected for 24 hours or less are analyzed, the corresponding LLD may be increased by a factor of 10.

e. The ratio of the sample flow rate to the sampled stream flow rate shall be known for the time period covered by each dose or dose rate calculation made in accordance with Specifications 3.15.2, 3.15.3 and 3.15.4.

f. The principal gamma emitters for which the LLD specification will apply are exclusively the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138 for gaseous emissions and Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141 and Ce-144 for particulate emissions. This list does not mean that only these nuclides are to be detected and reported. Other peaks which are measurable and identifiable, together with the above nuclides, shall also be identified and reported. Nuclides which are below the LLD may be reported as "less than" their respective LLD and should not be reported as being present at the LLD of the nuclide. Each measured radionuclide concentration is used in a required concentration of dose calculation only if it is detected at or above the LLD. When unusual circumstances result in LLD higher than required, the reasons shall be documented in the Semiannual Radiological Effluent Release Report.

LIMITING CONDITIONS FOR OPERATION:

3.15.5 Gaseous radwaste equipment used to establish compliance with the design guides of 10 CFR Part 50, Appendix I* shall be operated to treat radioactive gaseous wastes prior to their discharge when the projected air doses due to gaseous effluent releases to offsite areas (see Figure 3.14-1) when averaged over 31 days would exceed 1.5 mrad for gamma radiation and 3.0 mrad for beta radiation.

APPLICABILITY: At all times when monitoring is required.

ACTION:

a. With gaseous wastes being discharged for more than 31 days without treatment and in excess of the above limits, prepare and submit to the Commission within 30 days following the conclusion of the quarter in which the event occurred, pursuant to Specification 6.9.2, a Special Report which includes the following information:

   1. Identification of equipment of subsystems not OPERABLE and the reason for nonoperability.

   2. Action(s) taken to restore the non-operable equipment to OPERABLE STATUS.

   3. Summary description of action(s) taken to prevent a recurrence.

SURVEILLANCE REQUIREMENTS:

4.15.5.1 Doses due to gaseous releases to offsite areas shall be projected at least once per month in order to guide plant personnel in its operation of the radwaste system.

4.15.5.2 The appropriate systems shall be demonstrated OPERABLE at least once per calendar quarter unless the appropriate system has been utilized to process radioactive gaseous effluents during the calendar quarter.

*See "Evaluation of the Duane Arnold Energy Center to demonstrate conformance with the design objective of 10 CFR 50 Appendix I" May, 1976.

EXPLOSIVE GAS CONCENTRATION IN OFFGAS

LIMITING CONDITION FOR OPERATION:

3.15.6 The concentration of hydrogen in the main condenser offgas treatment system downstream of the recombiners shall be limited to $\leq$ 4% by volume.

APPLICABILITY: At all times when monitoring is required.

ACTION:

a. With the concentration of hydrogen or oxygen in the main condenser offgas treatment system downstream of the recombiners exceeding the limit, restore the concentration to within the limit within 48 hours.

SURVEILLANCE REQUIREMENTS:

4.15.6 The concentration of hydrogen in the main condenser offgas treatment system shall be determined by continuously monitoring the waste gases in the main condenser offgas treatment system with the hydrogen monitors (ref. Figure B-1 at point R2) required OPERABLE by Table 3.15-1 of Specification 3.15.1.

RADIOACTIVE NOBLE GAS EFFLUENT FROM MAIN CONDENSER AIR EJECTOR

LIMITING CONDITION FOR OPERATION:

3.15.7 The gross radioactivity (beta and/or gamma) rate of noble gases measured at the main condenser air ejector shall be limited to $\leq$ (100 µCi/sec/MWt).

APPLICABILITY: At all times when monitoring is required.

ACTION:

With the gross radioactivity (beta and/or gamma) rate of noble gases at the main condenser air ejector exceeding (100 µCi/sec/MWt), restore the gross radioactivity rate to within its limit within 72 hours or be in at least HOT STANDBY within the next 12 hours.

SURVEILLANCE REQUIREMENTS:

4.15.7 The gross radioactivity (beta and/or gamma) rate of noble gases from the main condenser air ejector shall be determined at the following frequencies by performing an isotopic analysis of a representative sample of gases taken at the discharge (prior to dilution and/or discharge) of the main condenser air ejector:

a. At least once per month.

b. Within 4 hours following an increase, as indicated by the Condenser Air Ejector Noble Gas Activity Monitor (ref. Figure B-1, at point R 1), of greater than 50%, after factoring out increases due to changes in THERMAL POWER level, in the nominal steady state fission gas release from the primary coolant.

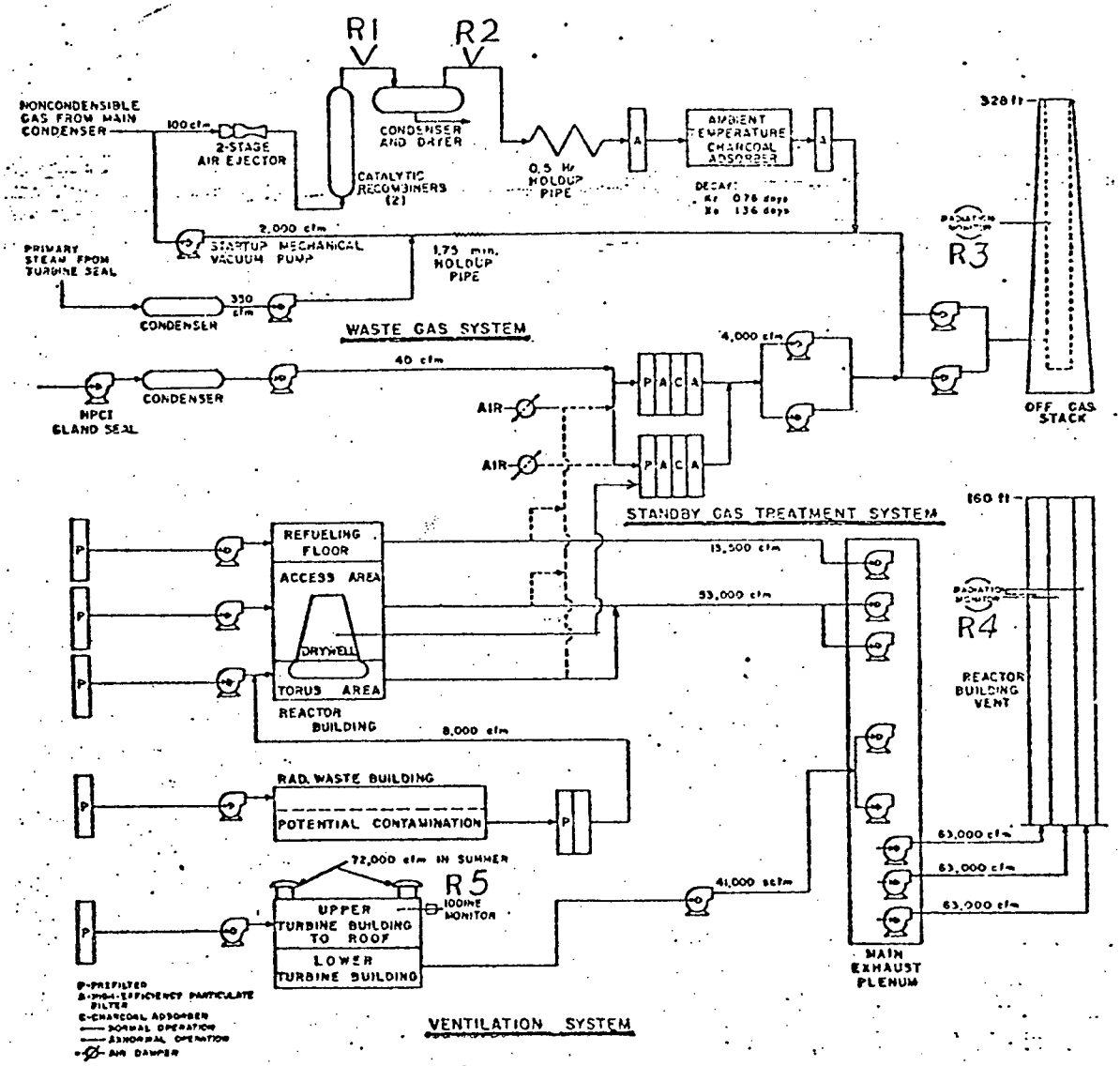

Figure B-1. Gaseous Radioactive Waste Flow Diagram

R1 Main Condenser SJAE Offgas Pretreatment Noble Gas Activity Monitor

R2 Main Condenser SJAE Offgas Hydrogen Monitor

R3 Offgas Stack Radiation Monitoring System

R4 Reactor Building Exhaust Vent Monitoring System

R5 Upper Turbine Building Exhaust Vent Sampling System

3/4.15.1 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 Figure B-1. The OPERABILITY and use of these instruments implements the requirements of 10 CFR Part 50, Appendix A, General Design Criteria 60, 63, and 64.

Main condenser SJAE offgas post-treatment monitors are operable during reactor power operation with their trip setting at a value not exceeding a limit computed by a method described in the Offsite Dose Assessment Manual. If both instruments reach their high trip point or if one reaches the high trip point and the other reaches a downscale trip point, the SJAE offgas isolation valves close immediately.

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

3/4.14.3 DOSE DUE TO RADIOACTIVE EFFLUENTS
3/4.15.3
3/4.15.4

Specifications 3.14.3, 3.15.3, and 3.15.4 implement the requirements of 10 CFR Part 50.36a and of 10 CFR Part 50, Appendix I, Section IV. These specifications state limiting conditions of operation (LCO) to keep levels of radioactive materials in LWR effluents as low as is reasonably achievable. Compliance with these specifications will also keep average releases of radioactive material in effluents at small percentages of the limits specified in 10 CFR Part 20.106. Surveillance Requirements provide for the measurement of releases and calculation of doses to verify compliance with the Specifications. Action statements in these Specifications implement the requirements of 10 CFR Part 50.36(c)(2) and 10 CFR Part 50, Appendix I, Section IV.A in the event a LCO is not met.

10 CFR Part 50 contains two distinctly separate statements of requirements pertaining to effluents from nuclear power reactors. The first concerns a description of equipment to maintain control over radioactive materials in effluents, determination of design objectives, and means to be employed to keep radioactivity in effluents ALARA. This requirement is stated in Part 50, Section 34a and Appendix I, Section II. Appendix I, Section III stipulates that conformance with the guidance on design objectives be demonstrated by calculations since demonstration is expected to be prospective.

The other is a requirement for developing limiting conditions of operation in technical specifications. It is stated in 10 CFR Part 50, Section 36a and Appendix I, Section IV. Both the intent of the Commission and the requirement are clearly stated in the Opinion of the Commission;[3] relevant paragraphs from that document follow:

> Section 50.36a(b) of 10 CFR Part 50 provides that licensees shall be guided by certain considerations in establishing and implementing operating procedures specified in technical specifications which take into account the need for operating flexibility and at the same time ensure that the licensee will exert his best efforts to keep levels of radioactive materials in effluents as low as practicable. The Appendix I that we adopt provides more specific guidance to licensees in this report.

[3] NRC Commissioners, "Opinion of the Commission," in the Appendix I Rulemaking Hearing, Docket Rm-50-2, p. 101-102, April 30, 1975.

A. The Rule

> Section IV of Appendix I specifies action levels for the licensee. If, for any individual light-water-cooled nuclear power reactor, the quantity of radioactive material actually released in effluents to unrestricted areas during any calendar quarter is such as to cause radiation exposure, calculated on the same basis as the design-objective exposure, which would exceed one-half the annual design-objective exposure, the licensee shall make an investigation to identify the causes of these high release rates, define and initiate a program of action to correct the situation, and report these actions to the Commission within 30 days of the end of the calendar quarter.

The conclusion of the NRC Staff in the Appendix I Rulemaking Hearing[4] seemed to agree with that of the Commission. The Staff recommended, "...that the limiting conditions for operation described in Appendix I, Section IV be applicable upon publication to technical specifications included in any license authorizing operation of a light-water-cooled nuclear power reactor..." (p. 73).

The action to be taken by a licensee in the event a limiting condition is exceeded, is stated in Appendix I, Section IV.A and in the Opinion of the Commission.[5] Technical Specifications 3/4.14.3, 3/4.15.3, and 3/4.15.4 submitted for the DAEC conform to this requirement.

Guidance for developing technical specifications for surveillance and monitoring is included in Appendix I, Section IV.B.

Although "it is expected that the annual releases of radioactive material in effluents from light-water-cooled nuclear power reactors can generally be maintained within the levels set forth as numerical guides for design objectives in Section II" (Appendix I, Section IV), no recommendation was made by either the Staff in its Concluding Statement[6] or by the Commission in its Opinion[7] that design objective values should appear as technical specification limits. The Opinion of the Commission and the statement of Appendix I are clear. Limiting conditions of operation (LCO) related to the quantity of radioactive material in effluents released to an unrestricted area stated in technical specifications shall conform to Appendix I, Section IV.A. Licensee action in the event an LCO is exceeded should meet Section IV.A. Finally, surveillance and monitoring of effluents and the environmental should conform to Section IV.B.

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[4] NRC Staff, "Concluding Statement of the Regulatory Staff," in the Appendix I Rulemaking Hearing, Docket RM-50-2, pp 17, 69, 73, 115, February 1974.

[5] NRC Commissioners, p. 101.

[6] NRC Staff

[7] NRC Commissioners

Liquid Effluents. With the implementation of Specification 3.14.3, there is reasonable assurance that Station operation will not cause a radionuclide concentration in public drinking water taken from the River that exceeds the standard for anthropogenic radioactivity in community drinking water. The equations in the ODAM for calculating doses due to measured releases of radioactive material in liquid effluent will be consistent with the methodology in Regulatory Guides 1.109 and 1.113. The assessment of personal doses will examine potential exposure pathways including consumption of fish and water taken from the River downstream of the discharge canal.

Gaseous Effluents. Assessments of dose required by Specifications 4.15.3.2 and 4.15.4.2 to verify compliance with Appendix I, Section IV is based on measured radioactivity in gaseous effluent and on calculational methods stated in the ODAM. Pathways of exposure and location of individuals are selected such that the dose to a nearby resident is unlikely to be underestimated. Dose assessment methodology described in the ODAM for gaseous effluent will be consistent with the methodology in Regulatory Guides 1.109 and 1.111. Cumulative and projected assessments of dose made during a quarter are based on historical average, or reference,* atmospheric conditions. Assessments made for the annual radiological environmental report will be based on quarterly and annual averages of atmospheric conditions during the period of release.

3/4.15.5 GASEOUS RADWASTE TREATMENT

This specification implements the requirement of 10 CFR Part 50.36a (a)(1) that operating procedures be established and followed and that equipment be maintained and used to keep releases to the environment as low as is reasonably achievable. The Waste Gas System charcoal adsorbers with pre- and aft-particulate filters, the Standby Gas Treatment System, and the Radwaste Building exhaust ventilation particulate filter must be used to process radioactive gaseous effluent prior to release or must be demonstrated OPERABLE at least once per calendar quarter in order to satisfy Technical Specification 4.15.5.2. Maintaining the OPERABILITY of these systems ensures that appropriate systems will be available for use whenever gaseous effluents require treatment before release to the atmosphere. The specification that the portions of these systems which were used to establish compliance with the design objectives in 10 CFR Part 50, Appendix I, Section II be used when specified provides reasonable assurance that the releases of radioactive materials in gaseous effluents will be kept as low as is reasonably achievable.

Figure B-1 is a flow diagram depicting gaseous radioactive waste streams. The Standby Gas Treatment System is considered an Engineered Safety Feature and not a Ventilation Exhaust Treatment System.

3/4.15.6 EXPLOSIVE GAS MIXTURE

Specification 3/4.11.2.6 is provided to ensure that the concentration of potentially explosive gas in the waste gas treatment system downstream of the recombiners is maintained below the flammability limit of a hydrogen and oxygen mixture in the system. Keeping the mixture below

*The same period of record used in the design objective Appendix I evaluation.

its flammability limit will provide assurance that waste gas treatment system integrity and operability is maintained and that the radioactive material concentration in the offgas will be controlled in conformance with 10 CFR Part 50, Appendix A, Criterion 60.

3/4.15.7 MAIN CONDENSER

Restricting the gross radioactivity rate of noble gases from the main condenser provides reasonable assurance that the total body exposure to an individual at the exclusion area boundary will not exceed a small fraction of the limits of 10 CFR Part 100 in the event this effluent is inadvertently discharged directly to the environment without treatment. This specification implements the requirements of General Design Criteria 60 and 64 of Appendix A to 10 CFR Part 50.

RADIOACTIVE GASEOUS EFFLUENT DOSE

LIMITING CONDITION FOR OPERATION:

3.16.1 The dose or dose commitment to a real individual offsite from the Station shall not exceed 25 mrem to the total body or any organ (except the thyroid, which is limited to $\leq$ 75 mrem) over a period of 12 consecutive months.

APPLICABILITY: At all times.

ACTION:

a. With the calculated dose from the release of radioactive materials in liquid or gaseous effluents exceeding twice the limits of Specifications 3.14.3, 3.15.3, or 3.15.4 prepare and submit a Special Report to the Commission pursuant to Specification 6.11.3 and limit the subsequent releases such that the dose or dose commitment to a real individual from Duane Arnold Energy Center is limited to $\leq$ 25 mrem to the total body or any organ (except thyroid, which is limited to $\leq$ 75 mrem) over 12 consecutive months. This Special Report shall include an analysis which demonstrates that radiation exposures to real individuals in the vicinity of the station due to the presence of the station (including all effluent pathways) are less than the 40 CFR Part 190 Standard. Otherwise, obtain a variance from the Commission to permit releases which exceeds the 40 CFR Part 190 Standard.

SURVEILLANCE REQUIREMENTS:

4.16.1 Dose Calculations. Cumulative dose contributions from liquid and gaseous effluents to an individual offsite shall be calculated at least once every year in accord with the methodology described in the ODAM.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

LIMITING CONDITION FOR OPERATION:

3.16.2 DAEC shall conduct a radiological environmental monitoring program in accord with the Radiological Environmental Monitoring Manual (REMM).

APPLICABILITY: At all times.

ACTION:

a. In the event the radiological environmental monitoring program is not conducted as specified in the REMM, prepare and submit to the Commission in the Annual Radiological Environmental Report the reasons for not conducting the program in accord with the REMM and the plans for preventing a recurrence.

b. When the radioactivity in a sampled environmental medium, averaged over a calendar quarter, exceeds an appropriate value stated in Table 2 in the REMM, prepare and submit to the Commission within 30 days from the end of the affected calendar quarter a Special Report which includes an evaluation of any release conditions, environmental factors or other conditions which caused the value(s) of Table 2 in the REMM to be exceeded. If the radioactivity in environmental sample(s) is not attributable to release from the Station, the Special Report is not required; instead the sample(s) result(s) shall be reported and explained in the Annual Radiological Environmental Report.

c. When environmental sampling medium is not available from a sampling location designated in the REMM, the cause and the location where replacement samples were obtained shall be reported in the Annual Radiological Environmental Report.

d. In the event a location is identified at which the calculated personal dose associated with one or more exposure pathways exceeds the calculated dose associated with like pathways at a location where sampling is conducted as specified by the REMM, then the pathways having maximum exposure potential at the newly identified location will be added to the radiological monitoring program and to the REMM at a subsequent Operations Committee meeting, if samples are reasonably attainable at the new location. Like pathways monitored (sampled) at a location, excluding the control station locations(s), having the lowest associated calculated personal dose may be deleted from the REMM at the time the new pathway(s) and location are added.

The NRC will be notified of a change in the REMM by description in the Monthly Operating Report within 90 days after the change was made effective.

SURVEILLANCE REQUIREMENTS:

4.16.2.1 Radiological environmental samples shall be collected and analyzed as specified in the REMM.

4.16.2.2 Land Use Census DAEC shall conduct a land use census annually and shall identify the location of the nearest garden that is greater than 500 square feet in area and that yields edible leafy vegetables, the location of the nearest milk animal, and the location of the nearest resident in each of the 16 meteorological sectors within three miles of the Station. The land use census shall be conducted at least once per 12 months.

4.16.2.3 Reports The results of sample analyses performed in accord with the REMM shall be summarized in the Annual Radiological Environmental Report.

4.16.2.4 The results of the land use census shall be included in the Annual Radiological Environmental Report.

INTERLABORATORY COMPARISON PROGRAM

LIMITING CONDITION FOR OPERATION:

3.16.3 Analyses shall be performed on radioactive materials supplied as part of an Interlaboratory Comparison Program which has been approved by NRC as part of a quality assurance check for radiological environmental monitoring.

APPLICABILITY: At all times when monitoring is required

ACTION:

a. With analyses not being performed as required above, report the corrective actions taken to prevent a recurrence to the Commission in the Annual Radiological Environmental Report.

SURVEILLANCE REQUIREMENTS:

4.16.3 The results of analyses performed as part of the above required Interlaboratory Comparison Program shall be included in the Annual Radiological Environmental Report, pursuant to Specification 6.11.1.e(2).

3/4.16.1 DOSE

Specification 3.16.1 is provided to comply with the dose limitation requirement of 40 CFR 190. The specification requires the assessment of dose to demonstrate that a real person (a nearby resident) has not received a radiation dose exceeding that specified in 40 CFR 190. There is no other licensed nuclear fuel cycle facility within 50 miles of DAEC, thus it is assumed that the dose from other uranium fuel cycle facilities is negligible.

3/4.16.2 RADIOLOGICAL ENVIRONMENTAL MONITORING

The radiological environmental monitoring program, including the land use census, is conducted to satisfy the requirements of 10 CFR Part 50, Appendix I, Section IV.B.2 and .3. The radiological monitoring program required by this specification provides measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides which lead to the highest potential radiation exposures of individuals resulting from the station operation. This monitoring program thereby supplements the radiological effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and modeling of the environmental exposure pathways.

The land use census is conducted annually to identify changes in use of the unrestricted area in order to recommend modifications in monitoring programs for evaluating individual doses from principal exposure pathways.

In order that the monitoring program may be adjusted on the bases of operational experience and the land use census, it is described in a separate Radiological Environmental Monitoring Manual (REMM). The REMM describes required sampling locations, sampling and collection frequency, type and frequency of analyses, lower limits of analytical detection, and the land use census. Changes to the REMM, and therefore to the conduct of the program may be made by the licensee only in accord with conditions stated in Specification 6.14 and 3/4.16.2. The need to adjust the program to current conditions and to assure that the integrity of the program is maintained are thereby provided. Restricting the census to gardens of greater than 500 square feet provides assurance that significant exposure pathways via leafy vegetables will be identified and monitored since a garden of this size is the minimum required to produce the quantity (26 kg/year) of leafy vegetables assumed in Regulatory Guide 1.109 for consumption by a child. To determine this minimum garden size, the following assumptions were used, 1) that 20% of the garden was used for growing broad leaf vegetation (i.e., similar to lettuce and cabbage), and 2) a vegetation yield of 2 kg/square meter.

3/4.16.3 INTERLABORATORY COMPARISON PROGRAM

The requirement for participation in a Interlaboratory Comparison Program is provided to ensure that independent checks on the precision and accuracy of the measurements of radioactive material in environmental sample matrices are performed as part of a quality assurance program for environmental monitoring in order to demonstrate that the results are reasonably valid.

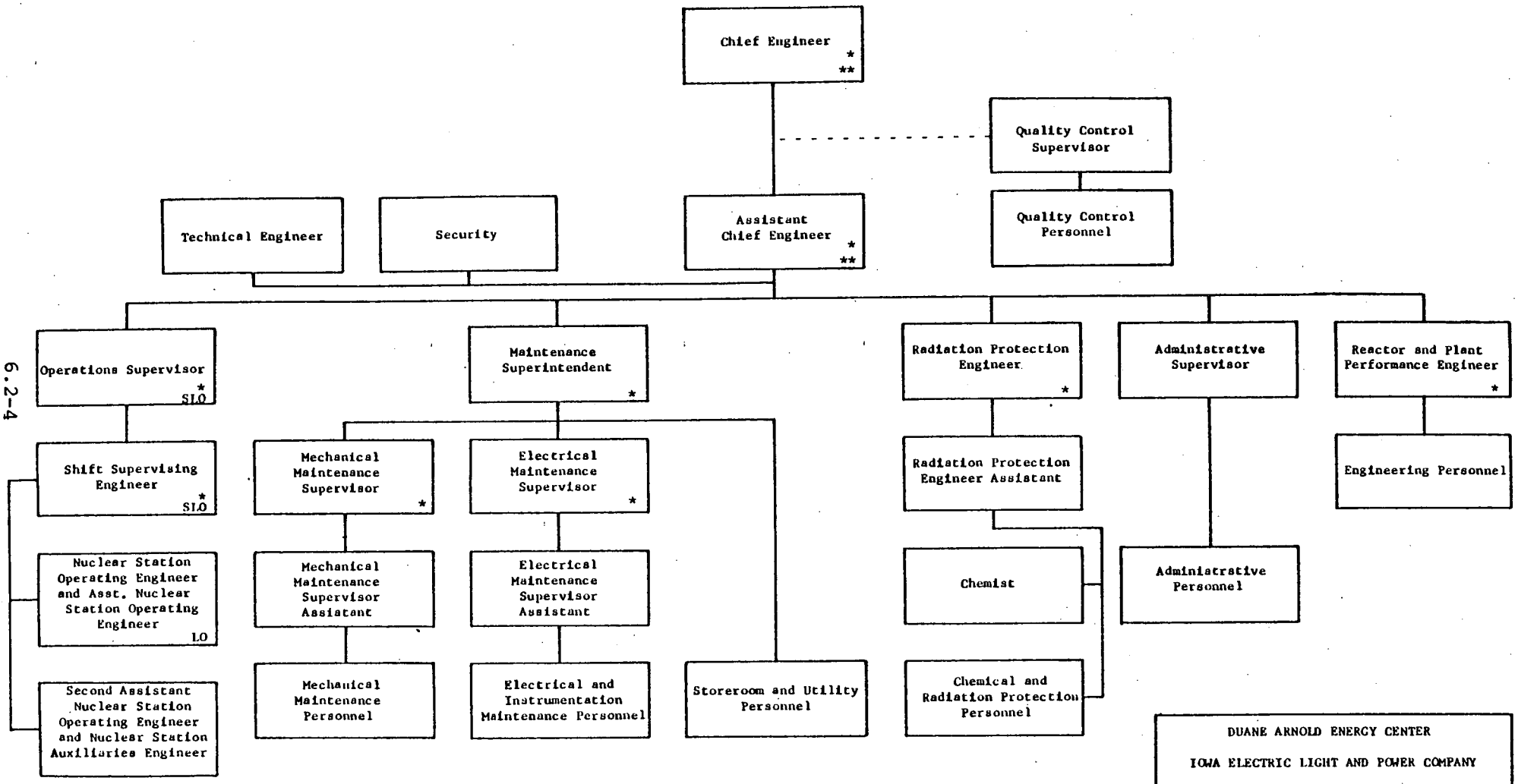
6.0 ADMINISTRATIVE CONTROLS

6.1 MANAGEMENT - AUTHORITY AND RESPONSIBILITY

6.1.1 The Chief Engineer has primary responsibility for the safe operation of the DAEC-1 plant, and reports, under the Senior Vice President, Energy Resources and Environment to the Assistant Vice President, Nuclear Division.

6.1.2 The overall responsibility for the fire protection program for DAEC is assigned to the Assistant Vice President, Nuclear Division. The DAEC Maintenance Superintendent is delegated the responsibility of directing the operating plant fire protection program.

6.1.3 The Quality Control Supervisor reports under the Senior Vice President, Energy Resources and Environment to the Quality Assurance Manager.



SLO - Senior Licensed Operator.

LO - Licensed Operator.

* - Routine Reporting Requirements on Change in Incumbents (Ref. Spec. 6.11.1).

** - Chief or Assistant Chief to Meet ANSI N.13.1-1971 License Requirements.

DUANE ARNOLD ENERGY CENTER

IOWA ELECTRIC LIGHT AND POWER COMPANY

TECHNICAL SPECIFICATIONS

DAEC NUCLEAR PLANT STAFFING

FIGURE 6.2-1

6.5 REVIEW AND AUDIT

6.5.1 Operations Committee

6.5.1.1 Function

The Operations Committee shall function to advise the Chief Engineer on all matters related to nuclear safety.

6.5.1.2 Composition

The Operations Committee shall be composed of the Assistant Chief Engineer and Supervisors from the following departments: Operations, Maintenance, Reactor and Plant Engineering, Radiation Protection and Quality Control.

The Assistant Chief Engineer shall act as the Chairman. One or more of the members shall be designated as Vice Chairman.

6.5.1.3 Alternates

All alternate members shall be appointed in writing by the Chief Engineer to serve on a permanent basis; however, no more than three alternates shall participate as voting members in Operations Committee activities at any one time.

e. Investigation of all violations of the Technical Specifications including the preparation and forwarding of reports covering evaluation and recommendations to prevent recurrence to the Assistant Vice President, Nuclear Division and to the Chairman of the Safety Committee.

f. Review of those Reportable Occurrences requiring 24 hour notification to the Commission.

g. Review of facility operations to detect potential safety hazards.

h. Performance of special reviews, investigations or analyses and reports thereon as requested by the Chairman of the Safety Committee.

i. Review of the Plant Security Plan and submission of recommended changes to the Security Plan to the Chairman of the Safety Committee.

j. Review of the Emergency Plan and submission of recommended changes to the Emergency Plan to the Chairman of the Safety Committee.

k. Review of every unplanned release of radioactivity to the environs for which a report to the NRC is required.

l. Review of every "major change" to a radwaste system.

6.5.1.7 Authority

The Operations Committee shall:

a. Recommend to the Chief Engineer written approval or disapproval of items considered under Specification 6.5.1.6 (a) through (d) above.

b. Render determinations in writing with regard to whether or not each item considered under 6.5.1.6 (a) through (e) above constitutes an unreviewed safety question.

c. Provide written notification within 24 hours to the Assistant Vice President, Nuclear Division and the Safety Committee of disagreement between the Operations Committee and the Chief Engineer; however, the Chief Engineer shall have responsibility for resolution of such disagreements pursuant to Specification 6.1.1 above.

6.5.1.8 Records

The Operations Committee shall maintain written minutes of each meeting and copies shall be provided to the Assistant Vice President, Nuclear Divison and the Chairman of the Safety Committee.

6.5.2 Safety Committee

6.5.2.1 Function

The Safety Committee shall function to provide independent review and audit of designated activities in the areas of:

a. Nuclear power plant operations.

b. Nuclear engineering.

c. Chemistry and radiochemistry.

d. Metallurgy.

e. Instrumentation and control.

f. Radiological Safety.

g. Mechanical and electrical engineering.

h. Quality assurance practices.

6.5.2.2 Composition

The Safety Committee shall be composed of persons who have been appointed in writing by the President to serve on a permanent basis and who collectively have or have access to applicable technical expertise and experience in the following areas.

a. Nuclear power plant operations

b. Nuclear engineering.

c. Chemistry and radiochemistry.

d. Instrumentation and control.

e. Radiation protection.

g. Any other area of facility operation considered appropriate by the Safety Committee or the President.

h. Design change request safety evaluations.

i. The DAEC Fire Protection Program and implementing procedures at least once per 24 months.

j. The Radiological Environmental Monitoring Manual, the implementing program, and the results thereof at least once per 12 months.

k. The Offsite Dose Calculation Manual and implementing procedures at least once per 24 months.

6.5.2.9 Authority

The Safety Committee shall report to and advise the President on those areas of responsibility specified in Specifications 6.5.2.7 and 6.5.2.8.

6.5.2.10 Records

Records of Safety Committee activities shall be prepared, approved and distributed as indicated below:

a. Minutes of each Safety Committee meeting shall be prepared, approved and forwarded to the President within 14 days following each meeting.

b. Reports of reviews encompassed by Specification 6.5.2.7 above, shall be prepared, approved and forwarded to the President within 14 days following completion of the review.

c. Audit reports encompassed by Specification 6.5.2.8 above, shall be forwarded to the President and to the management positions responsible for the areas audited within 30 days after completion of the audit.

6.6 REPORTABLE OCCURRENCE ACTION

6.6.1 Any reportable occurrence shall be reported immediately to the Chief Engineer and the the Assistant Vice President, Nuclear Division, and promptly reviewed by the Operations Committee.

6.6.2 The Operations Committee shall prepare a separate report for each reportable occurrence. This report shall include an evaluation of the cause of the occurrence, a record of the corrective action taken, and also recommendations for appropriate action to prevent or reduce the probability of a recurrence.

6.3.3 Copies of all such reports shall be submitted to the Safety Committee for review and to the Assistant Vice President, Nuclear Division for review and approval of any recommendations.

6.7 ACTION TO BE TAKEN IF A SAFETY LIMIT IS EXCEEDED

6.7.1 If a safety limit is exceeded, the reactor shall be shut down and reactor operation shall only be resumed when authorized by the NRC.

6.7.2 An immediate report shall be made to the Assistant Vice President, Nuclear Division and the Safety Committee. The Assistant Vice President, Nuclear Division shall promptly report the circumstances to the NRC as specified in Subsection 6.12, Plant Reporting Requirements.

6.7.3 A complete analysis of the circumstances leading up to and resulting from the situation together with recommendations to prevent a recurrence shall be prepared by the Operations Committee. This report shall be submitted to the Assistant Vice President, Nuclear Division and the Safety Committee. Appropriate analyses or reports will be submitted to the NRC by the Assistant Vice President, Nuclear Division as specified in Subsection 6.12, Plant Reporting Requirements.

6.8 PLANT OPERATING PROCEDURES

6.8.1 Detailed written procedures involving nuclear safety, including applicable check-off lists and instructions, covering areas listed below shall be prepared, and approved as specified in Subsection 6.8.2. All procedures shall be adhered to:

1. Normal startup, operation, and shutdown of systems and components of the facility.

2. Refueling operation.

3. Actions to be taken to correct specific and foreseen potential malfunctions of systems or components, including responses to alarms, suspected primary system leaks, and abnormal reactivity changes.

4. Emergency and off-normal condition procedures.

5. Preventive and corrective maintenance operations which could have an effect on the nuclear safety of the facility.

6. Surveillance and testing requirements of equipment that could have an effect on the nuclear safety of the facility.

7. Procedures required by the Preparedness Plan.

8. Procedures required by the plant Security Plan.

9. Operation of radioactive waste systems.

10. Fire Protection Program implementation.

11. Radiological environmental monitoring program described in the Radiological Environmental Monitoring Manual.

12. Offsite Dose Assessment Manual implementation.

6.8.2 Procedures described in 6.8.1 above, and changes thereto, shall be reviewed by the Operations Committee and approved by the Chief Engineer prior to implementation, except as provided in 6.8.3 below.

6.8.3 Temporary minor changes to procedures described in 6.8.1 above which do not change the intent of the original procedure may be made with the concurrence of two members of the plant management staff, at least one of whom shall hold a senior operator license. Such changes shall be documented and promptly reviewed by the Operations Committee and by the Chief Engineer. Subsequent incorporation, if necessary, as a permanent change, shall be in accord with 6.8.2 above.

6.8.4 Selected drills of emergency procedures shall be conducted quarterly in accordance with the provisions of the Preparedness Plan.

6.10 RECORDS RETENTION

6.10.1 The following records shall be retained for at least 5 years:

1. Records and logs of facility operation covering time interval at each power level.
2. Records and logs of principal maintenance activities, inspections, and repair and replacement of principal items of equipment related to nuclear safety.
3. Reportable occurrence reports.
4. Records of surveillance activities, inspections and calibrations required by these Technical Specifications.
5. Records of reactor tests and experiments.
6. Records of changes made to Operating Procedures.
7. Records of radioactive shipments.
8. Records of sealed source leak test and results.
9. Records of annual physical inventory verifying accountability of sources on record.
10. Records of radioactive effluent monitor setpoints and setpoint determinations.

6.10.2 The following records shall be retained for the duration of the Facility Operating License.

1. Record and drawing changes reflecting facility design modifications made to systems and equipment described in the Final Safety Analysis Report.
2. Records of new and irradiated fuel inventory, fuel transfers and assembly burnup histories.
3. Records of facility radiation and contamination surveys.

4. Records of radiation exposure for all individuals entering radiation control areas.

5. Records of gaseous and liquid radioactive material released to the environment.

6. Records of transient or operational cycles for those facility components designed for a limited number of transients or cycles.

7. Records of training and qualification for members of the plant staff.

8. Records of in-service inspections performed pursuant to these Technical Specifications.

9. Records of Quality Assurance activities.

10. Records of reviews performed for changes made to procedures or equipment or reviews of tests and experiments pursuant to 10 CFR 50.59.

11. Records of meetings of the Operations Committee and the Safety Committee.

12. Records of results of analyses required by the radiological environmental monitoring program.

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c. Monthly Operating Report Routine reports of operating statistics and shutdown experience shall be submitted on a monthly basis to the Director, Office of Management Information and Program Control, U.S. Nuclear Regulatory Commission, Washington, D. C. 20555, with a copy to the appropriate Regional Office, to arrive no later than the 15th of each month following the calendar month covered by the report. A major change to the radioactive waste treatment system to be reported pursuant to Specification 6.15 shall be submitted with the Monthly Operating Report for the period in which the change was made. A change to the Radiological Environmental Monitoring Manual or a change to the Offsite Dose Assessment Manual shall be submitted with the Monthly Operating Report within 90 days after the change was made effective.

d. Semiannual Radioactive Material Release Report

(1) A report of radioactive materials released from the Station shall be submitted to the NRC within 60 days after January 1 and July 1 of each year. Each report shall include the information specified in item (2) below covering the preceeding six months.

(2) A semiannual radioactive material release report shall include a summary by calendar quarter of the quantities of radioactive liquid and gaseous effluents and radioactive solid waste released from the Station. The data should be reported in the format in Tables 6.11-1a through 6.11-1d.

A semiannual radioactive material release report shall include the following information related to each unplanned release of radioactive material in gaseous or liquid effluent to offsite environs:

a. A description of the event and equipment involved,

b. Cause(s) of the unplanned release,

c. Actions taken to prevent recurrence, and

d. Consequences of the unplanned release.

TABLE 6.11-1a

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (YEAR)

LIQUID EFFLUENTS

		CONTINUOUS MODE		BATCH MODE	
Nuclides Released	Unit	Quarter	Quarter	Quarter	Quarter
strontium-89	Ci	. E	. E	. E	. E
strontium-90	Ci	. E	. E	. E	. E
cesium-134	Ci	. E	. E	. E	. E
cesium-137	Ci	. E	. E	. E	. E
iodine-131	Ci	. E	. E	. E	. E
cobalt-58	Ci	. E	. E	. E	. E
cobalt-60	Ci	. E	. E	. E	. E
iron-59	Ci	. E	. E	. E	. E
zinc-65	Ci	. E	. E	. E	. E
manganese-54	Ci	. E	. E	. E	. E
chromium-51	Ci	. E	. E	. E	. E
zirconium-niobium-95	Ci	. E	. E	. E	. E
molybdenum-99	Ci	. E	. E	. E	. E
technetium-99m	Ci	. E	. E	. E	. E
barium-lanthanum-140	Ci	. E	. E	. E	. E
cerium-141	Ci	. E	. E	. E	. E
Other (specify)	Ci	. E	. E	. E	. E
	Ci	. E	. E	. E	. E
	Ci	. E	. E	. E	. E
	Ci	. E	. E	. E	. E
	Ci	. E	. E	. E	. E
unidentified	Ci	. E	. E	. E	. E
Total for period (above)	Ci	. E	. E	. E	. E
xenon-133	Ci	. E	. E	. E	. E
xenon-135	Ci	. E	. E	. E	. E

TABLE 6.11-1b

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (YEAR)

GASEOUS EFFLUENTS–ELEVATED RELEASE

		CONTINUOUS MODE		BATCH MODE	
Nuclides Released	Unit	Quarter	Quarter	Quarter	Quarter
1. Fission gases					
krypton-85	Ci	. E	. E	. E	. E
krypton-85m	Ci	. E	. E	. E	. E
krypton-87	Ci	. E	. E	. E	. E
krypton-88	Ci	. E	. E	. E	. E
xenon-133	Ci	. E	. E	. E	. E
xenón-135	Ci	. E	. E	. E	. E
xenon-135m	Ci	. E	. E	. E	. E
xenon-138	Ci	. E	. E	. E	. E
Others (specify)	Ci	. E	. E	. E	. E
	Ci	. E	. E	. E	. E
	Ci	. E	. E	. E	. E
unidentified	Ci	. E	. E	. E	. E
Total for period	Ci	. E	. E	. E	. E
2. Iodines					
iodine-131	Ci	. E	. E	. E	. E
iodine-133	Ci	. E	. E	. E	. E
iodine-135	Ci	. E	. E	. E	. E
Total for period	Ci	. E	. E	. E	. E
3. Particulates					
strontium-89	Ci	. E	. E	. E	. E
strontium-90	Ci	. E	. E	. E	. E
cesium-134	Ci	. E	. E	. E	. E
cesium-137	Ci	. E	. E	. E	. E
barium-lanthanum-140	Ci	. E	. E	. E	. E
Others (specify)	Ci	. E	. E	. E	. E
	Ci	. E	. E	. E	. E
	Ci	. E	. E	. E	. E
unidentified	Ci	. E	. E	. E	. E

TABLE 6.11-1c

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (YEAR)

GASEOUS EFFLUENTS—GROUND-LEVEL RELEASES

		CONTINUOUS MODE		BATCH MODE	
Nuclides Released	Unit	Quarter	Quarter	Quarter	Quarter
1. Fission gases					
krypton-85	Ci	. E	. E	. E	. E
krypton-85m	Ci	. E	. E	. E	. E
krypton-87	Ci	. E	. E	. E	. E
krypton-88	Ci	. E	. E	. E	. E
xenon-133	Ci	. E	. E	. E	. E
xenon-135	Ci	. E	. E	. E	. E
xenon-135m	Ci	. E	. E	. E	. E
xenon-138	Ci	. E	. E	. E	. E
Others (specify)	Ci	. E	. E	. E	. E
	Ci	. E	. E	. E	. E
	Ci	. E	. E	. E	. E
unidentified	Ci	. E	. E	. E	. E
Total for period	Ci	. E	. E	. E	. E
2. Iodines					
iodine-131	Ci	. E	. E	. E	. E
iodine-133	Ci	. E	. E	. E	. E
iodine-135	Ci	. E	. E	. E	. E
Total for period	Ci	. E	. E	. E	. E
3. Particulates					
strontium-89	Ci	. E	. E	. E	. E
strontium-90	Ci	. E	. E	. E	. E
cesium-134	Ci	. E	. E	. E	. E
cesium-137	Ci	. E	. E	. E	. E
barium-lanthanum-140	Ci	. E	. E	. E	. E
Others (specify)	Ci	. E	. E	. E	. E
	Ci	. E	. E	. E	. E
	Ci	. E	. E	. E	. E
unidentified	Ci	. E	. E	. E	. E

TABLE 6.11-1d

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (YEAR)

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not irradiated fuel)

1. Type of waste	Unit	6-month Period	Est. Total Error, %
a. Spent resins, filter sludges, evaporator bottoms, etc.	m^3 Ci	. E . E	. E
b. Dry compressible waste, contaminated equip, etc.	m^3 Ci	. E . E	. E
c. Irradiated components, control rods, etc.	m^3 Ci	. E . E	. E
d. Other (describe)	m^3 Ci	. E . E	. E

2. **Estimate of major nuclide composition** (by type of waste)

a. _____	%	. E
_____	%	. E
_____	%	. E
b. _____	%	. E
_____	%	. E
_____	%	. E
c. _____	%	. E
_____	%	. E
_____	%	. E
d. _____	%	. E
_____	%	. E
_____	%	. E

3. **Solid Waste Disposition**

Number of Shipments	Mode of Transportation	Destination

B. IRRADIATED FUEL SHIPMENTS (Disposition)

Number of Shipments	Mode of Transportation	Destination

e. Annual Radiological Environmental Report

(1) A report of radiological environmental surveillance activities related to the Station operation during each calendar year shall be submitted to the NRC before May 1 of the following year. Each report shall include the information specified in item (2) below.

(2) The annual radiological environmental operating report shall include a summary description of the radiological environmental monitoring program, including a map of all sampling locations.

The report shall include a summary of results of the land use census required in Specification 4.16.2.2.

The report shall include a summary of results of analyses obtained by participation in the Interlaboratory Comparison Program required by Specification 3.16.3

The report shall include summarized and tabulated results in the format of Table 6.11-2 of analyses of samples required by the radiological environmental monitoring program. In the event that some results are not available, the reasons shall be explained in the report. In the event the missing results are obtained, they shall be submitted in a supplementary report.

The annual radiological environmental report shall also include

a. Comparison of results with operational controls, preoperational studies, and previous environmental surveillance reports as appropriate.

b. An assessment of the observed radiological environmental impact of plant operation.

TABLE 6.11-2

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility _____ Docket No. _____

Location of Facility _____ Reporting Period _____
(County, State)

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection[a] (LLD)	All Indicator Locations Mean (f)[b] Range[b]	Location with Highest Annual Mean		Control Locations Mean (f)[b] Range[b]	Number of REPORTABLE OCCURRENCES
				Name Distance and Direction	Mean (f)[b] Range[b]		
Example Data Presentation[d]							

[a] Nominal Lower Limit of Detection (LLD) as defined in table notation a. of Table 4.12-1 of Specification 4.12.1.1.

[b] Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses. (f)

[d] Note: The example data are provided for illustrative purposes only.

c. A summary of meteorological data collected during the year in the form of joint frequency distributions of wind speed, wind direction and atmospheric stability.

d. An assessment of radiation doses to an individual offsite due to radioactive liquid and gaseous effluents released from the Station during each calendar quarter of the year and during the year. The dose assessment shall be performed in accord with the ODAM.

f. Other Reports

Table 6.11.-1 lists some of the routine reports required by 10 CFR Parts 20, 40, 50 and 70, including those listed in Specification 6.11.1.

6.11.2 REPORTABLE OCCURRENCES

Reportable occurrences, including corrective actions and measures to prevent reoccurrence, shall be reported to the NRC. Supplemental reports may be required to fully describe final resolution of occurrence. In case of corrected or supplemental reports, a licensee event report shall be completed and reference shall be made to the original report date.

Note: Routine surveillance testing, instrument calibration, or preventative maintenance which require system configurations as described in items 6.11.2.b(1) and 6.11.2.b(2) need not be reported except where test results themselves reveal a degraded mode as described above.

(3) Observed inadequacies in the implementation of administrative or procedural controls which threaten to cause reduction of degree of redundancy provided in reactor protection systems or engineered safety feature systems.

(4) Abnormal degradation of systems other than those specified in Item 6.11.2.(a)(3) designed to contain radioactive material resulting from the fission process.

Note: Sealed sources or calibration sources are not included under this item. Leakage of valve packing or gaskets within the limits for identified leakage set forth in technical specifications need not be reported under this item.

(5) Measured levels of radioactivity in an environmental sampling medium determined to exceed the reporting level values of Table 6.11-3 when averaged over any calendar quarter sampling period. When more than one of the radionuclides in Table 6.11-3 are detected in the sampling medium, this report shall be submitted if:

$$\frac{\text{concentration (1)}}{\text{limit level (1)}} + \frac{\text{concentration (2)}}{\text{limit level (2)}} + \ldots \geq 1.0$$

When radionuclides other than those in Table 6.11-3 are detected and are the result of plant effluents, this report shall be

TABLE 6.11-3

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

Analysis	Reporting Levels				
	Water (pCi/l)	Airborne Particulate or Gases (pCi/m^3)	Fish (pCi/Kg, wet)	Milk (pCi/l)	Food Products (pCi/Kg, wet)
H-3	2×10^{4}[a]				
Mn-54	1×10^{3}		3×10^{4}		
Fe-59	4×10^{2}		1×10^{4}		
Co-58	1×10^{3}		3×10^{4}		
Co-60	3×10^{2}		1×10^{4}		
Zn-65	3×10^{2}		2×10^{4}		
Zr-Nb-95	4×10^{2}[b]				
I-131	2	0.9		3	1×10^{2}
Cs-134	30	10	1×10^{3}	60	1×10^{3}
Cs-137	50	20	2×10^{3}	70	2×10^{3}
Ba-La-140	2×10^{2}[b]			3×10^{2}[b]	

(a) - For drinking water samples. This is 40 CFR Part 141 value.

(b) - Total for parent and daughter.

submitted if the potential annual dose to an individual is equal to or greater than the quarterly limits of Specifications 3.14.3, 3.15.3, or 3.15.4. This report is not required if the measured level of radioactivity was not the result of plant effluents; however, in such an event, the condition shall be reported and described in the Annual Radiological Environmental Report.

(6) An unplanned offsite release of 1) more than 1 curie of radioactive material in liquid effluents, 2) more than 150 curies of noble gas in gaseous effluents, or 3) more than 0.05 curies of radioiodine in gaseous effluents. The report of an unplanned offsite release of radioactive material shall include the following information:

1. A description of the event and equipment involved.
2. Cause(s) for the unplanned release.
3. Actions taken to prevent recurrence.
4. Consequences of the unplanned release.

6.11.3 UNIQUE REPORTING REQUIREMENTS

Special reports shall be submitted to the Director of Inspection and Enforcement Regional Office within the time period specified for each report. These reports shall be submitted covering the activities identified below pursuant to the requirements of the applicable reference specification.

a. Reactor vessel base, weld and heat affected zone metal test specimens (Specification 4.6.A.2).

b. I-131 dose equivalent exceeding 50% of equilibrium value (Specification 4.6.B.1.h).

c. Inservice inspection (Specification 4.6.G).

d. Reactor Containment Integrated Leakage Rate Test (Specification 4.7.A.2.f).

e. Auxiliary Electrical System - Operation with inoperable components (Specification 3.8.B.4).

f. Fire Protection Systems (Specifications 3.13.A.3, 3.13.B.3, 3.13.C.3, and 3.13.D.3).

g. Radioactive Liquid or Gaseous Effluent - calculated dose exceeding specified limit (Specifications 3.14.3, 3.15.3 and 3.15.4).

h. Radioactive Liquid or Gaseous Effluent - discharge of sampled effluent that does not meet Specification limits.

6.13 OFFSITE DOSE ASSESSMENT MANUAL (ODAM)

FUNCTION

6.13.1 The ODAM shall describe the methodology and parameters to be used in the calculation of offsite doses due to radioactive gaseous and liquid effluents and in the calculation of gaseous and liquid effluent monitoring instrumentation alarm setpoints consistent with the applicable LCO's contained in these Technical Specifications.

The ODAM shall be subject to review and approval by the Commission prior to implementation.

6.13.2 Any changes to the ODAM shall be made by either of the following methods:

A. Licenses initiated changes:

1. Shall be submitted to the Commission by inclusion in the monthly operating report within 90 days of the date the change(s) was made effective and shall contain:

   a. sufficiently detailed information to toally support the rationale for the change without benefit of additional or supplemental information. Information submitted should consist of a package of those pages of the ODAM to be changed with each page numbered and provided with an approval and date box, together with appropriate analyses or evaluations justifying the change(s);
   b. a determination that the change will not reduce the accuracy or reliability of dose calculations or setpoint determinations; and
   c. documentation of the fact that the change has been reviewed by the Operations Committee.

2. Shall become effective upon review by the Operations Committee and approval by the Chief Engineer.

6.14 RADIOLOGICAL ENVIRONMENTAL MONITORING MANUAL (REMM)

FUNCTION

6.14.1 The REMM shall describe the Radiological Environmental Monitoring Program. The description shall identify

a. sampling locations

b. sampling and collection frequency

c. type and frequency of analyses

d. maximum values for lower limits of detection

e. land use census.

6.14.2 Any changes to the REMM by Iowa Electric Light and Power Company:

1. Shall be submitted to the Commission by inclusion in the Monthly Operating Report within 90 days of the date the change(s) was made effective and shall contain:

   a. sufficiently detailed information to totally support the rationale for the change without benefit of additional or supplemental information. Information submitted should consist of a package of those pages of the REMM to be changed with each page numbered and provided with an approval and date box, together with appropriate analyses or evaluations justifying the change(s);

   b. a determination that the change will not substantially reduce the information collected on measurable levels of radiation and radioactive materials in the environment; and

   c. documentation of the fact that the change has been reviewed by the Operations Committee.

2. Shall become effective upon review by the Operations Committee and approval by the Chief Engineer.

3. Shall be reviewed by the Safety Committee at a subsequent meeting.

6.15 MAJOR CHANGES TO RADIOACTIVE WASTE TREATMENT SYSTEMS (liquid, Gaseous and Solid)

FUNCTION

6.15.1 The radioactive waste treatment systems (liquid, gaseous and solid) are those systems described in the facility Final Safety Analysis Report or Hazards Summary Report, and amendments thereto, and in the Appendix I design objectives analysis, which are used to establish compliance with the design objective guides of 10 CFR Part 50, Appendix I in order to maintain as low as reasonably achievable concentrations in gaseous and liquid effluents and to meet requirements for handling and packaging radioactive solid wastes for offsite shipment.

6.15.2 Major changes to the radioactive waste systems (liquid, gaseous and solid) shall be reported by the following method. 'Major changes' is defined in section 1.0, item 32.

Licensee initiated changes:

1) The Commission shall be informed of all major changes by the inclusion of a suitable discussion of each change in the Monthly Operating Report pursuant to Specification 6.11.1.C for the period in which the change(s) was made. The discussion of each change shall contain:

   a) a summary of the evaluation that led to the determination that the change could be made (in accordance with 10 CFR 50.59);

   b) sufficient detailed information to totally support the reason for the change without benefit of additional or supplemental information;

   c) a detailed description of the equipment, components and processes involved and the interfaces with other plant systems;

   d) an evaluation of the change which shows the predicted releases of radioactive materials in liquid and gaseous effluents and/or quantity of solid waste from those previously predicted in the license application and amendments thereto;

   e) an evaluation of the change which shows the expected maximum exposures to individual in the unrestricted area and to the general population from those previously estimated in the license application and amendments thereto;

   f) a comparison of the predicted releases of radioactive materials in liquid and gaseous effluents and in solid waste to the actual releases for the period in which the changes were made;

g) an estimate of the exposure to plant operating personnel as a result of the change; and

h) documentation of the fact that the change was reviewed by the Operations Committee.

2) The change shall become effective upon review and acceptance by the Operations Committee and approval by the Chief Engineer.

6.15 MAJOR CHANGES TO RADIOACTIVE WASTE TREATMENT SYSTEMS

10 CFR Part 50, Section 50.34a(a) requires that each application to construct a nuclear power reactor provide a description of the equipment installed to maintain control over radioactive material in gaseous and liquid effluents produced during normal reactor operations including operational occurrences.

10 CFR Part 50, Section 50.34a(b)(2) requires that each application to construct a nuclear power reactor provide an estimate of the quantity of radionuclides expected to be released annually to unrestricted areas in liquid and gaseous effluents produced during normal reactor operation.

10 CFR Part 50, Section 50.34a(3) requires that each application to construct a nuclear power reactor provide a description of the provisions for packaging, storage and shipment offsite of solid waste containing radioactive materials resulting from treatment of gaseous and liquid effluents and from other sources.

10 CFR Part 50, Section 50.34a(2)(c) requires that each application to operate a nuclear power reactor shall include (1) a description of the equipment and procedures for the control of gaseous and liquid effluents and for the maintenance and use of equipment installed in radioactive waste systems and (2) a revised estimate of the information required in (b)(2) if the expected releases and exposures differ significantly from the estimate submitted in the application for a construction permit.

The Regulatory staff's Safety Evaluation Report and amendments thereto issued prior to the issuance of an operating license contains a description of the radioactive waste systems installed in the nuclear power reactor and a detailed evaluation (including estimated releases of radioactive materials in liquid and gaseous waste and quantities of solid waste produced from normal operation, estimated annual maximum exposures to an individual in the unrestricted area and estimated exposures to the general population) which shows the capability of these systems to meet the appropriate regulations.

The applicant's "Evaluation of the Duane Arnold Energy Center to Demonstrate Conformance to the Design Objectives of 10 CFR 50 Appendix I," May 1976, determined the liquid and gaseous radwaste treatment that is as low as is reasonably achievable. Specifications 3.14.4 and 3.15.5 require that the equipment needed to provide this (ALARA) treatment be maintained OPERABLE.

The Regulatory staff's Final Environmental Statement issued prior to the issuance of an operating license contains a detailed evaluation as to the expected environmental impact from the estimated releases of radioactive material in liquid and gaseous effluents.

Effective January 19, 1975, activities under the U. S. Atomic Energy Commission regulatory program were assumed by the U. S. Nuclear Regulatory Commission in accordance with the Energy Reorganization Act of 1974. Any references to the Atomic Energy Commission (AEC) contained herein should be interpreted as Nuclear Regulatory Commission (NRC).

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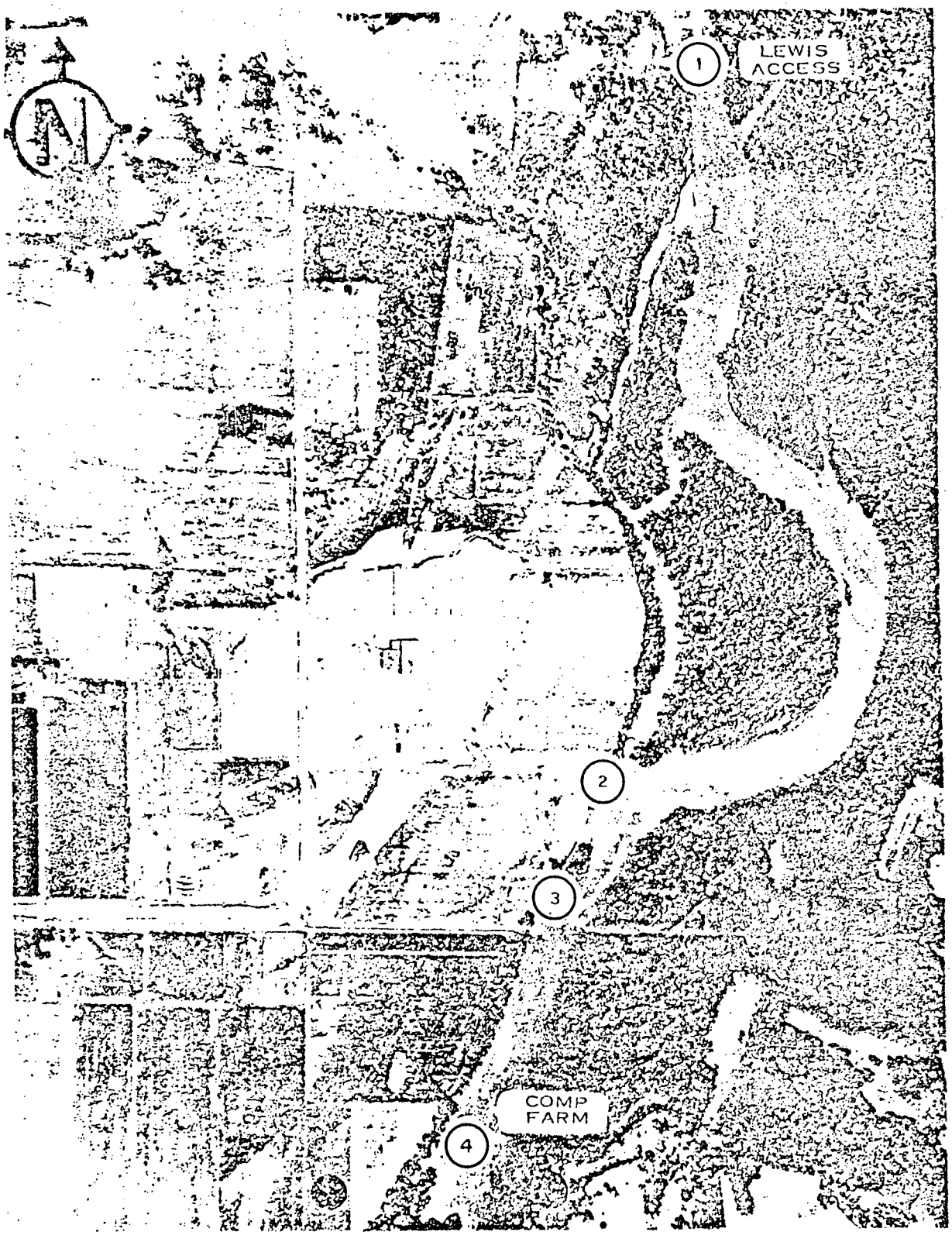

FIGURE 4.1-1 NON-RADIOLOGICAL CEDAR RIVER OPERATIONAL SAMPLING LOCATIONS