Byron/Braidwo
Q-1 (FSAR
Apr. 6, 1979

Q-331.0 RADIOLOGICAL ASSESSMENT

Q-331.12 (12.0) Indicate whether, and if so how, the guidance provided ~~followed~~ by the following Regulatory Guides has been followed; if not followed, describe the specific alternative methods used:

R.G. 8.2, "Guide for Administrative Practices in Radiation Monitoring".

R.G. 8.3, "Film Badge Performance Criteria".

R.G. 8.7, "Occupational Radiation Exposure Records System".

R.G. 8.9, "Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program".

R.G. 8.10, "Operating Philosophy for Maintaining Occupational Radiation Exposures as Low as is Reasonably Achievable".

R.G. 8.12, "Criticality Accident Alarm Systems".

R.G. 8.15, "Acceptable Programs for Respiratory Protection".

R.G. 8.19, "Occupational Radiation Dose Assessment in Light-Water Reactor Power Plants Design Stage Man-Rem Estimates".

Q-331.13 (12.1.2) The following design features are intended to complement the ALARA program. Describe how your plant design reflects consideration of these features:

1. Use of adequate and quick-service auxiliary lighting in high radiation areas.
2. Clear identification of localized radiation sources.

Q-331.14 (Tables 12.2-46 thru 12.2-48)

Tables 12.2-46 through 12.2-48 give the calculated airborne iodine activity concentrations for the major plant buildings. Provide similar tables listing calculated airborne radioactivity concentrations in these areas for krypton, xenon, tritium, and other expected airborne radionuclides.

Q-331.15 (12.3.1)

Provide an illustrative example of each of the following components describing how they are designed to minimize occupational dose: demineralizers, recombiners, evaporators, and sampling stations. Include diagrams of these examples showing the radiation protection features.

Q-331.16 (12.3.1)

Show that your change and locker room facilities are sufficient to accommodate and provide services for an expected increased number of maintenance personnel present during major outages.

Q-331.17 (12.3.2)

Provide the following information concerning the spent fuel transfer tubes:

a) Describe the shielding or structural barriers used to prevent inadvertent access to potentially high radiation areas near the fuel transfer tube and describe the shielding provided to assure acceptable radiation levels in adjacent occupied areas.

Q-331.17 - cont'd

b) Provide plan and elevation layout drawings of the areas through which the spent fuel transfer tube passes.

c) Discuss your procedure for positive access control and radiation monitoring for the areas where the spent fuel transfer tubes may be exposed.

Q-331.18 (12.3.4)

Area and airborne radiation monitors located in high noise areas should have visual as well as audible alarms. State how you plan to comply.

Q-331.19 (Table 12.3-3)

Indicate the location of the following area monitors on the appropriate figures in Chapter 12: ORE-AR001 through ORE-AR003, ORE-AR041 through ORE-AR050, IRE-AR001, IRE-AR002, 2RE-AR001, and 2RE-AR002.

Q-331.20 (Fig. 12.3-23 and 1.2-8)

-33
12.

Using the appropriate layout drawings as references, describe the path of the 55-gallon drum waste container from the time it is removed from the empty drum storage area to the time it is loaded onto the waste loading trailer. The section of the radwaste/service building between grid H-L and 37-41 on level 401', depicted in Figure 1.2-8, appears to contain radwaste equipment. This same area on the 401' level of figure 12.3-23 appears to contain radwaste storage areas. Clarify this apparent discrepancy. Also describe the function of the floor transfer system shown between grids N-P

Q-331.20 - cont'd	and 36-48 on the 401' level of the radwaste/service building complex in Figure 1.2-8. Describe the relationship, if any, between this system and the drum transfer tunnel depicted on level 401' in Figure 12.3-23.
Q-331.21 (Fig. 12.3-26)	Figure 12.3-26 shows the laundry room to be in a radiation zone of ≤ 4 mrem/hr. State how you plan to control access to this room so that plant personnel doses do not exceed 100 mrem/week.
Q-331.22 (12.4)	Using occupational exposure data from Zion 1&2 and other applicable operating reactors for 1977 and 1978, update your operating exposure estimates for Byron/Braidwood 1&2 in Table Q-331.9-1. Incorporate the revised dose estimates from your response to Q-331.9 into the appropriate sections of Chapter 12.4.
Q-331.23 (12.5.3.3)	Your response to Q-331.11 is inadequate. Supply the specific frequencies to be used for plant and contractor bioassays and the criteria used for determining which personnel are to be tested.

Q-2(5)(FSAR)
Jan. 11, 1979

331.0 RADIOLOGICAL ASSESSMENT BRANCH

331.11 (12.0) The versions of Regulatory Guides 8.8 and 8.10 referenced in Chapter 12 were issued in September 1975. It is our position that you base your radiation protection practices on the latest revisions of each of these guides (Regulatory Guide 8.8--Revision 3 June 1978, Regulatory Guide 8.10--Revision 1-R, May 1977). Change your references in Chapter 12.1, 3 and 5 to R.G. 8.8, Rev. 3, June 1978 and provide your plan to comply with this revision. Change your reference in Chapter 12.1 and 5 to R.G. 8.10, Rev. 1-R, May 1977.

CESSAR
Q-O (FSAR)
Dec. 18, 1976

331.0
12.0

RADIOLOGICAL ASSESSMENT

Q331.1 (12.1) Describe system and equipment design considerations for the System 80 NSSS that are directed toward ensuring that occupational radiation exposures are ALARA. Describe how experience from past designs and from operating plants is utilized to develop improved design for ensuring that occupational radiation exposures are ALARA. Describe how system and equipment design is directed toward reducing the need for maintenance of equipment. Describe what specific features are included to minimize dose to personnel during inservice inspection. Include an indication of whether, and if so, how the design consideration guidance provided in Regulatory Guide 8.8 will be followed; if it is not followed, describe the specific alternative approaches to be used.

Q331.2 (12.1) Describe the specific review functions and responsibilities of the personnel who ensure that the features for maintaining occupational radiation exposures as low as is reasonably achievable are included in the design of the System 80 NSSS. Describe the procedures for assuring that adequate radiation protection reviews are performed throughout the design process.

Q331.3 (12.1) Provide information concerning action taken by the applicant to maintain occupational radiation exposure as low as is reasonably achievable during the eventual decommissioning of CESSAR reactor plants.

Q331.4 (12.2) Using calculational models and experience from operating reactors, provide a listing of the maximum expected activities due to crud deposits on steam generator tubing and primary system piping for the System 80 NSSS.

Q331.5 (12.2.1.2.1) Supply a listing of the maximum specific source strengths (in MeV/gram-sec) in the shutdown cooling system (SDCS) at various times after reactor shutdown. Provide these source strengths for gamma energy groups between 0.2 and 4.0 MeV/gamma.

Q331.6 (12.3.1.2) For the following reactor plant (NSSS) components, describe the specific design features which will be used to assure that occupational exposure due to operations and maintenance of the System 80 NSSS will be ALARA: valves, piping, evaporators, heat exchangers, demineralizers and sample stations.

Q331.7 (12.3.1.2) Describe what actions you have taken to maintain occupational radiation exposures as low as is reasonably achievable by minimizing and controlling the production, transport, and deposition of activated corrosion products in the reactor coolant and auxiliary systems in the System 80 NSSS. Include as a minimum, information on the following steps taken to minimize cobalt-58 and cobalt-60:

a. The use of reduced nickel in primary coolant system alloys.

b. Low cobalt impurity specifications in primary coolant system alloys.

c. The minimization of high cobalt, hard facing wear materials in the primary coolant system.

d. The use of high flow rate/high temperature filtration.

e. The selection of valves and packing materials to minimize crud buildup and maintenance.

f. Provisions for decontamination of reactor coolant components and systems.

g. Recommendations for primary system coolant chemistry specifications which will minimize crud buildup.

Q331.8 (12.3.1.2) Describe any plans that you have to use removable insulation sections over reactor vessel nozzle welds to facilitate inservice inspections and thereby reduce exposure times.

Q331.9 (12.3) Field-run piping carrying radioactive material should be routed so as to minimize personnel exposures. Describe how your design reflects this consideration.

331.0 12.0 RADIOLOGICAL ASSESSMENT

331.9 (12.3.4.1.3) The number of area radiation monitors listed in Table 12.3-2 does not agree with the number of monitor locations shown in the revised figures (Revision 14) for section 12.3. Revise Table 12.3-2 to include those additional area radiation monitors shown in the figures and listed below:

Area (elevation	Figure	Number of monitors appearing in: Table 12.3-2	Figures
Radwaste (568')	12.3-16	1	2(8400,8401)
Aux. bldg. corr.(599')	12.3-18	2	3(8409,-10,-11)
Fuel pool H.X. (599')	12.3-18	1	2(8408,8445)
Counting Room (614')	12.3-19	1	none
Aux. shutdown panel (659')	12.3-22	2	4(5462A,B,C,D)
New Fuel storage area (659')	12.3-22	2	4(8433,-4,-5,-6)
Aux. bldg. crane(685')	12.3-23	1	4(6513A,B,6514A,B)
Radwaste access way (634')	12.3-43	0	1(8427)
Radwaste work area (634')	12.3-43	0	1(8426)

331.10 (Table 12.4-8) Table 12.4-8 lists the total annual man-rem to Unit 1 construction workers from the direct radiation of Unit 2 as being 20.13 man-rem. The total annual man-rem as calculated using the numbers in footnote (2) of this same table is 15.1 man-rem ((571 worker)(26.5 mrem/yr)). Clarify this apparent discrepancy in figures.

Q-1 (FSAR)
Nov 17, 1978

331.0
12.0

RADIOLOGICAL ASSESSMENT

331.15 (12. Indicate whether, and if so how, the guidance provided by the following Regulatory Guides has been followed; if not followed, describe the specific alternative methods used:

R.G. 8.14, "Personnel Neutron Dosimeters."

R.G. 8.15, "Acceptable Programs for Respiratory Protection."

331.16 (12.1.2.1) The following design features are intended to complement the ALARA program. Describe how your plant design reflects consideration of these features:

1. use of adequate and quick-service auxiliary lighting in high radiation areas.
2. clear identification of localized radiation sources.

331.17 (12.2.2) Tables 12.2-14 through 12.2-16 give the estimated airborne radionuclide concentrations for three normally occupied areas at WNP-2. Provide similar tables giving the estimated airborne radionuclide concentrations for these other areas of the plant: solid radwaste handling areas, and liquid radwaste handling areas.

331.18 (12.3.4.3) Specify the frequency with which you plan to calibrate your area radiation monitors.

331.19 reworded. (12.3.4-5) Area monitors located in high noise areas should have visual as well as audible alarms. State how you plan to comply.

331.20 (12.4.1) In addition to the job group exposure breakdown contained in Section 12.4, provide a profile of the estimated annual man-rem doses at WNP-2 broken down by major functions such as operations, maintenance, radwaste handling, and inservice inspection. Using experience from other BWR's, provide estimates of doses resulting from non-routine or special maintenance activities. Include estimated dose rates, expected required number of workers and occupancy times required for performing such maintenance work. Regulatory Guide 8.19 provides guidance in making such an assessment.

331.21 (12.4.2.3) The annual exposure estimates given for the job group classifications in Section 12.4.2.3 do not agree with the total group exposures listed in Table 12.4-1. Clarify this apparent discrepancy.

331.22 (12.5.2.2) Provide a detailed layout drawing of your change and locker facilities in the Service Building.

a. Show that you have made provisions for both male and female employees.

b. Show that your change and locker facilities are sufficient to accomodate and provide services for an expected increased number of maintenance personnel present during major outages.

331.23 (12.5.2.2) Discuss provisions for local exhaust systems to be employed in the hot machine shop for work on contaminated items.

331.24 (12.5.2.3) Discuss provisions for laundering soiled and contaminated protective clothing at WNP-2.

Q-1 (S) (FSAR
Sept 18, 197[illegible]

331.0 RADIOLOGICAL ASSESSMENT

331.8
(12.3)
Provide information concerning what actions you have taken to maintain occupational radiation exposures as low as is reasonably achievable during the eventual decontamination and decommissioning of the Midland 1&2 reactor units.

Q-1(S) (FSAR)
Aug 21, 1978

12.0 RADIOLOGICAL ASSESSMENT

331.6 (12.5.2.1.1) In revision 11, you have deleted the requirement for having 2 portal monitors and a frisking station at the exit point of controlled areas (as mentioned in the second sentence of Section 12.5.2.1.1). Describe what degree of monitoring you will require at the exit to controlled zones.

331.7 (12.5.3.3) In Section 12.5.3.3 of revision 11, you state that radiation workers will be tested for their understanding of radiation protection principles once every 2 years, as opposed to once every year as stated in the FSAR prior to revision 11. Justify your relaxation to this 2 year testing interval.

331.0 RADIOLOGICAL ASSESSMENT

331.1 (12.1.3) Describe how information from operating BWR experience is included in the development of the radiation protection procedures. Section 12.1.2 on design considerations specifically describes your inclusion of BWR operating experience into the plant design. However, Section 12.1.3 does not describe how BWR operating experience is included in the development of your procedures. A description similar to that presented in Section 12.1.2 will be acceptable to supply the information called for in Section 12.1.3 of Regulatory Guide 1.70, Revision 2.

331.2 (12.2.1) Provide your analysis of the deposition and buildup of activated corrosion products (crud). Include estimates of the amount of deposited crud which may buildup over the plant life. Explain how such crud source term estimates are factored into the shielding design and expected dose rates. This information is called for in Section 12.2.1 of Regulatory Guide 1.70, Revision 2.

331.3 (12.2.2) Provide tabulations by nuclide of the expected airborne concentrations of radioactivity in areas normally occupied by operating personnel.

Include tabulations of the expected airborne concentrations of radioactivity which result from these sources:

1) removal of reactor vessel head and internals;

2) relief valve venting.

3) movement of spent fuel.

Describe the models and parameters which are used in calculating these concentrations.

This information is called for by Section 12.2.2 of Regulatory Guide 1.70, Revision 2.

331.4 (12.3.1) Describe the features and considerations included in your design to reduce radio-cobalt production and build-up. Explain what use will be made of the following methods of cobalt reduction:

1) The use of reduced nickel in primary coolant system alloys.

2) Low cobalt impurity specifications in primary coolant system alloys.

331.4 (12.3.1)

3) The minimization of high cobalt, hard facing wear materials in the primary coolant system.

4) The use of high flow rate/high temperature filtration.

5) The selection of valves and packing materials to minimize crud buildup and maintenance.

6) Provisions for decontamination of components and systems containing buildups of cobalt.

7) Continuous monitoring and adjustment of oxygen concentration and pH in the coolant.

This information is called for by Section 12.3.1 of Regulatory Guide 1.70, Revision 2; this subject is an item of generic concern to the ACRS.

331.5 (12.3.1) Describe the features you have included in the design to ensure that occupational dose will be ALARA during decommissioning. Information submitted in response to requirements of Section 12.3.1 of Regulatory Guide 1.70 Revision 2 can be referenced or used as applicable. This subject is an item of generic concern to the ACRS.

331.6 (12.3.1) Provide an illustrative example of each of the following components describing how they are designed to minimize occupational dose: liquid filters, demineralizers, ventilation filter trains, recombiners, tanks, evaporators, pumps, heat exchangers, recirculation pumps, valve operating stations, sampling station, and valve galleries. Include layout drawings and diagrams of these examples showing the radiation protection design features.

This information is called for in Section 12.3.1 of Regulatory Guide 1.70, Revision 2.

331.7 (12.3.1) Regulatory Guide 8.8, Revision 2, recommends that either 1) there should be no field routing of piping for radioactive materials, or 2) the field routing should be accomplished under the guidance of an engineer familiar with the principles of radiation protection. Describe how you will implement this recommendation or justify your alternatives.

331.8 (12.3.1) Explain what use is made of these ALARA design considerations which are suggested in Regulatory Guide 8.8, C.2, Revision 2:

1) Sloping of piping runs and tank bottoms.

2) Placement of drain tap-offs at low points.

3) Placement of connections above the centerline of piping.

4) Avoidance of dead legs and low points in piping.

5) Avoidance of T connections in piping.

6) Use of large radius bends or elbows in piping.

7) Use of butt welding and consumable inserts.

8) Use of canned pumps and flushable seals.

9) Use of short pipe runs and large diameter piping.

10) Provisions for remote filter changing.

11) Provisions for adequate equipment laydown space inside cubicles.

331.9 (2.3.1) You have indicated (FSAR Section 12.1.2.1b) that you place major sources of radioactivity in individually shielded cubicles as suggested in Regulatory Guide 8.8, Revision 2. However, numerous major sources on level 437' of the radwaste building are not individually shielded. (For example, floor drain collector tank, waste collector tank, chemical waste tanks, distillate tanks, gas coolers.)

Justify the absence of individual shields for these sources in light of your commitment to keep occupational dose ALARA.

31.10 (.3.4) Describe the functions which your fixed area and airborne radioactivity monitoring systems are expected to perform in the event of an accident.

This information is called for in Section 12.3.4 of Regulatory Guide 1.70, Revision 2.

31.11 (.3.4) Provide an analysis of the capability of your airborne radioactivity montioring systems to detect MPC_a levels of airborne radioiodine and particulates. An acceptable analysis should explain, for example, how long the systems will take to detect MPC_a levels of Iodine-131 and Cesium-137 in the rooms of lowest ventilation exhaust. The analysis should encompass areas which have the potential for airborne contamination and are normally accessed by personnel.

Section 12.3.4 of Regulatory Guide 1.70, Revision 2 calls for information on the sensitivity of monitoring systems.

12 Provide your estimates of the man-rem doses which workers
(12.4) will receive. These estimates should be based on 1) the tasks to be performed during operation and anticipated occurrences, 2) the time and manpower required to perform those tasks, and 3) the expected dose rates and levels of airborne radioactivity to which workers will be exposed in performing those tasks. Evidence should be provided that your estimates are based on these factors. An acceptable method of providing such evidence is:

1) Present selected parts of the detailed analysis as illustrative examples.

2) Summarize the detailed information for all other tasks.

3) Present the total estimated annual occupational dose (man-rems).

This information is called for by Section 12.4 of Regulatory Guide 1.70, Revision 2.

331.13 Describe your equipment decontamination and portable monitoring
(12.5.2) instrument calibration facilities. Also, specify the locations of these facilities on Figures 12.3-1 through 12.3-8 as you did the other health physics facilities listed in FSAR Section 12.5.2.

This information is called for by Section 12.5.2 of Regulatory Guide 1.70, Revision 2.

331.14 Describe how you will monitor airborne iodine radioactivity
(12.5.3) using the portable air monitoring equipment specified in Table 12.5-1.

Section 12.5.3 of Regulatory Guide 1.70, Revision 2 calls for information on the methods of evaluating airborne radioactivity.

Indiana IFC
Q-1 (FSAR)
Feb 18, 1978

331.0 RADIOLOGICAL ASSESSMENT BRANCH

331.2 (12.3) One of the concerns of the Advisory Committee on Reactor Safeguards (ACRS) during their reviews of reactor applications involves controlling the buildup, transport, and deposition of activated corrosion products in the reactor coolant and auxiliary systems at nuclear power plants. In addition to your discussion on methods used to minimize piping low points, dead legs and crud traps describe any steps you may have taken to minimize the buildup, transport and deposition of Co-58 and Co-60 in the reactor coolant and auxiliary systems. Examples of some methods used to reduce the formation and transport of crud products would include:

1. The use of reduced nickel in primary coolant system alloys.

2. Low cobalt impurity specifications in primary coolant system alloys.

3. The minimization of high cobalt, hard facing wear materials in the primary coolant system.

4. The use of high flow rate/high temperature filtration.

331.3 (12.3.4) Specify the frequency with which you plan to calibrate your area and airborne radioactivity monitors.

331.4 (12.3) Provide a detailed layout of the solid radwaste area (similar to the one in figure 11.4-5) indicating radiation zoning for the 634 foot and 652 foot levels.

331.5 (12.5.2) Discuss provisions for local exhaust systems to be employed in the hot machine shop for work on contaminated items.

DUPSSHK (Bio.
Q-1 (PSAR)
Feb 10, 1978

331.0 RADIOLOGICAL ASSESSMENT BRANCH Fig 1.2-2 13 of 17

331.1 (12.3) Provide a detailed layout of the radioactive waste processing area showing; 1) low and high radioactive waste storage area; 2) fill and cap area; 3) radwaste control room; and truck loadout area. Indicate on this layout drawing the path of the 55-gallon drum waste container from the time it is removed from the clean drum storage area to the time it is loaded onto the waste loading trailer.

331.2 (12.3.4) In order to accurately determine the radioactive airborne concentration in an area, airborne activity monitors should be located upstream of the filter system (one example is the absence of any radioactivity monitor upstream of the filter system for the decon rooms and hot instrument lab). State how you plan to comply with this or give suitable alternatives.

331.3 (Figures 12.3) On figures 12.3-1 through 12.3-8 indicate the major traffic patterns used by plant personnel during their daily activities. On figure 12.3-3 describe the route (including access control points, decontamination stations, and change areas encountered) that a plant employee would take in going from a Restricted Radiation Area to an unrestricted area.

331.4 (Figures 12.3) Show that your change and locker room facilities for men and women are sufficient to accommodate and provide services for an expected increased number of maintenance personnel present during major outages.

331.5 (Figure 12.3-3) In figure 12.3-3 there appears to be no access control in Corridor 6 between the Restricted Radiation area near the Hot Decon Rooms and the unrestricted portion of this corridor (located approximately at grid marks X-Y and 5-6). Show how you intend to control personnel access in this corridor.

331.6 (Figures 12.3-4 and 12.3-8) The applicant should justify his placement of five components (reverse osmosis feed tank, detergent waste test tank pump, detergent waste test tank 2, detergent waste test tank 1, and reverse osmosis package) in a single zone 4 cubicle on the 59'-9" level of auxiliary building (figures 12.3-4 and 12.3-8) as meeting the ALARA criteria.

Q-2 (FSAR)
Oct. 21, 1977

331.0 RADIOLOGICAL ASSESSMENT BRANCH

331.16 (12.1) Describe any actions taken to ensure that occupational radiation exposures will be maintained as low as is reasonably achievable during the eventual decommissioning of the San Onofre 2 and 3 nuclear plants.

331.17 (12.3) One of the concerns of the Advisory Committee on Reactor Safeguards (ACRS) during their reviews of reactor applications involves controlling the buildup, transport, and deposition of activated corrosion products in the reactor coolant and auxiliary systems at nuclear power plants. In sections 12.1 and 12.3 you have listed several design features intended to minimize the problem of crud deposition at San Onofre 2 and 3. Describe any steps you may have taken to minimize the formation and transport of Co-58 and Co-60 in the reactor coolant and auxiliary systems. Examples of some methods used to reduce the formation and transport of crud products would include:

1. The use of reduced nickel in primary coolant system alloys.

2. Low cobalt impurity specifications in primary coolant system alloys.

3. The minimization of high cobalt, hard facing wear materials in the primary coolant system.

4. The use of high flow rate/high temperature filtration.

331.18 (Fig. 12.3-3) Figure 12.3-3 classifies the fill and cap area as a zone I region. Justify your use of this zoning classification when the radwaste liners are filled and capped in this area.

Q-D (FSAR)
Oct 4 1977

331.1 (12.5.2)

Provide a detailed layout drawing of your change and locker facilities.

a. Show that you have made provisions for both male and female employees.

b. Show that your change and locker room facilities are sufficient to accommodate and provide services for an expected increased number of maintenance personnel present during major outages.

Q-1 (FSAR)
June 3, 1977

331.8 (Table 12.2-4)	The units of activity in Table 12.2-4 should be disintegrations/Cm^3 - S instead of disintegrations/cm^2 - S.
331.9 (12.3)	Provide a detailed layout of the solid radwaste area showing: low and high radioactive waste storage areas; fill and cap area; radwaste control room; truck loadout area; and waste baler. Indicate on the layout drawing the path of a waste liner from the time it is removed from the new liner storage area to the time it is placed in the high radioactive storage area.
331.10 (Figure 12.3-1)	Provide the justification for the zone V classification of the passageway located between the boric acid concentrator pac and the radwaste control panels in Figure 12.3-1. Describe how personnel access is regulated through the door connecting this passageway with the zone I area opposite the chemical storage room.
331.11 (Fig. 12.3-4 and Fig 12.3-8)	In Figure 12.3-4, the room containing the fuel handling building pumps and sumps (P-328 and P-329), the fuel pool purification pump (P-014), the spent fuel pool pumps (P-009 and P-010), and the leak detection sump is designated as a zone I area. The room containing the same equipment for unit 3 in Figure 12.3-8 has a zone III designation. Clarify this apparent discrepancy in zoning. If these rooms are zone III areas, justify your use of a zone III radiation designation considering the location of the six above listed components in the same room.
331.12 (Figure 12.3-23)	Figure 12.3-23 indicates that the local sample lab in the radwaste area of the auxiliary building will be designated a zone V area during reactor shutdown. Describe your plans to restrict personnel access to this lab during this period.
331.13 (Table 12.4-10)	The estimated tritium concentration in the containment four hours after purge initiation as given in Table 12.4-10 is 3.8 times greater than the estimated tritium concentration in the containment during normal operation (with no purge) as listed in Table 12.2-8. Explain why the tritium concentration after four hours of purging is greater than the normal tritium concentration.
331.14 (12.5.2)	Discuss provisions for laundering contaminated protective clothing and equipment.

331.15 (12.5.2.1)

Discuss provisions for local exhaust systems to be employed in the hot machine shop for work on contaminated items.

Q-2 (FSAR)
May 20, 197

331.10 (12.2.4) In reference to your response to question 12.1 concerning annual man-rem estimates at FFTF, provide a profile of the estimated annual man-rem doses at FFTF broken down by major functions such as operations, maintenance, radwaste handling, and inservice inspection. Describe the models and assumptions used (such as dose rates and occupancy times) to arrive at these values. Using experience from other sodium-cooled reactors, provide estimates of doses resulting from non-routine or special maintenance activities (e.g. intermediate heat exchanger tube plugging). Include estimated dose rates, expected required number of workers, and occupancy times required for performing such maintenance work.

331.11 (12.2.5) Describe the significance of the "Reporting Level" column in the table on page 12.2-60.

331.12 (Fig. H-4-14637) Provide figure H-4-14637 (from SDD-21) showing the master plot plan.

331.13 (Fig. H-4-17633) In figure H-4-17633 there appear to be two uncontrolled passageways to the outside plant area from the South HTS Service Building. Describe your plans to control access and egress of personnel from this controlled area.

331.7
(12.2)

The following design features are intended to complement the ALARA program. Describe how your plant design reflects consideration of these features:

1. use of adequate and quick-service auxiliary lighting in high radiation areas.
2. routing of field-run piping carrying radioactive material so as to minimize personnel exposures.
3. clear identification of radiation hazards.

331.8
(12.2)

On figure H-4-17635, show the location of the liquid waste sampling box. Describe the shielding and ventilation requirements for this box.

331.9
(12.2)

Within a given radiation area there may be some components which have a much higher level of radiation than the surrounding equipment. These localized sources should be marked with signs giving the approximate exposure rate at that point so that these areas can be avoided. Indicate your plans to provide such warning signs.

Q-2 (PSAR)
January 5, 1977

331.11	In response to Q331.7 you stated that there will be no central change facility at the Yellow Creek Nuclear Plant. State your justification for using local change facilities for areas of known contamination during major outages and provide a sample layout of such an area. These change facilities should be able to accomodate both men and women and should have sufficient services for the increased number of maintenance personnel expected during major outages. Describe the route (including any access control points and change areas encountered) that a plant employee would take in traveling from the gate house to each of the following buildings: 1) waste management building 2) containment building 3) fuel building 4) control building Provide layout drawings of the complete tunnel system and the central service building (including non-nuclear locker area).
331.12 (12.3.4.1)	It is our position that area monitors located in high noise areas should have visual as well as audible local alarms. State how you plan to comply.
331.13 (Figures 12.3-26, 12.3-27, 1.2-6)	In figures 12.3-26, 12.3-27, and 1.2-6 there appear to be six uncontrolled passageways to the outside plant area from the fuel and control buildings. Describe your plans to control access and egress of personnel from controlled areas.

331.0 RADIATION PROTECTION

331.1 (12.2.2.1) The term ($V\lambda_{Ti}$) should appear in the numerator, not the denominator, of the first equation in section 12.2.2.1.

331.2 (Table 12.2-6) Give the units of the figures in Table 12.2-6.

331.3 (Table 12.2-8) Include expected particulate isotopes in your table of normal airborne radioactivity concentrations (Table 12.2-8).

331.4 (12.3.1) Adequate and rapidly serviceable lighting should be provided for each room or cubicle containing zone III-V components. State how you plan to implement the above.

331.5 (Table 12.4.9) Do the figures in the last four columns of Table 12.4-9 represent the doses received by individual plant employees working in the areas listed, or do they represent the total accumulated personnel dose commitment caused by airborne radioactivity in these areas? If these figures represent individual worker doses, list the total number of personnel expected to work in each of the areas listed and give the total estimated personnel dose caused by airborne radioactivity.

331.6 (12.5.2.1) On figures 12.3-1 through 12.3-25 indicate the major traffic patterns used by plant personnel during their daily activities. Also describe the route a plant employee would take in going from the main entrance to the controlled area.

331.7(a) (12.5.2.2.5) The airborne radioactivity monitoring system should be sensitive enough to indicate that an airborne radioactivity hazard exists in any compartment (or area) for which the monitor is applicable. Assume a 1 MPC concentration of the most representative particulate and gas is present in the compartment with the lowest flowrate in the area being monitored during normal operation. For each airborne radioactivity monitor in the plant, give the response time to detect this concentration.

331.7(b) (12.5.2.2.5) In order to adequately detect airborne radioactivity in areas which may be occupied by personnel, airborne radioactivity monitors should be located upstream of the air cleaning systems. It is not clear from studying Fig. 9.4-9 (sheet 2) whether this is being done for the exhaust air from the fuel handling building. Provide assurance that all airborne radioactivity monitors sampling air from areas which may be occupied by personnel have sampling points upstream of the air cleaning systems. Provide HVAC drawing 40090.

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Figure 5.2-8 — The applicant should justify his placement of five radioactive components (flush tank, drain tank, feed tank, sample tank, and scrubber tank) in a single zone 4 cubicle on the 161 foot level of the radwaste processing cell as meeting the ALARA criteria.

8.0 — The applicant should discuss how the guidance given in the following Regulatory Guides will be followed. If it will not be followed, he should describe the specific alternative approaches to be used and the guidance followed.

1.8 "Personnel Selection and Training."
3.12 "General Design Guide for Ventilation Systems of Plutonium Processing and Fuel Fabrication Plants."
3.18 "Confinement Barriers and Systems for Fuel Reprocessing Plants."
3.19 "Reporting of Operating Information for Fuel Reprocessing Plants."
8.7 "Occupational Radiation Exposure Records System."
8.8 "Information Relevant to Maintaining Occupational Radiation Exposure as Low as Practicable (Nuclear Reactors)." — where applicable.
8.10 "Operating Philosophy for Maintaining Occupational Radiation Exposures as Low as Practicable."

8.3 — The applicant should describe how he intends to implement the following ALARA features in his facility:

1. use of adequate and quick-service auxiliary lighting in high radiation areas.
2. routing of field-run piping carrying radioactive material so as to minimize personnel exposures.
3. training with cold mockups to save exposure time in radiation fields.

8.3.2 — The applicant should describe how he intends to implement the following design features in resin and sludge treatment systems (or he should give suitable alternatives). These design features are intended to minimize personnel exposure by reducing radioactive resin and sludge accumulation and deposition in components.

1. use of long radius pipe bends and elbows
2. use of smooth interior pipe surfaces at connections
3. minimizing the use of tees, pipe fittings, and flow restrictions in process lines.

4. use of screens, filters, or other features to prevent the loss of resins or sludge through overflows or vents.
5. avoidance of unnecessary cavities in valves to minimize accumulations of radioactive materials.

Figure 8.3-17 — The low-Level Compaction Station and the Warm Shop, both areas of frequent personnel access, have radiation zone 4 (100 mR to 1R) designations. The applicant should justify his use of a zone 4 designation for these two areas as meeting the ALARA concept.

85..2.1 — The applicant states that gamma sensitive instruments employed in his system are capable of measuring 0.1 to 20 mR/hr. This range appears too restrictive for the varied areas in which these monitors are located. The applicant should consider the use of an area radiation monitoring system with a range up to 20 R/hr, and with variable alarm set points which can be adjusted to meet conditions peculiar to its location.

8.5.2.1 — The applicant should describe his bioassay program, including the bases for selecting personnel who will be in the program, the frequency of their bioassay, and any nonroutine bioassay that will be performed.

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331.1 (12.3.1) Describe in detail the material specifications, that will be used, "to reduce exposures by reducing maintenance frequencies and by providing less circulating crud..." List the Co-59 specification for your steam generator tubing and core internals. Discuss the extent to which stellite wear materials can be prevented from entering regions of high neutron fluence.

331.2 (12.3.2) Discuss the extent to which the shield wall thicknesses shown in tables 12.3-2 through 12.3-7 does apply to floors and ceilings.

331.3 (12.4.1) Your dose assessment for the Yellow Creek Nuclear Plant appears unrealistic. Table 12.4-4 estimates only 130 man-rem/year per unit for all occupational exposure, and 73% of this is allocated to testing, maintenance, refueling, and inspection. Historically, PWR's have averaged about 420 man-rem/year per unit with at least 80% of the dose arising from maintenance including refueling. Describe in detail those particular design features that are expected to save approximately 290 man-rem/year per unit at Yellow Creek.

331.4 (12.3) The following design features are intended to complement the ALARA program. Describe how your station design reflects consideration of these features:

1. use of adequate and quick-service auxiliary lighting in high radiation areas.
2. selection of cubicle wall materials to facilitate decontamination
3. Routing of field-run piping carrying radioactive material so as to minimize personnel exposures.

331.5 (12.3.4.2) In order to accurately determine the radioactive airborne concentration in an area, airborne activity monitors should be located upstream of the filter system. State how you plan to comply with this or give suitable alternatives.

331.6 (Fig. 12.3-6(T)) The change room facilities should be designed to provide services for an expected increased number of maintenance personnel present during major outages. Describe how you intend to satisfy this criterion.

.7
.g. 12.3-9(T)) In section 12.3.1.1 you state that all zone V areas will be provided with doors capable of being locked as per 10 CFR 20.203. The zone V designated cubicles containing the primary waste pumps, waste pumps, concentrate booster pumps, and gas surge tank on the 471 foot level of the waste management building show no such barriers. State how you plan to restrict personnel access to these cubicles.

331.8
(Fig.12.3-10(T)) The following statements pertain to figure 12.3-10(T) (Waste Management Building, Plan 458.0):

1. Provide the thicknesses of the partitions between the four sets of sump pumps (laundry waste, primary waste, chem waste, and waste) located in the southeast corner of the building. Justify that this shielding is sufficient to prevent personnel servicing the pumps in one cubicle from being exposed to radiation from the pumps in the adjacent cubicles.
2. In section 12.3.1.1 you state that all zone V areas will be provided with doors capable of being locked as per 10 CFR 20.203. State why there is no indication of any barrier for the zone V designated cubicle containing the equipment drain collection tank and pump.
3. Justify the zone II radiation designation for the counting room as meeting the as low as is reasonably achievable criteria. Describe how low background counting can be performed in this area.

331.9
(12.5.2) In section 12.5.2 you described how all TVA personnel working in radiation areas will be provided with film badges which are to be processed on a monthly basis. State how you plan to monitor TVA personnel on a day-to-day basis prior to film processing (e.g. use of dosimeters). State your plans to monitor contractor personnel and visitors.

331.16 (11.5.3)	Show the location of the solid waste baler on the appropriate drawings in Chapter 12. It is the staffs' position that the waste baler be outfitted with a hood connected directly to the exhaust ventilation system to prevent any radioactive particulate matter from being released into the air. Show your plans to meet this criteria.
331.17 (12.3.4)	Provide plant layout drawings indicating the locations of all the plant area radiation monitors.
331.18 (12.3.4)	It is our position that area monitors located in high noise areas should have visual as well as audible local alarms. State how you plan to comply with this.
331.19 (12.3.4)	Specify the frequency with which you plan to calibrate your area and airborne radioactivity monitors.
331.20 (12.4.3)	Prior to entry into high radiation areas station personnel should have the benefit of plans and preparations which can ensure that exposures are as low as reasonably achievable (ALARA) while performing the services. State how you plan to implement the following: a) training with cold mockups to save exposure time in radiation fields. b) use of adequate auxiliary lighting c) clear identification of radiation hazards
331.21 (Table 12.4.4-1)	In table 12.4.4-1, the figure given for total continuous exposure at the access road from N-16 sources should be 83.7 mrem/yr, not 98.0 mrem/yr as listed. This would change the individual dose rate at the access road to 1.15 mrem/yr (versus 0.9 mrem/yr).
331.22 (Fig. 12.3.1-1)	Show that your change and locker room facilities are sufficient to accomodate and provide services for an expected increased number of maintenance personnel present during major outages.

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331.1 (12.2.3) This section does not predict the annual average man-rem required to operate and maintain the FFTF. Using experience from other sodium cooled reactors, provide a profile of the estimated annual man-rem doses associated with major functions such as operations, maintenance, radwaste handling, refueling, and inservice inspection.

331.2 (12.2.3) The long-term preferential leaching of nickel and cobalt from the large HX surface areas by 1000°F liquid sodium may not be well understood for the FTR. In view of this uncertainty (and Fermi experience) provide your solutions for performing contact maintenance in fields up to 50 Rem/hour. Discuss for example, the predicted dose rates and maintenance techniques for the hot leg and cold leg isolation valve.

331.3 (12.2.3) Describe your model for estimating the total corrosion product and Co-60 curie content in the primary loop after ten effective full power years. Provide an estimate of the curie content at 10 EFPY. Discuss ways of decontaminating Co-60 from either the primary loop or the sodium coolant.

331.4 (12.2) Indicate whether, and if so how, the guidance given in Regulatory Guides 1.21, 1.52, and 1.69 will be followed; if it will not be followed, describe the specific alternative approaches to be used and the guidance followed.

331.5 (12.2.3) In section 1.3.3 of SDD-21 you state that the change room facilities in the control building are sufficient to accomodate 100 men and 20 women. Describe how you intend to provide these services for an expected increased ~~member~~ number of maintenance personnel present during major outages.

331.6 (12.2.3) On drawings H-4-17630 through H-4-17636 indicate the major traffic patterns used by plant personnel during their daily activities.

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July 16, 1976

331.0 RADIOLOGICAL ASSESSMENT PSAR

331.4 In your response to question 331.4 you indicated that any pump bearing oil present in the Liquid Waste Management System would be removed by the demineralizers. It is our judgment that oil interceptors placed in the lines upstream of the evaporators would remove this oil more efficiently without the risk of imparing demineralizer or evaporator effectiveness. In order to prevent the increased exposure to plant personnel as a consequence of higher maintenance for evaporators and demineralizers, we require that you provide effective oil interceptors in the Liquid Waste Management System.