

RAI Volume 2, Chapter 2.1.1.6, Second Set, Number 2:

For structures, systems, and components (SSCs) ITS, identify the inspection, testing, and maintenance needed, including the scope and frequency, to ensure availability of safety functions of these SSCs ITS.

In SAR Section 1.9.1.13, DOE has stated that the information about inspection, test, and maintenance programs is provided in SAR Sections 1.2, 1.3, 1.4, 1.5, and 5.6. However, it is not clear whether DOE has provided the information on the type, scope, and frequency of inspection, testing, and maintenance needed for staff to verify compliance with 10 CFR 63.112(e)(13).

1. RESPONSE

Specific plans and procedures for inspection, testing, and maintenance of important to safety (ITS) structures, systems, and components (SSCs) associated with repository facility operation will be developed prior to the receipt and possession of high-level radioactive waste. Such plans and procedures will utilize industry information for similar SSCs used by operating nuclear facilities and will be developed in a phased manner to support the operation of each waste handling facility as the construction of each waste handling facility is completed. Programmatic controls will be put in place to ensure that inspection, testing, and maintenance of SSCs are performed in accordance with the processes outlined in SAR Section 5.6.

The type, scope, and frequency of inspection, testing, and maintenance required for ITS SSCs will be based on the specific components that are selected to perform ITS functions. Selection of specific components that provide the required degree of performance and reliability to perform ITS functions, as determined by the preclosure safety analysis, will be done during detailed design.

The reliability-centered maintenance process will be used to develop the plans and procedures by analyzing the inspection, testing, and maintenance needs for each component according to manufacturer's recommendations, industry codes and standards, equipment qualification (SAR Section 1.13), and reliability requirements from the preclosure safety analysis (SAR Section 1.9). The reliability-centered maintenance process will also use information from established maintenance programs in the nuclear industry, recognizing that many of the ITS SSCs are similar to those used in operating nuclear facilities. Periodic tests will be performed at scheduled intervals to detect the deterioration of equipment toward an unacceptable condition. Replacement of parts subject to degradation will be scheduled in accordance with the manufacturer's recommendations. This process, along with the testing requirements from SAR Section 5.10, will develop the maintenance program to ensure that suitable inspection, testing, and maintenance activities are performed at the proper frequency to ensure the availability of the safety functions of the ITS SSCs or to detect degradation and adverse trends so that action can be taken prior to component failure.

ENCLOSURE 1

Response Tracking Number: 00535-00-00

RAI: 2.2.1.1.6-2-002

2. COMMITMENTS TO NRC

None.

3. DESCRIPTION OF PROPOSED LA CHANGE

None.

RAI Volume 2, Chapter 2.1.1.6, Second Set, Number 6:

Provide the following document, referenced in SAR Table 1.13-1:

BSC 2007. "Preliminary Equipment Qualification Environment Bounding Design Basis Values for YMP ITS Surface and Subsurface Facility SSCs." 000-30R-MGR0-02900-000-000. Las Vegas, Nevada: Bechtel SAIC Company.

This document is needed to verify the environmental conditions in the equipment qualification program for the surface and subsurface facilities.

1. RESPONSE

The requested document is attached. This study (BSC 2007) provides preliminary values of environmental parameters for the design of important to safety structures, systems, and components. These values are compared to nuclear industry environmental qualification precedent. The environmental qualification preferred approach is to use equipment that has been previously qualified in other similar safety related nuclear applications. The study was preliminary and identified areas where additional environmental qualification work may be required. Environmental qualification documentation will be developed through detailed design consistent with the guidelines contained in Regulatory Guide 1.89, *Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants*, and IEEE Std 323-2003, *IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Station*, to ensure that active important to safety structures, systems, and components can perform their intended safety functions under the environmental conditions that are expected to exist during normal, off-normal, and event sequence conditions.

2. COMMITMENTS TO NRC

None.

3. DESCRIPTION OF PROPOSED LA CHANGE

None.

4. REFERENCES

BSC (Bechtel SAIC Company) 2007. *Preliminary Equipment Qualification Environment Bounding Design Basis Values for YMP ITS Surface and Subsurface Facility SSCs*. 000-30R-MGR0-02900-000-000. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070516.0027.

IEEE Std 323-2003. 2004. *IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations*. New York, New York: Institute of Electrical and Electronics Engineers. TIC: 255697.

ENCLOSURE 2

Response Tracking Number: 00539-00-00

RAI: 2.2.1.1.6-2-006

Regulatory Guide 1.89, Rev. 1. 1984. *Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants*. Washington, D.C.: U.S. Nuclear Regulatory Commission. TIC: 238593.

RAI Volume 2, Chapter 2.1.1.6, Second Set, Number 7:

Provide information on the functions of ITS controls in the Process & Instrumentation Diagram (P&ID) and Logic Diagrams in SAR section 1.2.4.

In SAR Section 1.2.4, DOE has provided P&IDs and logic diagrams for various equipment. However, the P&IDs do not indicate the functions of ITS controls (e.g., interlocks, sensors, limit switches). For example, SAR Figure 1.2.4-51 shows the P&ID for Canister Transfer Machine. However, it does not identify interlocks that have safety functions, and the interlocks that are provided for redundancy.

1. RESPONSE

The important to safety (ITS) controls shown in the process and instrumentation diagrams and logic diagrams in SAR Section 1.2.4 provide safety functions to ensure that the ITS structures, systems, and components (SSCs) operate in accordance with the requirements of the preclosure safety analysis. Many of the process and instrumentation diagrams and logic diagrams in SAR Section 1.2.4 are applicable to more than one surface nuclear facility. To facilitate review of the ITS controls, Table 1 is provided to identify the ITS controls and implementing components for the ITS SSCs described in SAR Section 1.2.4, including the canister transfer machine. Table 1 expands on the information provided in SAR Table 1.4.2-1 to show the related SAR figures and component identification numbers for the ITS controls. Table 2 of the supplemental response to RAI 2.2.1.1.7-5-001 identifies the ITS control functions that require multiple safety groups (i.e. redundancy).

2. COMMITMENTS TO NRC

None.

3. DESCRIPTION OF PROPOSED LA CHANGE

None.

Table 1. Safety Functions of ITS Controls in SAR Section 1.2.4

ITS SSC and Associated SAR Figures	Safety Function Implemented through ITS Controls (Excerpt from SAR Table 1.4.2-1)	Specific Safety Function/Features	Electrical Component	ITS Interlocks	Component Identification Number
Equipment Shield Door Process and Instrumentation Diagram Figures 1.2.4-20 and 1.2.4-23, 1.2.4-86 Logic Figures 1.2.4-21, 1.2.4-24, 1.2.4-58, 1.2.4-59, 1.2.4-83, 1.2.4-84, 1.2.4-87	Protect against inadvertent direct exposure of personnel to radiation	Shield doors cannot be opened unless the slide gates are closed and the confinement doors are closed.	Shield Door Motor Starter (assembly)	Slide Gate Closed	ZSL-3101A/B ZSL-3201A/B ZSL-3301A/B ZSL-3401A/B
		Shield door cannot be opened if Waste Package Loadout Room radiation is high. (CRCF WP loadout room equipment door only)		Waste Package Loadout Room Radiation Monitor(not high)	RSH-0005-1
		Waste Package Positioning Room equipment shield door cannot be opened unless the slide gates, Waste Package Loadout Room equipment shield door, and personnel shield doors are all closed.		Waste Package Loadout Room Equipment Shield Door Closed Personnel Shield Door Closed	ZSL-2101 ZSL-2201 ZSL-0701 ZSL-0801 ZSL-0901
	Mitigate the consequences of radionuclide release (CRCF cask unloading room shield doors)	Shield doors cannot be opened unless the slide gates and the confinement doors are closed.		Confinement Door Closed	ZSL-2101 A/B ZSL-2201 A/B ZSL-2301 A/B
Port Slide Gate – Single Process and Instrumentation Diagram Figure 1.2.4-20, 1.2.4-58 Logic Figure 1.2.4-61	Protect against inadvertent direct exposure of personnel to radiation	Slide gate cannot be opened unless the canister transfer machine shield skirt is in place over the slide gate.	Slide Gate Motor Starter (assembly)	Canister Transfer Machine Skirt In-place	ZS-3503 ZS-3603 ZS-3703 ZS-3803 ZS-3903 ZS-4003 (TAD Canister Staging) ZS-4103 (TAD Canister Staging)

ITS SSC and Associated SAR Figures	Safety Function Implemented through ITS Controls (Excerpt from SAR Table 1.4.2-1)	Specific Safety Function/Features	Electrical Component	ITS Interlocks	Component Identification Number
	Maintain DOE SNF canister separation (CRCF TAD canister slide gate)	Slide gate for the TAD staging area cannot be opened unless the canister transfer machine skirt is in place over the slide gate and the canister transfer machine is centered over the port, which maintains canister separation. Note: canister transfer machine is not centered for DOE canister staging.		Canister Transfer Machine Centered (Required for TAD canister staging port only)	YS-4004 (TAD Canister Staging) YS-4104 (TAD Canister Staging)
Port Slide Gate – Double Process and Instrumentation Diagram Figure 1.2.4-58 Logic Figures 1.2.4-59, 1.2.4-21, 1.2.4-84	Protect against inadvertent direct exposure of personnel to radiation	Slide gate cannot be opened unless the canister transfer machine skirt is in place over the slide gate.	Slide Gate Motor Starter (assembly)	Canister Transfer Machine Skirt In-place	ZS-3203 ZS-3103 ZS-3303 ZS-3403
		Slide gate cannot be opened unless the shield doors are closed.		Shield Door Closed	ZSL-2101 ZSL-2201
	Preclude canister drop onto floor (CRCF waste package port)	Slide Gate over waste package port cannot be opened unless the waste package transfer trolley with shield ring is present, the canister transfer machine centered switch is closed, and the TAD waste package present switch is closed.		Waste Package Transfer Trolley with Shield Ring Present (CRCF waste package port slide gates only)	YS-3304 YS-3404
		Slide gate over cask port cannot be opened unless the aging overpack is present and the canister transfer machine centered switch is closed. (CRCF only)		Aging Overpack Present (CRCF cask port slide gates only)	YS-3105 YS-3205
	TAD Waste Package Present (CRCF waste package port slide gates only)	Canister Transfer Machine Centered		YS-3305 YS-3405	
Maintain DOE SNF canister separation (CRCF cask and waste package ports)	An interlock is provided to prevent the cask and WP port slide gate from opening when an aging overpack or WP is present respectively, unless the canister transfer machine is centered over the port.		YS-3104 YS-3204 YS-3306 YS-3406		

ITS SSC and Associated SAR Figures	Safety Function Implemented through ITS Controls (Excerpt from SAR Table 1.4.2-1)	Specific Safety Function/Features	Electrical Component	ITS Interlocks	Component Identification Number
Personnel Access and Shield Door Process and Instrumentation Diagram Figure 1.2.4-86 Logic Figure 1.2.4-87	Protect against inadvertent direct exposure of personnel to radiation	Access door lock will not unlock unless hand switch in the Operations Room is enabled and the Waste Package Loadout Room radiation is not high.	Electronic door Lock Coil (HZ-0702, HZ-0802, HZ-0902)	Unlock Access Door (Operations Room)	HS-0702-1 HS-0802-1 HS-0902-1
				Waste Package Loadout Room Radiation High	RSH-0005-1
Equipment Confinement Door—Double Process and Instrumentation Diagram Figures 1.2.4-23, 1.2.4-20 Logic Figures 1.2.4-24, 1.2.4-21	Mitigate the consequences of radionuclide release	Confinement doors cannot be opened unless respective shield doors are closed.	Confinement Door Motor Starter (assembly)	Shield Door Closed	ZSL-2101 ZSL-2201
Waste Package Transfer Trolley Process and Instrumentation Diagram Figures 1.2.4-89 1.2.4-58 Logic Figures 1.2.4-90, 1.2.4-59	Protect against spurious movement	Power to the waste package trolley is removed if the slide gate is opened and/or the waste package transfer trolley is in position for loading.	Trolley Circuit Breaker	Slide Gate Closed	ZSL-3201A/B ZSL-3301A/B ZSL-3401A/B
				Waste Package Transfer Trolley Not In Position for Loading	ZS-0111

ITS SSC and Associated SAR Figures	Safety Function Implemented through ITS Controls (Excerpt from SAR Table 1.4.2-1)	Specific Safety Function/Features	Electrical Component	ITS Interlocks	Component Identification Number
Cask Handling Crane Process and Instrumentation Diagram Figures 1.2.4-35 (sheet 2), 1.2.4-29 Logic Figures 1.2.4-36, 1.2.4-30	Protect against drop	Power to the crane is removed if the final hoist upper limit switch or the rope mis-spool switch trips.	Hoist Circuit Breaker	No Final Hoist UL	ZSHH-0022
				No Rope Mis-spool	YS-0026
	Limit drop height	Crane hoist motions are stopped if any of the limit switches are tripped. (Except cask yoke engaged / disengaged switch)	ASD for Hoist Motor	No First Hoist UL	ZSH-0021
				No Broken Rope	YS-0027
				No Over Capacity limit	WSHH-0025
				Cask Yoke Arms Engaged (left/right)	ZSH-0050-A/B
				Cask Yoke Arms Disengaged	ZSL-0050
Holding brake is only released if no hoist stop command is present.	Holding Brake Coil	No Hoist Stop Commands	YV-0002		
Cask Handling Crane Auxiliary Hoist Process and Instrumentation Diagram Figures 1.2.4-35 (sheet 4), 1.2.4-32 Logic Figures 1.2.4-37, 1.2.4-33	Protect against drop	Power to the crane is removed if the final hoist upper limit switch or the rope mis-spool switch trips.	Hoist Circuit Breaker (Auxiliary)	No Final Hoist UL	ZSHH-0063
				No Rope Mis-spool	YS-0067
	Crane hoist motions are stopped if any of the limit switches are tripped. (Except cask lid lifting grapple engaged/disengaged switch).	ASD for Auxiliary Hoist Motor	No First Hoist UL	ZSH-0070	
			No Broken Rope	YS-0068	
			No Over Capacity limit	WSHH-0066	
			Cask Lid Lifting Grapple Disengaged	ZSL-0006	
			Cask Lid Lifting Grapple Engaged	ZSH-0006	
Holding brake is only released if no hoist stop command is present.	Holding Brake Coil	No Hoist Stop Commands	YV-0010		
Cask Handling Yoke Process and Instrumentation Diagram Figure 1.2.4-29 Logic Figure 1.2.4-30	Protect against drop	Requires pin to be engaged before yoke arms are engaged.	Yoke Arm Coil (HZ-0050)	Yoke Pin Engaged	ZSH-0051

ITS SSC and Associated SAR Figures	Safety Function Implemented through ITS Controls (Excerpt from SAR Table 1.4.2-1)	Specific Safety Function/Features	Electrical Component	ITS Interlocks	Component Identification Number
Cask Lid Lifting Grapple Process and Instrumentation Diagram Figure 1.2.4-32 Logic Figure 1.2.4-33	Protect against drop	Requires grapple to be connected before grapple motor engagement.	Grapple Engage Coil (HZ-0006)	Grapple Connected	YS-0006
Canister Transfer Machine Process and Instrumentation Diagram Figures 1.2.4-51, 1.2.4-44, 1.2.4-48, 1.2.4-64 Logic Figures 1.2.4-52, 1.2.4-53, 1.2.4-54, 1.2.4-55, 1.2.4-56, 1.2.4-65, 1.2.4-49, 1.2.4-45	Protect against drop	Power to the canister transfer machine hoist motor is removed if the final hoist upper limit switch or the rope mis-spool switch trips.	Canister Transfer Machine Canister Hoist Circuit Breaker	No Final Hoist UL	ZSHH-0122
				No Rope Mis-spool	YS-0126
	Limit drop height	Prevent hoist raising/lowering without safety permissives. Limit lift heights. Requires grapple signal to raise hoist.	Canister Transfer Machine Canister Hoist ASD Control	No First Hoist UL	ZSH-0121
				No Broken Rope	YS-0127
				No Over Capacity limit	WSHH-0125
				Canister Transfer Machine Shield Skirt Lowered/Raised	ZSH/L-0112
				Canister Transfer Machine Canister Grapple Engaged or Disengaged	ZSH/L-0111
				No Canister Clear of Slide Gate	YS-0132
				MCO/SNF Canister Grapple Connected and Engaged or Disengaged, or Grapple Not Connected	ZSH/L-0042-1, -2, -3 YS-0042-1, -2, -3
				DWPf/INL/WPDP HLW Canister Grapple Connected and Engaged or Disengaged, or Grapple Not Connected	ZSH/L-0044-1,-2 YS-0044-1,-2

ITS SSC and Associated SAR Figures	Safety Function Implemented through ITS Controls (Excerpt from SAR Table 1.4.2-1)	Specific Safety Function/Features	Electrical Component	ITS Interlocks	Component Identification Number
(continued)	Protect against spurious movement	Hoist holding brake will not release unless ASD is given a raise or lower command.	Hoist holding Brake Coil	ITS Interlock Permissives in Conjunction with Command	YV-1014
		Canister transfer machine hoist trolley cannot move forward or reverse unless CTM shield skirt raised interlock and canister hoist trolley and shield bell not locked interlock are satisfied.	ASD Hoist Trolley	Canister Transfer Machine Shield Skirt Raised	ZSH-0112
				Canister Hoist Trolley and Shield Bell Not Locked	YS-0141
	Protect against inadvertent direct exposure of personnel to radiation	Canister transfer machine shield skirt motor cannot be raised unless the canister transfer machine slide gate is closed.	Motor Starter coil for Shield Skirt	Canister Transfer Machine Slide Gate Closed	ZSL-0113
		Canister transfer machine slide gate cannot be opened unless the canister transfer machine shield skirt is lowered.	Motor Starter coil for Slide Gate	Canister Transfer Machine Shield Skirt Lowered	ZSL-0112
		Canister transfer machine bridge trolley cannot move forward or reverse unless canister transfer machine shield skirt is raised.	Bridge Motor ASD	Canister Transfer Machine Shield Skirt Raised	ZSH-0112
		Canister transfer machine shield bell trolley cannot move forward or reverse unless the canister transfer machine shield skirt is raised.	Shield Bell Trolley Motor ASD	Canister Transfer Machine Shield Skirt Raised	ZSH-0112
	Canister Transfer Machine Canister Grapple Process and Instrumentation Diagram Figure 1.2.4-48 Logic Figure 1.2.4-49	Protect against drop	Requires grapple to be connected before grapple motor engagement.	Grapple Engage Coil (HZ-0111)	Grapple Connected

ITS SSC and Associated SAR Figures	Safety Function Implemented through ITS Controls (Excerpt from SAR Table 1.4.2-1)	Specific Safety Function/Features	Electrical Component	ITS Interlocks	Component Identification Number
SNF Canister Grapple Process and Instrumentation Diagram Figure 1.2.4-64 Logic Figure 1.2.4-65	Protect against drop	Requires grapple to be connected before grapple motor engagement.	Grapple Engage Coil (HZ-0042-1, -2, -3)	Grapple Connected	YS-0042-1 YS-0042-2 YS-0042-3
High Level Waste Canister Grapple Process and Instrumentation Diagram Figure 1.2.4-44 Logic Figure 1.2.4-45	Protect against drop	Grapple only provides interlock status to canister transfer machine canister hoist (mechanically engages / disengages).	NA	Grapple Connected	YS-0044-1 YS-0044-2
				Grapple Engaged	ZSH-0044-1 ZSH-0044-2
				Grapple Disengaged	ZSL-0044-1 ZSL-0044-2

ITS SSC and Associated SAR Figures	Safety Function Implemented through ITS Controls (Excerpt from SAR Table 1.4.2-1)	Specific Safety Function/Features	Electrical Component	ITS Interlocks	Component Identification Number
CRCF HVAC Ventilation and Instrumentation Figures 1.2.4-101 1.2.4-102 1.2.4-105 1.2.4-106 1.2.4-107 Logic Figures 1.2.4-103 1.2.4-109 1.2.4-110 1.2.4-111	Mitigate the consequences of radionuclide release	Failure of one train (A/B) initiates the other train ASD fan motor (B/A), ensuring confinement areas exhaust fans are running.	ASD Fan motors (A and B)	HEPA Filter Differential Pressure Not Low	PDSHL-0148-A PDSHL-0148-B
				HEPA Filter Differential Pressure Not High	PDSHL-0148-A PDSHL-0148-B
				Fan Discharge Flow Not Low	FSL-0109-A FSL-0109-B
				Fan Differential Pressure Not Low	PDSL-0111-A PDSL-0111-B
				Sequencer Start	YS-0108-A YS-0108-B
				Exhaust Fan Failure, or Tripped, or HEPA Filter Differential Pressure High, or Low	Output of ITS Logic
	Support ITS electric power	Failure of train A operating fan initiates the standby fan ASD fan coil unit fan for train A, ensuring Electrical room FCU fans are running for each train (A and B). Train B operates exactly like A for ITS Train B.	ASD FCU Fan motors (operating and standby) (for each Train A and B Electrical Rooms)	Fan Coil Unit Discharge Flow Not Low	FSL-1039-A FSL-1039-B FSL-1049-A FSL-1049-B
				Fan Coil Unit Differential Pressure Not Low	PDSL-1031-A PDSL-1031-B PDSL-1041-A PDSL-1041-B
				Sequencer Start	YS-1030-A YS-1030-B YS-1040-A YS-1040-B
				Fan Coil Unit Failure or Tripped	Output of ITS Logic
		Failure of one train initiates the Standby ASD Battery Room Exhaust Fan, ensuring each train (A and B) battery room exhaust fans are running.	ASD Battery Exhaust Fan motors (operating and standby)	Fan Discharge Flow Not Low	FSL-1179-A FSL-1179-B FSL-1191-A FSL-1191-B
				Fan Differential Pressure Not Low	PDSL-1175-A PDSL-1189-A PDSL-1175-B PDSL-1189-B

ITS SSC and Associated SAR Figures	Safety Function Implemented through ITS Controls (Excerpt from SAR Table 1.4.2-1)	Specific Safety Function/Features	Electrical Component	ITS Interlocks	Component Identification Number
				Sequencer Start	YS-1188-A YS-1188-B YS-1178-A YS-1178-B
				Battery Room Fan Failure, or Tripped	Output of ITS Logic

NOTE: ASD = adjustable speed drive; CRCF = Canister Receipt and Closure Facility; DWPF = Defense Waste Processing Facility (Savannah River); FCU = fan coil unit; HEPA = high-efficiency particulate air; HLW = high-level radioactive waste; HVAC = heating, ventilation and air-conditioning; INL = Idaho National Laboratory; MCO = multicanister overpack; NA = not applicable; SNF = spent nuclear fuel; TAD = transportation, aging, and disposal; UL = upper limit; V&ID = ventilation and instrumentation diagram; WPDP = West Valley Defense Processing Facility; WP = waste package.

RAI Volume 2, Chapter 2.1.1.6, Second Set, Number 8:

Provide a technical basis for the ITS diesel generator capacity, sized to accommodate ITS loads from the handling facilities (SAR Sections 1.2.8 and 1.4.1). This information is needed to verify compliance with 10 CFR 63.112(e)(8).

1. RESPONSE

The important to safety (ITS) diesel generator load capacity requirements are based on NFPA 70-2005, *National Electrical Code*; IEEE Std 387-1995, *IEEE Standard Criteria for Diesel-Generator Units Applied as Standby Power Generating Stations*; IEEE Std 399-1997, *IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis*; and IEEE Std 446-1995, *IEEE Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications Power System Analysis*.

Sizing of the ITS diesel generators is established by accounting for the ITS static loads, motor loads and motor starting loads for the Emergency Diesel Generator Facility (EDGF), Canister Receipt and Closure Facilities (CRCFs), and Wet Handling Facility (WHF). This sizing also accounts for the non-ITS Receipt Facility (RF) loads associated with the non-ITS heating, ventilation, and air-conditioning system. To provide for future growth of the ITS electrical loads, a design margin of 25% has been applied to each motor load and static load connected to the ITS diesel generators.

Upon loss of normal power, the EDGF, CRCFs, and WHF ITS electrical subsystem loads are automatically and sequentially connected to the ITS diesel generators as described in SAR Section 1.4.1.2.1 and shown in SAR Figures 1.4.1-18 and 1.4.1-19. Sequential or step loading of the ITS diesel generators minimizes load starting transients, and stabilizes voltage and frequency variations before additional electrical loads are added. In addition, each ITS heating, ventilation, and air-conditioning load is equipped with an adjustable speed drive to minimize voltage fluctuations and regulate frequency as recommended by IEEE Std 446-1995, Section 4.2. The first automatic sequential (step) load comprises the EDGF electrical ITS loads to support operation of the ITS diesel generators. Subsequent ITS loads are added automatically in a sequence that minimizes the size of later steps and reduces the required ITS diesel generator size. Successive ITS loads are added after a suitable delay between steps. With respect to the non-ITS RF, loads are added manually and may not necessarily amount to the total estimated running load.

Figure 4-20 of IEEE 399-1997 shows that induction motors operating near synchronous speed have a power factor of approximately 0.9. For conservatism, a power factor of 0.8 is applied to the loads on the ITS diesel generator. In accordance with IEEE Std 308-2001, *Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations*, there are no requirements, and no provisions exist, for automatically connecting one ITS train to another ITS train or for automatically transferring loads between trains.

The approximate running load for the ITS diesel generators is provided in Table 1 and consists of static loads, motor loads, and a 25% design margin. The ITS diesel generator's maximum load capacity is represented by the ITS running loads for the EDGF, CRCFs 1-3, WHF, and motor starting and running load requirements of the non-ITS RF manually transferred loads (see Table 1 note). The approximate load on each 5 MVA (4 MW) ITS diesel generator is 3.9 MVA (3.1 MW).

2. COMMITMENTS TO NRC

None.

3. DESCRIPTION OF PROPOSED LA CHANGE

None.

4. REFERENCES

IEEE Std 308-2001. 2002. *IEEE Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations*. New York, New York: Institute of Electrical and Electronic Engineers. TIC: 252746.

IEEE Std 446-1995. *IEEE Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications*. New York, New York: Institute of Electrical and Electronics Engineers. TIC: 242952.

IEEE Std 387-1995. 2001. *IEEE Standard Criteria for Diesel-Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations*. New York, New York: Institute of Electrical and Electronics Engineers. TIC: 258750.

IEEE Std 399-1997. 1998. *IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis*. New York, New York: Institute of Electrical and Electronics Engineers. TIC: 242962.

NFPA 70. 2005. *National Electrical Code*. 2005 Edition. Quincy, Massachusetts: National Fire Protection Association. TIC: 258735.

Table 1. ITS Diesel Generator Sizing

Facility [A]	Starting Step [B]	Running Load (kVA) [C]	Motor Starting Load (kVA) [D]	Cumulative Running Load from Previous Steps (kVA) [E]	Step Starting plus Running Load (kVA) [F]
EDGF	1	476	637	0	1113
CRCF 1	2	522	792	476	1790
CRCF 2	3	522	792	998	2312
CRCF 3	4	522	792	1520	2834
WHF	5	508	758	2042	3308
RF ^a	Manual	560	785	2550	3895

NOTE: ^aThe safety classification of the electrical power subsystem and associated loads in the RF is non-ITS as shown in SAR Table 1.9-5. The electrical design provides isolation and the ability to manually transfer power from the ITS bus to the RF.

The following list explains the columns in Table 1:

- [A] Facility with loads connected to the ITS diesel generators.
- [B] Starting sequence (step) as shown in SAR Section 1.4.1.2.1.
- [C] This value is the total (static and motor) load in kVA including 25% design margin connected to the ITS diesel generators. See the response to RAI: 2.2.1.1.7-6-004, Section 1.2, for the approximate total load of each major piece of ITS distribution equipment for the EDGF, CRCF, and WHF.
- [D] This value (kVA) is the result of converting the facility motor load to kVA by using a power factor of 0.8 and 0.5 HP/kW in accordance with the recommendation in IEEE 446-1995, Section 4.2.11.
- [E] This value is the cumulative running load in kVA, and includes the running load from any previous steps (column [C]).

For example, when the CRCF 2 loads are added in step 3 the cumulative running load from the previous steps is given by:

$$476 \text{ kVA (EDGF running load)} + 522 \text{ kVA (CRCF 1 running load)} = 998 \text{ kVA}$$

For step 1, the cumulative running load from previous steps is zero.

- [F] This value is given by adding the running load for the current step (Column [C]), the motor starting load for that step (Column [D]), and the cumulative running loads from previous steps (Column [E]).

For example, when the CRCF 2 loads are added in step 3, the step starting plus running load is given by:

ENCLOSURE 4

Response Tracking Number: 00541-00-00

RAI: 2.2.1.1.6-2-008

$$\begin{aligned} &522 \text{ kVA (CRCF 2 running load) +} \\ &792 \text{ kVA (CRCF 2 motor starting load) +} \\ &998 \text{ kVA (cumulative running load from EDGF and CRCF 1)} \\ &= 2312 \text{ kVA} \end{aligned}$$

The required capacity of the ITS diesel generator is 3895 kVA. To convert this value to kW, multiply the final result by a power factor of 0.8 (3895 kVA x 0.8) or 3116 kW.