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TOKYO, JAPAN

February 4, 2009

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Attention: Mr. Jeffrey A. Ciocco

Docket No. 52-021
MHI Ref: UAP-HF-09030

Subject: MHI's Responses to US-APWR DCD RAI No.134-1825 Revision 0

Reference: 1) "REQUEST FOR ADDITIONAL INFORMATION NO. 134-1825 REVISION 0, SRP Section: 16 - Technical Specifications, Application Section: 3.8 Electrical Power Systems, QUESTIONS for Technical Specification Branch (CTSB)" dated December 22, 2008.

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Responses to Request for Additional Information No.134-1825 Revision 0."

Enclosed is the responses to Questions 16-21 through 16-47 that are contained within Reference 1.

Please contact Dr. C. Keith Paulson, Senior Technical Manager, Mitsubishi Nuclear Energy Systems, Inc. if the NRC has questions concerning any aspect of the submittals. His contact information is below.

Sincerely,

Yoshiki Ogata,
General Manager- APWR Promoting Department
Mitsubishi Heavy Industries, LTD.

Enclosure:

1. Responses to Request for Additional Information No.134 Revision 0

CC: J. A. Ciocco
C. K. Paulson

D081
NRO

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Docket No. 52-021
MHI Ref: UAP-HF-09030

Enclosure 1

UAP-HF-09030
Docket No. 52-021

Responses to Request for Additional Information No.134-1825
Revision 0

February 2009

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

2/4/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 134-1825 REVISION 0**
SRP SECTION:	**16 – TECHNICAL SPECIFICATION**
APPLICATION SECTION:	**3.8 ELECTRICAL POWER SYSTEMS**
DATE OF RAI ISSUE:	**12/22/2008**

QUESTION NO. : 16-21

The following typographical and editorial errors were noted in Section 3.8:

TS 3.8.1, REQUIRED ACTION B.2, page 3.8.1-2
Add a space between the words "feature" and "in"...

TS 3.8.1, Bases, Background, page B 3.8.1-1
Fifth paragraph, second sentence: Within 3 minute after the initiating signal ... should be the plural minutes.

TS 3.8.1, Bases, ACTIONS B.2, page B 3.8.1-5
First paragraph, third and fourth sentences: change ... auxiliary feedwater ... to ...emergency feedwater ...

TS 3.8.1, Bases, ACTIONS B.2, page B 3.8.1-6
Second from the last paragraph, last sentence: the word ... Acceptable... does not need to be capitalized.

TS 3.8.9, CONDITION B, page 3.8.9-1
It looks like there are two spaces between the words more and required in CONDITION B. Only a single space is necessary.

TS 3.8.10, ACTIONS section, pages 3.8.10-1 and -2
It looks like there is an inadvertent < page break > in the ACTIONS section of TS 3.8.10 after the Note LCO 3.0.3 is not applicable on page 3.8.10-1 and the start of the CONDITION - REQUIRED ACTION - COMPLETION TIME table on page 3.8.10-2.

ANSWER:

Above indicated sections of DCD are revised to incorporate the comments in QUESTION NO.16-21.

Impact on DCD

The DCD Chapter 16, TS 3.8.1, TS 3.8.9 and TS 3.8.10 are revised as shown in attachment 1

Impact on COLA

There are impacts on the COLA to incorporate the DCD change.

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

2/4/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 134-1825 REVISION 0**
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DATE OF RAI ISSUE:	**12/22/2008**

QUESTION NO. : 16-22

Correct or justify the inconsistency between the minimum voltage of 6762 V (98%) to be achieved by the Class 1E GTG within 100 seconds after starting in the 10-year simultaneous startup surveillance test SR 3.8.1.19, Requirement a., and the minimum voltage of 6210 V (90%) in the monthly surveillance test of SR 3.8.1.2.a.

The monthly individual Class 1E GTG startup surveillance test SR 3.8.1.2, Requirement a., establishes a minimum voltage of 6210 V (90%) as the value to be achieved within 100 second after starting. It would be expected that the 10-year SR value would be the same as the Monthly SR.

ANSWER:

6210 V (90%) as minimum voltage of Class 1E GTG in SR 3.8.1.2 is revised to 6762 V (98%).

Impact on DCD

The DCD Chapter 16, TS 3.8.1 is revised as shown in attachment 2.

Impact on COLA

There are impacts on the COLA to incorporate the DCD change.

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

2/4/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

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DATE OF RAI ISSUE:	**12/22/2008**

QUESTION NO. : 16-23

Justify the minimum fuel contained in the GTG day tank in SR 3.8.1.4 and the minimum run time. The minimum run time provided in the Bases is not stated to be based on the US-APWR accident analyses.

The Bases discussion for the US-APWR Class 1E GTG surveillance test SR 3.8.1.4 is identical to the STS NUREG-1431 TS 3.8.1 Bases discussion for SR 3.8.1.4 for the DG in that the calculated run time is 1 hour plus 10%. However, these are two different types of prime movers with unique operating characteristics in different applications and the minimum fuel requirement for the GTG day tank is 600 gallons compared to 220 gallons for the DG. The concern is that the accident analysis run time requirement for the US-APWR Class 1E GTG may be different than that for the DG in the STS NUREG-1431 TS 3.8.1. The accident analyses run time should be presented in terms of the USAPWR accident analyses and the corresponding minimum fuel requirement should be based on the minimum run time.

The US-APWR FSAR Section 8.3.1.1.3.9 states that the day tank capacity is adequate for 1.5 hours of operation of a Class 1E GTG at maximum required loading.

ANSWER:

Fuel oil system including fuel oil storage tank of Class 1E GTG is designed as Class 1E. Total capacity including the fuel oil storage tank should be decided to have consistency with accident analysis and ANSI N195 endorsed by RG 1.137. Capacity of the day tank is not condition of accident analysis.

The day tank capacity of US-APWR is different from NUREG 1431, because fuel consumption of GTG is different from DG. The fuel consumption of GTG is approximately 542 gal/h at full load. 1hour plus 10 % capacity is approximately 600 gal/h.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

2/4/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

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QUESTION NO. : 16-24

Justify the performance frequency of 24 months for the automatic and manual bus transfer surveillance test SR 3.8.1.7 compared to the performance frequency of 18 months for the STS NUREG-1431 SR 3.8.1.8. The justification used for the surveillance frequency of 18 months may not directly apply for the 24 months surveillance frequency.

The Bases discussions for these surveillance tests are identical except for citing 24 months versus 18 months as the basis for operating experience and engineering judgement to support the two different performance frequencies. There is minimal specific operating experience for Class 1E GTGs in nuclear power plant applications. The 24 months surveillance frequency is desired to be consistent with the expected fuel cycle length, but it should also be justified from a reliability standpoint. If engineering judgement is being used to extend to 24 months, based on operating experience with an 18 months surveillance frequency, then it should be so stated in the Bases and the basis for arriving at the engineering judgment should be explained.

ANSWER:

This SR should be performed in refueling outage not normal operation, because this SR may affect to power supply to safety-related loads.

Opening function is significant for incoming breaker from offsite circuit. MHI believes opening of the breakers is reliable since opening action is performed by simple mechanism. Opening function of the breakers will not be degraded within 24 months based on appropriate maintenance of the breakers. In practical, any failures were not occurred, even if only visual inspection was performed in annual outage and detail inspection was performed per 24 months over. Therefore the extended surveillance frequency does not degrade reliability significantly. Furthermore, reliability of GTG is considered as indicated in response to QUESTION NO. 16-27.

Therefore, surveillance frequency of this SR was extended to 24 months.

Impact on DCD

The DCD Chapter 16, TS 3.8.1 BASES is revised as shown in attachment 3.

Impact on COLA

There are impacts on the COLA to incorporate the DCD change.

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

2/4/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

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SRP SECTION:	16 – TECHNICAL SPECIFICATION
APPLICATION SECTION:	3.8 ELECTRICAL POWER SYSTEMS
DATE OF RAI ISSUE:	12/22/2008

QUESTION NO. : 16-25

Justify the maximum allowable startup time of 100 seconds for a US-APWR Class 1E GTG in order to support the assumptions made for the design basis accident analysis when the comparable DG maximum allowable startup time is 10 seconds in the DG startup surveillance test requirements for the STS NUREG-1431 TS 3.8.1, LCO 3.8.1.

The US-APWR TS 3.8.1, LCO 3.8.1 GTG surveillance test requirements SR 3.8.1.2, SR 3.8.1.14, and SR 3.8.1.19 require the GTG to start from a standby condition and achieve greater than 90% voltage at greater than 99% frequency within 100 seconds or less. The US-APWR TS 3.8.1, LCO 3.8.1 GTG surveillance test requirements SR 3.8.1.10, SR 3.8.1.11, and SR 3.8.1.18 require the GTG to start from a standby condition and pick up specified required loads within 100 seconds or less while maintaining steady state voltage between 98% and 102% of 6.9kV and frequency between 99% and 101% of 60Hz. The design basis accident analysis assumes the availability of class 1E ac power to supply power to safety system equipment and pumps so that they can perform their required safety function in accordance with a specified time line for the design basis accident scenario. The US-APWR DBA analysis must account for the longer startup time for the Class 1E GTGs to achieve 90% voltage and 99% frequency, compared to the STS NUREG-1431 DGs, that would result in a corresponding delay in the operation of safety-related system equipment and pumps to achieve their full rated capacity as assumed in the accident analysis.

ANSWER:

The maximum allowable startup time of 100 seconds for a Class 1E GTG is considered in accident analysis. Table 15.0-5 of Chapter 15 shows considered time delays of Class 1E GTG startup time in accident analysis.

In addition, 90% voltage of SR 3.8.1.2 is revised to 98%, based on RAI No. 16-22.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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2/4/2009

US-APWR Design Certification

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Docket No. 52-021

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APPLICATION SECTION:	**3.8 ELECTRICAL POWER SYSTEMS**
DATE OF RAI ISSUE:	**12/22/2008**

QUESTION NO. : 16-26

Justify the absence of the required action equivalent to the required action in STS NUREG-1431 LCO 3.8.1 REQUIRED ACTION A.2 for the LCO 3.8.1 CONDITION A in the US-APWR TS,in order to provide assurance that an event with a coincident single failure will not result in a complete loss of redundant required safety functions associated with critical two-train safety loads. CONDITION A in STS NUREG-1431 TS 3.8.1, LCO 3.8.1, directs the licensee to perform REQUIRED ACTION A.1, the bus circuit breaker line-up verification surveillance SR 3.8.1.1 AND REQUIRED ACTION A.2 to "declare required feature(s) with no offsite power available inoperable when its redundant required feature(s) is inoperable."

Similarly, justify the absence of required action equivalent to the STS NUREG-1431 LCO 3.8.1 REQUIRED ACTION C.1 for the LCO 3.8.1 CONDITION C in the US-APWR TS in order to provide assurance that an event with a coincident single failure will not result in a complete loss of redundant required safety functions associated with critical two-train safety loads. CONDITION C in STS NUREG-1431 TS 3.8.1, LCO 3.8.1, directs the licensee to perform REQUIRED ACTION C.1 to "declare required feature(s) inoperable when its redundant required feature(s) is inoperable."

The FSAR Section 8.3.1.1.2.1, "System Redundancy," states that availability of power from any two of the four ac electric power trains is adequate to meet the load requirements. Each ac electric power train, supplied by one offsite power source and backed up by its associated dedicated Class 1E GTG, is adequate to satisfy the no single failure criterion. The FSAR Section 8.3.1.1.2.1, "System Redundancy," also states that there are two-train safety system loads, such as the motor-driven emergency feedwater pumps, and two-train loads distributed on Class 1E 480Vac bus A1, which can be backed up by manual alignment to Train B, and Class 1E 480Vac bus D1, which can be backed up by manual alignment to Train C. It appears that with neither of the offsite power sources available, a coincident single failure could potentially result in complete loss of redundant required safety functions in two-train safety loads. A TS REQUIRED ACTION to check for inoperable redundant safety features would address this potential vulnerability with two offsite circuits inoperable.

ANSWER:

Similar RAIs were responded in QUESTION NO. 16-2 and 16-5 of RAI No.72.

Redundant required functions are not lost in Condition A with a coincident single failure as shown

in response to QUESTION NO. 16-2 of RAI No.72.

The response to QUESTION NO. 16-5 of RAI No.72 showed that redundant required functions are not lost in Condition C with a coincident single failure. However, response to RAI 16-5 has to be corrected. Redundant required functions consisted of two trains may lose in Condition C with a coincident single failure. Required Action "declare required feature(s) inoperable when its redundant required feature(s) is inoperable." is got back.

Impact on DCD

The DCD Chapter 16 TS 3.8.1 is revised as shown in attachment 4.

Impact on COLA

There are impacts on the COLA to incorporate the DCD change.

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

2/4/2009

US-APWR Design Certification

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Docket No. 52-021

RAI NO.:	**NO. 134-1825 REVISION 0**
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APPLICATION SECTION:	**3.8 ELECTRICAL POWER SYSTEMS**
DATE OF RAI ISSUE:	**12/22/2008**

QUESTION NO. : 16-27

Justify the performance frequency of 24 months for the US-APWR Class 1E GTG refueling cycle surveillance tests SR 3.8.1.8 through SR 3.8.1.18 compared to 18 months for the equivalent STS NUREG-1431 DG surveillance tests SR 3.8.1.7 and SR 3.8.1.9 through SR 3.8.1.19. The industry operating experience with DGs may not directly translate over for GTGs and additional justification is needed.

The Bases discussions for these surveillance test requirements cite RG 1.9, "Selection, Design, Qualification, and Testing of Emergency Diesel Generator Units Used As Class 1E Onsite Electric Power Systems At Nuclear Power Plants," as the basis for the performance frequency. The concern is that there is minimal specific operating experience for Class 1E GTGs in nuclear power plant applications. Non-nuclear gas turbine generator operating experience must be factored in with plant risk considerations if the TS surveillance requirements frequencies are to be extended to coincide with a projected refueling cycle of 24 months in the US-APWR. DG operating experience in nuclear power plant applications may not translate over for Class 1E GTGs in this application.

ANSWER:

These SR should be performed in refueling outage not normal operation, because these SR may affect to power supply to safety-related loads.

The reliability of GTG was provided in Technical Report MUAP-07024. The reliability is based on operating experience of non-nuclear gas turbine generator with reduced surveillance and its frequency from emergency generator of nuclear plant. Therefore the Class 1E GTG in US-APWR should be more reliable by performing the SRs and 24 months frequency of this SR does not degrade reliability of GTG. In addition, when GTG has any failures, the failures can be detected by monthly surveillance.

Equivalent of DG is used as reliability of GTG in PRA. This value is conservative than reliability of non-nuclear GTG.

Impact on DCD

Bases of SR 3.8.1.8 through SR 3.8.1.18 are revised as shown in attachment 5.

Impact on COLA

There are impacts on the COLA to incorporate the DCD change.

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

2/4/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 134-1825 REVISION 0**
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APPLICATION SECTION:	**3.8 ELECTRICAL POWER SYSTEMS**
DATE OF RAI ISSUE:	**12/22/2008**

QUESTION NO. : 16-28

Provide further details in the Bases discussion for US-APWR TS 3.8.1 CONDITION C when the plant is operating in MODE 1, 2, 3, or 4 with none of the two required qualified offsite circuits available and is performing REQUIRED ACTION C.1 to restore one of the inoperable circuits. Clarify the start of the COMPLETION TIME clock for restoration of the remaining required offsite circuit to OPERABLE status and provide the required COMPLETION TIME for restoration of the remaining offsite power source. Describe the administrative controls that may be used to limit the maximum time allowed for any combination of conditions that result in a single contiguous occurrence of failure to meet the LCO 3.8.1.a.

The Bases discussion for REQUIRED ACTIONS C.1 AND C.2 for US-APWR TS 3.8.1 CONDITION C (No required offsite circuits OPERABLE) indicates that the unit may continue to operate for up to 24 hours to allow restoration of one required offsite circuit to OPERABLE status. The last sentence in the second from the last paragraph of the Bases discussion states that if only one offsite source is restored within 24 hours, power operation continues in accordance with CONDITION A. CONDITION A allows the licensee 72 hours to restore one inoperable required offsite circuit to OPERABLE status. Without any administrative controls to limit the maximum time allowed, the plant may conceivably continue to operate with one offsite circuit inoperable for an unlimited time.

ANSWER:

The start of the COMPLETION TIME is clocked at discovery of no required offsite circuits OPERABLE for REQUIRED ACTIONS C.1 and C.2. Maximum COMPLETION TIME for seriate entry to other CONDITION is limited by administrative control separately submitted. Therefore even if one required offsite circuit is restored within 24 hours in CONDITION C and CONDITION A is entered, the plant does not conceivably continue to operate with one offsite circuit inoperable for an unlimited time.

In particular, a remaining offsite circuit must be restore within 72 hours in CONDITION A following after CONDITION C. COMPRETION TIME of subsequent CONDITION is limited by maximum COMPLETION TIME in accordance with administrative control.

In addition, in our understanding, eliminating second COMPLETION TIME in Technical Specification was established as rule in accordance with TSTF-439 Rev.2.

Impact on DCD

The DCD Chapter 16, TS 3.8.1 BASES is revised as shown in attachment 6.

Impact on COLA

There are impacts on the COLA to incorporate the DCD change.

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

2/4/2009

US-APWR Design Certification

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QUESTION NO. : 16-29

Provide further details in the Bases discussion for REQUIRED ACTIONS C.1 AND C.2 for US-APWR TS 3.8.1 CONDITION C (Two required offsite circuits inoperable) about continuing to operate the unit for up to 24 hours to allow restoration of one required offsite circuit to OPERABLE status. The discussion provided in the Bases does not address all of the relevant scenarios.

Discuss the scenarios that could lead to two required offsite circuits inoperable while the plant continues to operate, for the plant ac electrical distribution system response to the LOOP, and for the configuration of the ac electric power system supply to the Class 1E 6.9kV buses if it is decided to continue operation during the period of up to 24 hours, until one required offsite circuit is restored to OPERABLE status. Your response should address LOOP scenarios resulting in automatic fast bus transfer and automatic slow bus transfer, the resulting status of the Class 1E GTGs and their output circuit breakers, whether the main generator is continuing to supply power to the safety loads through the UATs, whether transmission lines other than the two qualified offsite ac circuits remain connected to the plant switchyard, and the status of the UATs and RATs.

ANSWER:

Class 1E buses are normally powered form RATs. Class 1E GTGs are started by undervoltage signal of Class 1E medium voltage bus. And their output circuit breakers are closed automatically after completion of GTG starting and opening of other incoming circuit breaker of Class 1E bus.

When the main generator can continue to supply power to the safety loads through the UATs as a minimum load operation in two qualified offsite circuits inoperable condition, the Class 1E medium voltage buses are switched from RAT to UAT with fast transfer or slow transfer. The Class 1E GTGs start by undervoltage signal in slow transfer and their output circuit breakers keep opening.

When transmission lines other than the two qualified offsite ac circuits still remain in two qualified offsite circuits inoperable condition, the Class 1E buses are powered from those remaining transmission lines. The Class 1E GTGs are started, if slow transfer is operated in accordance with connection of site specific offsite circuit.

The Class 1E GTGs connect to Class 1E buses when other all ac power sources are unavailable, until one required offsite circuit is restored to OPERABLE status.

Impact on DCD

The DCD Chapter 16, TS 3.8.1 BASES is revised as shown in attachment 7.

Impact on COLA

There are impacts on the COLA to incorporate the DCD change.

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

2/4/2009

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QUESTION NO. : 16-30

Justify the COMPLETION TIME of 2 hours in the US-APWR TS 3.8.1, LCO 3.8.1 ACTIONS CONDITION E, when 3 required GTGs are inoperable.

RG 1.93, Regulatory Position C.4 states that if the available onsite ac electric supplies are two less than the LCO requires, power operation may continue for a period that should not exceed two hours. However, when 3 required GTGs are inoperable, the plant is operating with three less than the LCO 3.8.1.b requirement for 3 Class 1E GTGs. This case is, therefore, more similar to US-APWR TS 3.8.1, LCO 3.8.1 ACTIONS CONDITION H where you have various simultaneous inoperable combinations of offsite power sources and onsite GTGs that amount to three or more ac sources less than the normal five ac sources (2 of 2 offsite power sources and 3 of 4 GTGs) required by the LCO. The COMPLETION TIME for CONDITION H is to immediately enter LCO 3.0.3.

ANSWER:

Remaining function of Condition E (two or more required Class 1E GTG inoperable) of US-APWR is equivalent to Condition E of STS. Even if all emergency power sources are inoperable, redundant required features can be powered from offsite circuit. Therefore, required safety function can be maintained with expected single failure.

The COMPLETION TIME for CONDITION H is to immediately enter LCO 3.0.3, because required safety function can not maintain with expected single failure in Condition H.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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2/4/2009

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QUESTION NO. : 16-31

Clarify whether the intent of the TS 3.8.1, LCO 3.8.1, Item c, is to require OPERABLE automatic load sequencers for all four Class 1E ac power safety trains since their function can also affect offsite circuits or, OPERABLE automatic load sequencers for only those Class 1E ac power safety trains that are backed up by OPERABLE Class 1E GTGs.

Discuss whether a Class 1E bus can remain OPERABLE when its corresponding automatic load sequencer becomes inoperable. Section 8.3.1.2.4 of the DCD describes the various combinations of manual and automatic interconnections between the Class 1E buses, offsite ac sources, and Class 1E GTGs and the electrical distribution system's automatic load shedding and load sequencing responses to different plant operating contingencies, such as LOCA with offsite power available or simultaneous LOOP/LOCA. Also discuss the completeness of the TS requirements for automatic load sequencers regarding the different plant operating contingencies.

ANSWER:

The automatic load sequencer operates after receiving actuation signal stated in TS 3.3.2 (ECCS etc.) or TS 3.3.5 (LOP) as shown in BACKGROUND of BASES. Required loads are operated by load sequencer for mitigation against operating contingencies. Therefore, when automatic load sequencer becomes inoperable, its corresponding Class 1E ac power system can not keep the safety function for mitigation against operating contingencies.

The function of load sequencing is different among LOCA, LOOP, and simultaneous LOOP/LOCA. However the TS requirement of automatic load sequencer for different operating contingencies is commonly provided as one LCO shown in LCO 3.8.1 item c.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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2/4/2009

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QUESTION NO. : 16-32

Confirm that the CONDITION F under the US-APWR TS 3.8.1, LCO 3.8.1 ACTIONS is intended to include the CONDITION where the plant is operating in MODE 1, 2, 3, or 4 with more than one automatic load sequencer inoperable. Justify using only one CONDITION with one COMPLETION TIME to address the automatic load sequencers.

This potential operating condition does not appear to be specifically addressed in the US-APWR TS 3.8.1, LCO 3.8.1 as it is presently written, because the US-APWR plant ac electrical design consists of two offsite circuits and three of four onsite safety buses backed up by a dedicated GTG on each bus, whereas the model for this TS, the STS NUREG-1431 TS 3.8.1, LCO 3.8.1, is based on a standard plant design with two offsite circuits and two onsite safety buses backed up by a dedicated diesel generator on each bus. If this represents a CONDITION not previously covered, REQUIRED ACTIONS would need to be developed to assure availability of ac electric power to redundant Class 1E electrical trains and redundant safety features and to restore the required inoperable automatic load sequencers to OPERABLE status within specified COMPLETION TIMES.

If the CONDITION of more than one automatic load sequencer inoperable is covered by CONDITION F, then justify specifying the same COMPLETION TIME for one or more inoperable automatic load sequencers.

ANSWER:

CONDITION F in TS 3.8.1, LCO 3.8.1 is not covered "more than one automatic load sequencers inoperable".

When an associated Action is not provided, the plant shall enter LCO 3.0.3. Therefore when two or more required automatic load sequencers become inoperable, the plant shall enter LCO 3.0.3.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

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2/4/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 134-1825 REVISION 0**
SRP SECTION:	**16 – TECHNICAL SPECIFICATION**
APPLICATION SECTION:	**3.8 ELECTRICAL POWER SYSTEMS**
DATE OF RAI ISSUE:	**12/22/2008**

QUESTION NO. : 16-33

Confirm that CONDITION B under the US-APWR TS 3.8.2, LCO 3.8.2 ACTIONS is intended to include the CONDITION for the plant is operating in MODE 5 or 6 when both of the two required Class 1E GTGs become inoperable during shutdown.

This potential operating condition does not appear to be specifically addressed in the US-APWR TS 3.8.2, LCO 3.8.2 as it is presently written, because the US-APWR plant ac electrical design consists of two offsite circuits and three of four onsite safety buses backed up by a dedicated GTG on each bus, whereas the model for this TS, the STS NUREG-1431 TS 3.8.1, LCO 3.8.1, is based on a standard plant design with two offsite circuits and two onsite safety buses backed up by a dedicated diesel generator on each bus. Condition B would address the case where two required Class 1E GTGs become inoperable during shutdown if it was worded (One or more required Class 1E GTGs inoperable.) This would also be consistent with the wording used for CONDITION A in TS 3.8.10, Distribution Systems - Shutdown.

ANSWER:

CONDITION B of LCO 3.8.2 is revised to "One or more required Class 1E GTGs inoperable".

Impact on DCD

The DCD Chapter 16, TS 3.8.2 CONDITION B is revised as shown in attachment 8.

Impact on COLA

There are impacts on the COLA to incorporate the DCD change.

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

2/4/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 134-1825 REVISION 0**
SRP SECTION:	**16 – TECHNICAL SPECIFICATION**
APPLICATION SECTION:	**3.8 ELECTRICAL POWER SYSTEMS**
DATE OF RAI ISSUE:	**12/22/2008**

QUESTION NO. : 16-34

Justify the difference in the minimum current limit (greater than or equal to 400 A) supplied by the battery charger at greater than or equal to the minimum established float voltage for at least 8 hours cited in US-APWR TS 3.8.4 surveillance test requirement SR 3.8.4.2 compared to the minimum current limit cited in STS NUREG-1431 TS 3.8.4 SR 3.8.4.2 (greater than or equal to 800 A).

The Bases discussion for the US-APWR SR 3.8.4.2 is nearly identical to the Bases discussion for STS NUREG-1431 SR 3.8.4.2 except for the battery charger minimum current limit.

The response to RAI 3.8.4-3 regarding the determination of the minimum established float voltage also affects acceptance criteria for SR 3.8.4.2.

ANSWER:

The capacity of battery charger is decided based on battery capacity and steady state loads. The battery capacity and steady state load are different from STS. The bases discussion of US-APWR is nearly identical to the STS, because methodology for decision of the minimum current limit is same.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

2/4/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 134-1825 REVISION 0**
SRP SECTION:	**16 – TECHNICAL SPECIFICATION**
APPLICATION SECTION:	**3.8 ELECTRICAL POWER SYSTEMS**
DATE OF RAI ISSUE:	**12/22/2008**

QUESTION NO. : 16-35

Describe the determination methodology and administrative control for the minimum established float voltage, for the Class 1E battery as an acceptance criterion for USAPWR TS 3.8.4 surveillance test requirement SR 3.8.4.1. It is also referred to in TS 3.8.4 REQUIRED ACTION A.1, TS 3.8.4 surveillance test requirement SR 3.8.4.2, and TS 3.8.5 REQUIRED ACTION A.1, but no quantitative voltage value is specified directly.

The Bases discussion for the US-APWR indicates a manufacturer's suggested minimum of 2.17 V per cell and 130.2 V at the battery terminals, indicating a 60-cell battery. The Bases discussion for the STS NUREG-1431 SR 3.8.4.1 is nearly identical except for a different manufacturer's suggested minimum of 2.20 V per cell and 127.6 V at the battery terminals, indicating a 58-cell battery. The description of the Class 1E batteries in FSAR Section 3.8.3.1.1 states the design basis minimum of 1.8 V per cell end voltage with a minimum battery terminal voltage of 108 V at 65oF and 25% aging factor. Your response should discuss the basis for the difference in the battery size, how the minimum float voltage will be determined and administratively controlled, and whether the value will be verified by test for each Class 1E battery.

US-APWR TS 3.8.5 surveillance test requirement SR 3.8.5.1 directs the licensee to perform SR 3.8.4.1 to verify shutdown operability of the Class 1E battery.

ANSWER:

108 V as minimum battery voltage is adopted based on allowable minimum voltage of loads and consideration of system voltage drop. Therefore, individual end voltage is decided 1.8 V. Battery capacity is sized with 1.8 V end voltage. Capacity of Class 1E battery in US-APWR is larger than STS, approximately 5000 Ah.

The minimum established float voltage will be selected from manufacturer's recommendation float voltage range and controlled by administrative control. It will be tested that float voltage satisfies minimum value for each Class 1E battery.

There is no relation between float voltage and end voltage.

Impact on DCD

The DCD Chapter 16, TS 3.8.4 BASES is revised as shown in attachment 9.

Impact on COLA

There are impacts on the COLA to incorporate the DCD change.

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

2/4/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 134-1825 REVISION 0**
SRP SECTION:	**16 – TECHNICAL SPECIFICATION**
APPLICATION SECTION:	**3.8 ELECTRICAL POWER SYSTEMS**
DATE OF RAI ISSUE:	**12/22/2008**

QUESTION NO. : 16-36

Justify not including a CONDITION under TS 3.8.4, LCO 3.8.4 ACTIONS specifically addressing the case where the plant is operating in MODE 1, 2, 3, or 4 when two or more required dc electrical power subsystems become inoperable.

This potential operating condition does not appear to be specifically addressed in the US-APWR TS 3.8.4, LCO 3.8.4 as it is presently written. TS 3.8.9, LCO 3.8.9 ACTIONS CONDITION C states that with "one or more required dc electrical power subsystems inoperable" the licensee must complete REQUIRED ACTION C.1 within 2 hours. This is consistent with the 2 hours COMPLETION TIME for TS 3.8.4, LCO 3.8.4 ACTIONS CONDITION C. However, TS 3.8.9, LCO 3.8.9 ACTIONS CONDITION E states that with "two or more required electrical power subsystems inoperable that result in a loss of safety function" the licensee must immediately enter LCO 3.0.3 (REQUIRED ACTION E.1). TS 3.8.4, LCO 3.8.4 does not provide guidance consistent with TS 3.8.9, LCO 3.8.9 ACTIONS CONDITION E for the case when two or more required dc electrical power subsystems become inoperable.

TS 3.8.9, LCO 3.8.9 ACTIONS CONDITION C indicates that it is acceptable for the plant to continue to operate for up to two hours with two of the three required dc electrical subsystems until an inoperable dc electrical subsystem is restored to OPERABLE status. Justify operating the plant for up to two hours with only one of the three required dc electrical subsystems OPERABLE, or none of the three required dc electrical subsystems OPERABLE. Also confirm an associated dc electrical bus is considered inoperable when the plant enters TS 3.8.4, LCO 3.8.4 CONDITION A alone, CONDITION B alone, or CONDITION A and CONDITION B simultaneously.

ANSWER:

The condition of "three required dc electrical power subsystems inoperable" is the same as condition of "two required dc electrical power subsystems inoperable" in STS NUREG-1431. Therefore, when plant becomes this condition, the plant shall enter LCO 3.0.3. On the other hand, the condition of "two required dc electrical power subsystems inoperable" can use one remaining dc electrical power subsystem. However, as a conservative approach, "two required dc electrical power subsystems inoperable" and "three required dc electrical power subsystems inoperable"

achieve as a same condition. When an associated Action is not provided, the plant shall enter LCO 3.0.3. Therefore when two or more required dc electrical power subsystems become inoperable, the plant shall enter LCO 3.0.3.

TS 3.8.9, LCO 3.8.9 Actions Condition C should be operating the plant for up to two hours with two of the three required dc electrical subsystems OPERABLE. Therefore Condition C is revised to "One required dc electrical power distribution subsystem inoperable."

When the plant enters TS 3.8.4, LCO 3.8.4 Condition A and Condition B simultaneously, a dc electrical subsystem is considered inoperable.

Impact on DCD

The DCD Chapter 16, TS 3.8.9 Actions Condition C is revised as shown in attachment 10.

Impact on COLA

There are impacts on the COLA to incorporate the DCD change.

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

2/4/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 134-1825 REVISION 0**
SRP SECTION:	**16 – TECHNICAL SPECIFICATION**
APPLICATION SECTION:	**3.8 ELECTRICAL POWER SYSTEMS**
DATE OF RAI ISSUE:	**12/22/2008**

QUESTION NO. : 16-37

Justify the difference between the US-APWR Technical Specifications Class 1E battery float current limit of 5 A and its corresponding verification COMPLETION TIME of once per 24 hours and the STS NUREG-1431 float current limit of 2 A and corresponding COMPLETION TIME of once per 12 hours.

This difference affects the following: US-APWR TS 3.8.4, LCO 3.8.4, REQUIRED ACTION A.2; TS 3.8.5, LCO 3.8.5, REQUIRED ACTION A.2; and TS 3.8.6, LCO 3.8.6, CONDITION B and REQUIRED ACTION B.2. The Bases discussions for these operating and shutdown conditions for the US-APWR and the STS NUREG-1431 are identical except for the above values.

The difference in the battery float current limit indicated above (5 A cited in the USAPWR compared to 2 A cited in the STS NUREG-1431) also affects TS 3.8.6 CONDITION F and surveillance test requirement SR 3.8.6.1.

ANSWER:

Same RAI was responded in RAI No.72. Please see response to RAI 16-10 of No.72.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

2/4/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 134-1825 REVISION 0**
SRP SECTION:	**16 – TECHNICAL SPECIFICATION**
APPLICATION SECTION:	**3.8 ELECTRICAL POWER SYSTEMS**
DATE OF RAI ISSUE:	**12/22/2008**

QUESTION NO. : 16-38

Provide the methodology and administrative control for the manufacturer's rating of the battery capacity as an acceptance criterion for the TS 3.8.6 battery capacity surveillance test requirement SR 3.8.6.6. Also, describe the establishment of the manufacturer's rating for battery capacity and expected life including the "battery degradation" determination and the administrative controlls necessary to set the performance FREQUENCY for the TS 3.8.6 battery capacity surveillance test requirement SR 3.8.6.6.

The TS 3.8.6 SR 3.8.6.6 Bases discussion indicates that the IEEE Std. 450 definition of battery degradation will be used. Discuss the use this standard as guidance for implementation.

ANSWER:

Manufacturer's rating of the battery capacity for an acceptance criterion of the TS 3.8.6 battery capacity surveillance test requirement SR 3.8.6.6 and manufacturer's battery expected life for setting the performance FREQUENCY of the TS 3.8.6 battery capacity surveillance test requirement SR 3.8.6.6 are determined based on manufacturer's recommendation and controlled by administrative control. BASES of TS 3.8.6 is revised based on above.

Impact on DCD

The DCD Chapter 16, TS 3.8.6 BASES is revised as shown in attachment 11.

Impact on COLA

There are impacts on the COLA to incorporate the DCD change.

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

2/4/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 134-1825 REVISION 0**
SRP SECTION:	**16 – TECHNICAL SPECIFICATION**
APPLICATION SECTION:	**3.8 ELECTRICAL POWER SYSTEMS**
DATE OF RAI ISSUE:	**12/22/2008**

QUESTION NO. : 16-39

Justify the individual cell and battery terminal voltage values suggested in the Bases discussion for TS 3.8.6 surveillance test requirements SR 3.8.6.2 and 3.8.6.5 on page B.3.8.6-6.

As presently written in the Bases, the values suggested for individual cell voltage and battery terminal voltage for the US-APWR are the same as for the STS NUREG-1431. However, at least the battery terminal voltage value should be different because, as noted in RAI 3.8.4-3, the US-APWR battery is comprised of 60 cells compared to the STS NUREG-1431 battery that is comprised of 58 cells.

ANSWER:

The battery terminal voltage is corrected to "135 V" from "130.5 V" as 60 cells batteries.

Impact on DCD

The DCD Chapter 16, TS 3.8.6 BASES is revised as shown in attachment 12.

Impact on COLA

There are impacts on the COLA to incorporate the DCD change.

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

2/4/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 134-1825 REVISION 0**
SRP SECTION:	**16 – TECHNICAL SPECIFICATION**
APPLICATION SECTION:	**3.8 ELECTRICAL POWER SYSTEMS**
DATE OF RAI ISSUE:	**12/22/2008**

QUESTION NO. : 16-40

Describe the determination and administrative control of the minimum established design limits and battery parameters limits referred to in TS 3.8.6 CONDITIONS C, D, E, and indirectly, F, and in surveillance test requirements SR 3.8.6.3 and SR 3.8.6.4.

ANSWER:

The minimum established design limits and battery parameters limits are determined based on manufacturer's recommendation and controlled by administrative control. BASES of TS 3.8.6 is revised based on above.

Impact on DCD

The DCD Chapter 16, TS 3.8.6 BASES is revised as shown in attachment 13.

Impact on COLA

There are impacts on the COLA to incorporate the DCD change.

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

2/4/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 134-1825 REVISION 0**
SRP SECTION:	**16 – TECHNICAL SPECIFICATION**
APPLICATION SECTION:	**3.8 ELECTRICAL POWER SYSTEMS**
DATE OF RAI ISSUE:	**12/22/2008**

QUESTION NO. : 16-41

Justify the monthly frequency for the GTG fuel oil inventory surveillance check SR 3.8.3.1 to assure that the TS 3.8.3, LCO 3.8.3 is satisfied.

The REQUIRED ACTION for CONDITION A directs the licensee to restore the fuel oil inventory to greater than the 91,000 gallons storage tank level within a COMPLETION TIME of 48 hours if the fuel inventory has dropped to a storage tank level equivalent to between 78,000 gallons and 91,000 gallons of fuel. An inventory of 78,000 gallons is estimated to allow the GTG to operate at DBA loading for at least six days. A frequency of once per week with a safety-related level indicating instrument and/or a low fuel oil storage tank level alarm may be appropriate for SR 3.8.3.1 to assure that the TS LCO 3.8.3 and the REQUIRED ACTION for CONDITION A are satisfied. In your response describe administrative controls that would be used to assure that Class 1E GTG fuel oil storage tank inventory is restored in accordance with the TS LCO 3.8.3 following any operation of a gas turbine, including maintenance and testing runs.

ANSWER:

Testing (starting and loading) of Class 1E GTG are performed per month. Generally, only these testing combust fuel oil. And as shown in BASES of SR 3.8.3.1, condition of decreasing fuel oil can be recognized by other than performing SR. Therefore, it is not needed to perform SR per week. This FREQUENCY is consistent with STS NUREG-1431.

Administrative controls that, would be used to assure that Class 1E GTG fuel oil storage tank inventory is restored following any operation of a gas turbine, is described in BASES of SR 3.8.3.1.

Impact on DCD

The DCD Chapter 16, TS 3.8.3 BASES is revised as shown in attachment 14.

Impact on COLA

There are impacts on the COLA to incorporate the DCD change.

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

2/4/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 134-1825 REVISION 0**
SRP SECTION:	**16 – TECHNICAL SPECIFICATION**
APPLICATION SECTION:	**3.8 ELECTRICAL POWER SYSTEMS**
DATE OF RAI ISSUE:	**12/22/2008**

QUESTION NO. : 16-42

Justify the monthly frequency for the GTG lube oil inventory surveillance check SR 3.8.3.2 to assure that the TS 3.8.3, LCO 3.8.3 is satisfied.

The REQUIRED ACTION for CONDITION B directs the licensee to restore the lube oil inventory to greater than 81 gallons within a COMPLETION TIME of 48 hours if the inventory has dropped to between 79 and 81 gallons. An inventory of 79 gallons is estimated to allow the GTG to operate at DBA loading for at least six days. A frequency of once per week with a safety-related level indicating instrument and/or a low lube oil level alarm may be appropriate for SR 3.8.3.2 to assure that the TS LCO 3.8.3 and the REQUIRED ACTION for CONDITION B are satisfied.

ANSWER:

As shown in BASES of SR 3.8.3.2, condition of decreasing lube oil can be recognized by other than performing SR. Therefore, it is not needed to perform SR per week. This FREQUENCY is consistent with STS NUREG-1431.

In addition, lube oil consumption of the GTG is much less than the DG and the tank has much capacity compared with limiting inventory.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

2/4/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 134-1825 REVISION 0**
SRP SECTION:	**16 – TECHNICAL SPECIFICATION**
APPLICATION SECTION:	**3.8 ELECTRICAL POWER SYSTEMS**
DATE OF RAI ISSUE:	**12/22/2008**

QUESTION NO. : 16-43

Justify that the Class 1E GTG starting air receiver pressure values specified in TS 3.8.3, CONDITION E, i.e. less than 270 psig and greater than or equal to 185 psig, provides enough capacity for at least one start cycle and the starting air receiver pressure greater than 270 psig specified in SR 3.8.3.4 provides enough capacity for at least three start cycles.

The FSAR Section 9.5.6, describing the GTG starting air system, indicates that there are six compressors supplying two air start receivers for each Class 1E GTG. The air compressors cycle the starting air receiver pressure between the minimum setpoint of 384 psia to the maximum of 435 psia. The concern is that the TS and SR may not be reflecting the design parameters of the GTG starting air system as described in FSAR Section 9.5.6.

ANSWER:

The Class 1E GTG starting air receiver pressure values are revised to "less than 398 psig and greater than or equal to 228 psig".

In addition, the FSAR Section 9.5.6 is also revised about starting air receiver pressure value and air receiver capacity.

Impact on DCD

The DCD Chapter 16, TS 3.8.3 Actions Condition E, SR 3.8.3.4, and Section 9.5.6 are revised as shown in attachment 15.

Impact on COLA

There are impacts on the COLA to incorporate the DCD change.

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

2/4/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 134-1825 REVISION 0**
SRP SECTION:	**16 – TECHNICAL SPECIFICATION**
APPLICATION SECTION:	**3.8 ELECTRICAL POWER SYSTEMS**
DATE OF RAI ISSUE:	**12/22/2008**

QUESTION NO. : 16-44

Justify not including a CONDITION under TS 3.8.7, LCO 3.8.7 ACTIONS specifically addressing the case where the plant is operating in MODE 1, 2, 3, or 4 when two or more required inverters become inoperable.

This potential operating condition does not appear to be specifically addressed completely in the US-APWR TS 3.8.7, LCO 3.8.7 as it is presently written. TS 3.8.7, LCO 3.8.7 ACTIONS CONDITION A states that with one of the three required inverters inoperable the licensee is required to restore the inverter to OPERABLE status within 24 hours. However, no specific guidance is provided for the cases where two of three required inverters become inoperable or all three of the required inverters become inoperable.

TS 3.8.9, LCO 3.8.9 ACTIONS CONDITION B states that with "one or more required ac vital buses inoperable" the licensee must complete REQUIRED ACTION B.1 within 2 hours. However, neither TS 3.8.7, LCO 3.8.7 nor TS 3.8.9, LCO 3.8.9 specifically address the effect of inverter operability on the operability of an associated ac vital bus. Confirm that an ac vital bus is considered inoperable if its associated inverter is inoperable.

ANSWER:

When an associated Action is not provided, the plant shall enter LCO 3.0.3. Therefore when two or more required inverter become inoperable, the plant shall enter LCO 3.0.3. See response to QUESTION NO. 16-46 as reference.

The ac vital bus is considered OPERABLE, when the ac vital bus is supplied from associated transformer if inverter is inoperable. If associated inverter and transformer become inoperable, the ac vital bus is considered inoperable. It is depicted in last sentence of first paragraph of TS 3.8.9 BASES ACTIONS B.1.

Impact on DCD

There is no impact on the DCD

Impact on COLA

There is no impact on the COLA

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

2/4/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 134-1825 REVISION 0**
SRP SECTION:	**16 – TECHNICAL SPECIFICATION**
APPLICATION SECTION:	**3.8 ELECTRICAL POWER SYSTEMS**
DATE OF RAI ISSUE:	**12/22/2008**

QUESTION NO. : 16-45

Specify and describe the administrative controll of the the "correct inverter voltage, frequency, and alignments to required ac vital buses" as the acceptance criteria for the TS 3.8.7 inverter surveillance test requirement SR 3.8.7.1 and the TS 3.8.8 inverter surveillance test requirement SR 3.8.8.1.

ANSWER:

SR 3.8.7.1 and SR 3.8.8.1 verify that the output voltage and frequency of inverter are correct and the ac vital bus is supplied by the associated inverter. The correct inverter voltage is = +/- 2 % and frequency is = +/- 0.5 %. Alignment to ac vital bus is verified by condition of output breaker of the inverter and associated switching circuit. These are controlled by administrative control. These are described in BASES of TS 3.8.7 and TS 3.8.8.

Impact on DCD

The DCD Chapter 16, TS 3.8.7 and TS 3.8.8 BASES are revised as shown in attachment 16.

Impact on COLA

There are impacts on the COLA to incorporate the DCD change.

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

2/4/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 134-1825 REVISION 0**
SRP SECTION:	**16 – TECHNICAL SPECIFICATION**
APPLICATION SECTION:	**3.8 ELECTRICAL POWER SYSTEMS**
DATE OF RAI ISSUE:	**12/22/2008**

QUESTION NO. : 16-46

Correct the inconsistency with TS 3.8.9 Table 3.8.9-1 indicating that four of four trains of the ac vital buses are required OPERABLE when the plant is operating in MODES 1, 2, 3, or 4, but TS 3.8.7, LCO 3.8.7 requires inverters in only three trains to be OPERABLE.

Neither TS 3.8.7, LCO 3.8.7 nor TS 3.8.9, LCO 3.8.9 specifically address how inverter operability affects the operability of an associated ac vital bus. Confirm if an ac vital bus is considered inoperable if its associated inverter is inoperable. Based on this discussion, justify the success requirements in Table 3.8.9-1 and the inverter operability requirements in LCO 3.8.7.

ANSWER:

The inverters are provided as power source which can maintain power to I&C loads at instantaneous power loss or LOOP condition. The ac vital buses can be powered by not only the associated inverter but also associated Class 1E transformer. Normally, the ac vital buses are powered by the inverter.

Basically one train inoperable condition of vital ac load is acceptable because these are composed of four trains, but there are exceptions. There are some loads required 4 trains/channels OPERABLE in MODE 1, 2, 3, or 4. Since these loads do not require uninterruptible power and allow to be fed from transformer, four trains operation of the combination of inverter and transformer is allowed. However, loss of one ac vital bus should not be allowed from view point of keeping function of the some loads. Therefore, TS 3.8.7, LCO 3.8.7 requires inverters in three trains to be OPERABLE, and TS 3.8.9 Table 3.8.9-1 requires ac vital buses in four trains to be OPERABLE. In addition, it is noted that Train A and B or Train C and D ac vital buses shall not be supplied from Class 1E transformer concurrently.

Impact on DCD

The DCD Chapter 16, TS 3.8.7 LCO 3.8.7 is revised as shown in attachment 17.

Impact on COLA

There are impacts on the COLA to incorporate the DCD change.

Impact on PRA

There is no impact on the PRA

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

2/4/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 134-1825 REVISION 0**
SRP SECTION:	**16 – TECHNICAL SPECIFICATION**
APPLICATION SECTION:	**3.8 ELECTRICAL POWER SYSTEMS**
DATE OF RAI ISSUE:	**12/22/2008**

QUESTION NO. : 16-47

For TS 3.8.10, LCO 3.8.10, specify and describe the administrative controll of the necessary portions of ac, dc, and ac vital bus electrical power distribution subsystems...to support equipment required to be OPERABLE.

Discuss the definition of the necessary portions of the ac, dc, and ac vital bus for the plant operating in MODE 5 or 6 during the movement of irradiated fuel assemblies. The discussion should also specify and describe the administrative controll for the inverters required for the plant operating in MODE 5 or 6 during the movement of irradiated fuel assemblies in accordance with TS 3.8.8, LCO 3.8.8.

ANSWER:

The necessary portions of ac, dc, and ac vital bus electrical power distribution subsystems are determined by the system it supports in MODE 5 or 6 during the movement of irradiated fuel assemblies. For example, three residual heat removal (RHR) loops shall be OPERABLE in MODE 5, Loops not filled in accordance with LCO 3.4.8. In this time, the necessary portions of ac buses are three trains.

Similarly, the necessary portions of ac vital bus are determined by the system it supports in MODE 5 or 6 during the movement of irradiated fuel assemblies. For example, three Automatic Trip Logics shall be OPERABLE in MODE 5 with Rod Control System capable of rod withdrawal or one or more rods not fully inserted in accordance with function 18 of Table 3.3.1-1 in LCO 3.3.1. In this time, the necessary portions of Inverters are three trains.

The necessary portions in each mode are controlled by administrative control. This is described in BASES of TS 3.8.10.

Impact on DCD

The DCD Chapter 16, TS 3.8.10 BASES is revised as shown in attachment 18.

Impact on COLA

There are impacts on the COLA to incorporate the DCD change.

Impact on PRA

There is no impact on the PRA

This completes MHI's response to the NRC's question.

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~A. One required offsite circuit inoperable.~~	~~A.1 Perform SR 3.8.1.1 for required OPERABLE offsite circuit.~~ ~~AND~~ ~~A.2.1 Restore required offsite circuit to OPERABLE status.~~ ~~[OR~~ A.2.2 ----------NOTE---------- This Required Action is not applicable in MODE 4. ---------- Apply the requirements of Specification 5.5.18.	~~1 hour~~ ~~AND~~ ~~Once per 8 hours thereafter~~ ~~72 hours~~ 72 hours]
B. One required Class 1E GTG inoperable.	B.1 Perform SR 3.8.1.1 for the required offsite circuit(s). AND B.2 Declare required feature(s) supported by the inoperable Class 1E GTGs inoperable when its required redundant feature in a train with an OPERABLE Class 1E GTG is inoperable. AND B.3.1 Determine OPERABLE Class 1E GTGs are not	1 hour AND Once per 8 hours thereafter 4 hours from discovery of Condition B concurrent with inoperability of redundant required feature(s) 24 hours

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.1 AC Sources - Operating

BASES

BACKGROUND

The unit Class 1E ac electrical power distribution system ac sources consist of the offsite power sources (preferred power sources, normal and alternate(s)), and the onsite standby power sources (Train A, B, C, and D Class 1 E Gas Turbine Generators (GTGs)). As required by 10 CFR 50, Appendix A, GDC 17 (Ref. 1), the design of the ac electrical power system provides independence and redundancy to ensure an available source of power to the Engineered Safety Feature (ESF) systems.

The onsite Class 1E ac distribution system is divided into redundant load groups (trains) so that the loss of any one or two groups does not prevent the minimum safety functions from being performed. Each train has connections to two preferred offsite power sources and a single Class 1E GTG.

Offsite power is supplied to the unit switchyard(s) from the transmission network by two transmission lines. From the switchyard(s), two electrically and physically separated circuits provide ac power, through auxiliary transformers, to the Class 1E 6.9 kV buses. A detailed description of the offsite power network and the circuits to the Class 1E 6.9kV buses is found in Chapter 8 (Ref. 2).

An offsite circuit consists of all breakers, transformers, switches, interrupting devices, cabling, and controls required to transmit power from the offsite transmission network to the onsite Class 1E 6.9kV bus(es).

Certain required unit loads are returned to service in a predetermined sequence in order to prevent overloading the transformer supplying offsite power to the onsite Class 1E distribution system. Within 3 minutes after the initiating signal is received, all automatic and permanently connected loads needed to recover the unit or maintain it in a safe condition are returned to service via the load sequencer.

ACTIONS (continued)

A.2.1 [and A.2.2]

According to Regulatory Guide 1.93 (Ref. 6), operation may continue in Condition A for a period that should not exceed 72 hours. With one offsite circuit inoperable, the reliability of the offsite system is degraded, and the potential for a loss of offsite power is increased, with attendant potential for a challenge to the unit safety systems. In this Condition, however, the remaining OPERABLE offsite circuit and Class 1E GTGs are adequate to supply electrical power to the onsite Class 1E distribution system.

[Required Action A.2.2 allows the option to apply the requirements of Specification 5.5.18 to determine a Risk Informed Completion Time (RICT). This Requied Action is not applicable in MODE 4.]

The 72 hour Completion Time takes into account the capacity and capability of the remaining ac sources, a reasonable time for repairs, and the low probability of PA occurring during this period.

B.1

To ensure a highly reliable power source remains with an inoperable Class 1E GTG, it is necessary to verify the availability of the offsite circuits on a more frequent basis. Since the Required Action only specifies "perform," a failure of SR 3.8.1.1 acceptance criteria does not result in a Required Action being not met. However, if a circuit fails to pass SR 3.8.1.1, it is inoperable. Upon offsite circuit inoperability, additional Conditions and Required Actions must then be entered.

B.2

Required Action B.2 is intended to provide assurance that a loss of offsite power, during the period that Class 1E GTGs in two trains are inoperable, does not result in a complete loss of safety function of critical systems. These features are designed with redundant safety related trains. This includes motor driven ~~auxiliary~~ emergency feedwater pumps. Two train systems, such as turbine driven ~~auxiliary~~ emergency feedwater pumps, are not included. Redundant required feature failures consist of inoperable features associated with a train, redundant to the train that has an inoperable Class 1E GTG.

ACTIONS (continued)

The Completion Time for Required Action B.2 is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." In this Required Action, the Completion Time only begins on discovery that both:

a. An inoperable Class 1E GTG exists and

b. A required feature on the other trains (Train A, B, C or D) is inoperable.

If at any time during the existence of this Condition (Class 1E GTGs in two trains inoperable) a required feature subsequently becomes inoperable, this Completion Time would begin to be tracked.

Discovering required Class 1E GTGs in two trains inoperable coincident with two or more inoperable required support or supported features, or both, that are associated with the OPERABLE Class 1E GTG, results in starting the Completion Time for the Required Action. Four hours from the discovery of these events existing concurrently is ~~Acceptable~~ acceptable because it minimizes risk while allowing time for restoration before subjecting the unit to transients associated with shutdown.

In this Condition, the remaining OPERABLE Class 1E GTG and offsite circuits are adequate to supply electrical power to the onsite Class 1E distribution systems. Thus, on a component basis, single failure protection for the required feature's function may have been lost; however, function has not been lost. The 4 hour Completion Time takes into account the OPERABILITY of the redundant counterpart to the inoperable required feature. Additionally, the 4 hour Completion Time takes into account the capacity and capability of the remaining ac sources, a reasonable time for repairs, and the low probability of PA occurring during this period.

3.8 ELECTRICAL POWER SYSTEMS

3.8.9 Distribution Systems - Operating

LCO 3.8.9 The ac, dc, and ac vital bus electrical power distribution subsystems shall be OPERABLE as specified in Table 3.8.9-1.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One ~~or more~~ required ac electrical power distribution subsystems inoperable.	----------NOTE---------- Enter applicable Conditions and Required Actions of LCO 3.8.4, "DC Sources - Operating," for dc trains made inoperable by inoperable power distribution subsystems. ----------	
	A.1 Restore required ac electrical power distribution subsystem(s) to OPERABLE status.	8 hours
	[OR	
	A.2 ----------NOTE---------- This Required Action is not applicable in MODE 4. ---------- Apply the requirements of Specification 5.5.18.	8 hours]
B. One ~~or more~~ required ac vital buses inoperable.	B.1 Restore ac vital bus subsystem(s) to OPERABLE status.	2 hours

3.8 ELECTRICAL POWER SYSTEMS

3.8.10 Distribution Systems - Shutdown

LCO 3.8.10 The necessary portions of ac, dc, and ac vital bus electrical power distribution subsystems shall be OPERABLE to support equipment required to be OPERABLE.

APPLICABILITY: MODES 5 and 6,
During movement of irradiated fuel assemblies.

ACTIONS

---NOTE---

LCO 3.0.3 is not applicable.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more required ac, dc, or ac vital bus electrical power distribution subsystems inoperable.	A.1 Declare associated supported required feature(s) inoperable. OR A.2.1 Suspend CORE ALTERATIONS. AND A.2.2 Suspend movement of irradiated fuel assemblies. AND A.2.3 Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration. AND	Immediately Immediately Immediately Immediately

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more required ac, dc, or ac vital bus electrical power distribution subsystems inoperable.	A.1 Declare associated supported required feature(s) inoperable. OR A.2.1 Suspend CORE ALTERATIONS. AND A.2.2 Suspend movement of irradiated fuel assemblies. AND A.2.3 Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration. AND A.2.4 Initiate actions to restore required ac, dc, and ac vital bus electrical power distribution subsystems to OPERABLE status. AND A.2.5 Declare associated required residual heat removal subsystem(s) inoperable and not in operation.	Immediately Immediately Immediately Immediately Immediately

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
G. Required Action and associated Completion Time of Condition A, B, C, D, E, or F not met.	G.1 Be in MODE 3. AND G.2 Be in MODE 5.	6 hours 36 hours
H. Two offsite circuits and one or more required GTGs inoperable. OR One offsite circuit and two or more required GTGs inoperable.	H.1 Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.1.1	Verify correct breaker alignment and indicated power availability for each required offsite circuit.	[7 days OR In accordance with the Surveillance Frequency Control Program]
SR 3.8.1.2	Verify each Class 1E GTG starts from standby condition and achieves: a. In ≤ 100 seconds, voltage ≥ ~~6210~~ 6762 V and frequency ≥ 59.4 Hz and b. Steady state voltage ≥ 6762 V and ≤ 7038 V, and frequency ≥ 59.4 Hz and ≤ 60.6 Hz.	[31 days OR In accordance with the Surveillance Frequency Control Program]

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.6

This Surveillance demonstrates that each required fuel oil transfer pump operates and transfers fuel oil from its associated storage tank to its associated day tank. This is required to support continuous operation of standby power sources. This Surveillance provides assurance that the fuel oil transfer pump is OPERABLE, the fuel oil piping system is intact, the fuel delivery piping is not obstructed, and the controls and control systems for automatic fuel transfer systems are OPERABLE.

[The Frequency for this SR is variable, depending on individual system design, with up to a 92 day interval. The 92 day Frequency corresponds to the testing requirements for pumps as contained in the ASME Code (Ref. 10); however, the design of fuel transfer systems is such that pumps operate automatically or must be started manually in order to maintain an adequate volume of fuel oil in the day tanks during or following Class 1E GTG testing. In such a case, a 31 day Frequency is appropriate. Since proper operation of fuel transfer systems is an inherent part of Class 1E GTG OPERABILITY, the Frequency of this SR should be modified to reflect individual designs. OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

SR 3.8.1.7

Transfer of each Class 1E 6.9 kV bus power supply from the normal offsite circuit to the alternate offsite circuit demonstrates the OPERABILITY of the alternate circuit distribution network to power the shutdown loads. [The 24 month Frequency of the Surveillance is based on engineering judgment, taking into consideration the unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths. Switching function of the breakers will not be degraded within 24 months based on appropriate maintenance of the breaker. ~~Operating experience has shown that these components usually pass the SR when performed at the 24 month Frequency.~~ Therefore, the Frequency was concluded to be acceptable from a reliability standpoint. ~~OR~~ Or ~~The~~ the Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

This SR is modified by a Note. The reason for the Note is that, during operation with the reactor critical, performance of this SR could cause perturbations to the electrical distribution systems that could challenge continued steady state operation and, as a result, unit safety systems. This restriction from normally performing the Surveillance in MODE 1 or 2 is further amplified to allow the Surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	~~B.3.1 Determine OPERABLE Class 1E GTGs are not inoperable due to common cause failure.~~	~~24 hours~~
	~~OR~~	
	~~B.3.2 Perform SR 3.8.1.2 for OPERABLE Class 1E GTGs.~~	~~24 hours~~
	~~AND~~	
	B.4.1 Restore required Class 1E GTGs in three trains to OPERABLE status.	72 hours
	[OR	
	B.4.2 ----------NOTE---------- This Required Action is not applicable in MODE 4. ---------- Apply the requirements of Specification 5.5.18.	72 hours]
C. Two required offsite circuits inoperable.	C.1 Declare required feature(s) inoperable when its redundant required feature(s) is inoperable.	12 hours from discovery of Condition C concurrent with inoperability of redundant required features
	AND	
	C.2.1 Restore one required offsite circuit to OPERABLE status.	24 hours
	[OR	
	C.2.2 ----------NOTE---------- This Required Action is not	24 hours]

ACTIONS (continued)

B.3.1 and B.3.2

Required Action B.3.1 provides an allowance to avoid unnecessary testing of OPERABLE Class 1E GTG(s). If it can be determined that the cause of the inoperable Class 1E GTG does not exist on the OPERABLE Class 1E GTG, SR 3.8.1.2 does not have to be performed. If the cause of inoperability exists on other Class 1E GTG(s), the other Class 1E GTG(s) would be declared inoperable upon discovery and Condition E of LCO 3.8.1 would be entered. Once the failure is repaired, the common cause failure no longer exists, and Required Action B.3.1 is satisfied. If the cause of the initial inoperable Class 1E GTG cannot be confirmed not to exist on the remaining Class 1E GTG(s), performance of SR 3.8.1.2 suffices to provide assurance of continued OPERABILITY of that Class 1E GTG.

In the event the inoperable Class 1E GTG is restored to OPERABLE status prior to completing either B.3.1 or B.3.2, the plant corrective action program will continue to evaluate the common cause possibility. This continued evaluation, however, is no longer under the 24 hour constraint imposed while in Condition B.

According to Generic Letter 84-15 (Ref. 7), 24 hours is reasonable to confirm that the OPERABLE Class 1E GTGs are not affected by the same problem as the inoperable Class 1E GTGs.

B.4.1 [and B.4.2]

According to Regulatory Guide 1.93 (Ref. 6), operation may continue in Condition B for a period that should not exceed 72 hours.

[Required Action B.4.2 allows the option to apply the requirements of Specification 5.5.18 to determine a Risk Informed Completion Time (RICT). This Requied Action is not applicable in MODE 4.]

In Condition B, the remaining OPERABLE Class 1E GTG and offsite circuits are adequate to supply electrical power to the onsite Class 1E distribution systems. The 72 hour Completion Time takes into account the capacity and capability of the remaining ac sources, a reasonable time for repairs, and the low probability of PA occurring during this period.

C.1, C.2.1 [and C.2.2]

Required Action C.1, which applies when two offsite circuits are inoperable, is intended to provide assurance that an event with a coincident single failure will not result in a complete loss of redundant required safety functions.

ACTIONS (continued)

The Class 1E GTGs are adequate to supply electrical power to the onsite Class 1E Distribution System. The 12 hour Completion Time takes into account the component OPERABILITY of the redundant counterpart to the inoperable required feature. Additionally, the 12 hour Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period. Regulatory Guide 1.93 (Ref. 6) allows a Completion Time of 24 hours for two required offsite circuits inoperable, based upon the assumption that safety trains are completely OPERABLE. When a concurrent redundant required feature failure exists, this assumption is not the case, and a shorter Completion Time of 12 hours is appropriate.

The Completion Time for Required Action C.1 is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." In this Required Action the Completion Time only begins on discovery that both:

a. All required offsite circuits are inoperable and

b. A required feature is inoperable.

If at any time during the existence of Condition C (two offsite circuits inoperable) a required feature becomes inoperable, this Completion Time begins to be tracked.

According to Regulatory Guide 1.93 (Ref. 6), operation may continue in Condition C for a period that should not exceed 24 hours. This level of degradation means that the offsite electrical power system does not have the capability to effect a safe shutdown and to mitigate the effects of an accident; however, the onsite ac sources have not been degraded. This level of degradation generally corresponds to a total loss of the immediately accessible offsite power sources.

Because of the normally high availability of the offsite sources, this level of degradation may appear to be more severe than other combinations of two ac sources inoperable that involve one or more Class 1E GTGs inoperable. However, two factors tend to decrease the severity of this level of degradation:

a. The configuration of the redundant ac electrical power system that remains available is not susceptible to a single bus or switching failure and

b. The time required to detect and restore an unavailable offsite power source is generally much less than that required to detect and restore an unavailable onsite ac source.

SURVEILLANCE REQUIREMENTS (continued)

corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with a failed Surveillance, a successful Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when the Surveillance is performed in MODE 1 or 2. Risk insights or deterministic methods may be used for this assessment. Credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.8

Each Class 1E GTG is provided with an engine overspeed trip to prevent damage to the engine. Recovery from the transient caused by the loss of a large load could cause engine overspeed, which, if excessive, might result in a trip of the engine. This Surveillance demonstrates the Class 1E GTG load response characteristics and capability to reject the largest single load without exceeding predetermined voltage and frequency and while maintaining a specified margin to the overspeed trip. This Surveillance may be accomplished by:

a. Tripping the Class 1E GTG output breaker with the Class 1E GTG carrying greater than or equal to its associated single largest post-accident load while paralleled to offsite power, or while solely supplying the bus, or

b. Tripping its associated single largest post-accident load with the Class 1E GTG solely supplying the bus.

As required by IEEE-308 (Ref. 11), the load rejection test is acceptable if the increase in Class 1E GTG speed does not exceed 75% of the difference between synchronous speed and the overspeed trip setpoint, or 15% above synchronous speed, whichever is lower.

The time, voltage, and frequency tolerances specified in this SR are derived from Regulatory Guide 1.9 (Ref. 3) recommendations for response during load sequence intervals. The 3 seconds specified is equal to 60% of a typical 5 second load sequence interval associated with sequencing of the largest load. The voltage and frequency specified are consistent with the design range of the equipment powered by the Class 1E GTG. SR 3.8.1.8.a corresponds to the maximum frequency

SURVEILLANCE REQUIREMENTS (continued)

excursion, while SR 3.8.1.8.b and SR 3.8.1.8.c are steady state voltage and frequency values to which the system must recover following load rejection. [The 24 month Frequency of this SR is based on engineering judgment, taking into consideration the unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths. The reliability proved in Technical Report MUAP-07024 for Class 1E GTG is based on operating experience of non-nuclear gas turbine generator with reduced surveillance and its frequency from emergency generator of nuclear plant. The Class 1E GTG in US-APWR should be more reliable by performing the SRs. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint. The 24 month Frequency is also consistent with the recommendation of Regulatory Guide 1.9 (Ref. 3). ~~OR~~ Or ~~The~~ the Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

This SR is modified by two Notes. The reason for Note 1 is that during operation with the reactor critical, performance of this SR could cause perturbations to the electrical distribution systems that could challenge continued steady state operation and, as a result, unit safety systems. This restriction from normally performing the Surveillance in MODE 1 or 2 is further amplified to allow the Surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with a failed Surveillance, a successful Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when the Surveillance is performed in MODE 1 or 2. Risk insights or deterministic methods may be used for this assessment. Credit may be taken for unplanned events that satisfy this SR.

Note 2 ensures that the Class 1E GTG is tested under load conditions that are as close to design basis conditions as possible. When synchronized with offsite power, testing should be performed at a power factor of ≤ 0.9. This power factor is representative of the actual inductive loading a Class 1E GTG would see under design basis accident conditions. Under certain conditions, however, Note 2 allows the Surveillance to be conducted at a power factor other than ≤ 0.9. These conditions occur when grid voltage is high, and the additional field excitation needed to get the power factor to ≤ 0.9 results in voltages on the emergency busses that are too high. Under these conditions, the power factor should be maintained as close as practicable to 0.9 while

SURVEILLANCE REQUIREMENTS (continued)

still maintaining acceptable voltage limits on the emergency busses. In other circumstances, the grid voltage may be such that the Class 1E GTG excitation levels needed to obtain a power factor of 0.9 may not cause unacceptable voltages on the emergency busses, but the excitation levels are in excess of those recommended for the Class 1E GTG. In such cases, the power factor shall be maintained as close as practicable to 0.9 without exceeding the Class 1E GTG excitation limits.

SR 3.8.1.9

This Surveillance demonstrates the Class 1E GTG capability to reject a full load without overspeed tripping or exceeding the predetermined voltage limits. The Class 1E GTG full load rejection may occur because of a system fault or inadvertent breaker tripping. This Surveillance ensures proper engine generator load response under the simulated test conditions. This test simulates the loss of the total connected load that the Class 1E GTG experiences following a full load rejection and verifies that the Class 1E GTG does not trip upon loss of the load. These acceptance criteria provide for Class 1E GTG damage protection. While the Class 1E GTG is not expected to experience this transient during an event and continues to be available, this response ensures that the Class 1E GTG is not degraded for future application, including reconnection to the bus if the trip initiator can be corrected or isolated.

[The 24 month Frequency is consistent with the recommendation of Regulatory Guide 1.9 (Ref. 3) and is intended to be consistent with expected fuel cycle lengths. The reliability proved in Technical Report MUAP-07024 for Class 1E GTG is based on operating experience of non-nuclear gas turbine generator with reduced surveillance and its frequency from emergency generator of nuclear plant. The Class 1E GTG in US-APWR should be more reliable by performing the SRs. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint. ~~OR~~ Or ~~The~~ the Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

This SR has been modified by two Notes. The reason for Note 1 is that during operation with the reactor critical, performance of this SR could cause perturbation to the electrical distribution systems that could challenge continued steady state operation and, as a result, unit safety systems. This restriction from normally performing the Surveillance in MODE 1 or 2 is further amplified to allow the Surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with a failed Surveillance, a

SURVEILLANCE REQUIREMENTS (continued)

successful Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when the Surveillance is performed in MODE 1 or 2. Risk insights or deterministic methods may be used for this assessment.

Credit may be taken for unplanned events that satisfy this SR. Note 2 ensures that the Class 1E GTG is tested under load conditions that are as close to design basis conditions as possible. When synchronized with offsite power, testing should be performed at a power factor of ≤ 0.9. This power factor is representative of the actual inductive loading a Class 1E GTG would see under design basis accident conditions. Under certain conditions, however, Note 2 allows the Surveillance to be conducted at a power factor other than ≤ 0.9. These conditions occur when grid voltage is high, and the additional field excitation needed to get the power factor to ≤ 0.9 results in voltages on the emergency busses that are too high. Under these conditions, the power factor should be maintained as close as practicable to 0.9 while still maintaining acceptable voltage limits on the emergency busses. In other circumstances, the grid voltage may be such that the Class 1E GTG excitation levels needed to obtain a power factor of 0.9 may not cause unacceptable voltages on the emergency busses, but the excitation levels are in excess of those recommended for the Class 1E GTG. In such cases, the power factor shall be maintained as close as practicable to 0.9 without exceeding the Class 1E GTG excitation limits.

SR 3.8.1.10

As required by Regulatory Guide 1.9 (Ref. 3), this Surveillance demonstrates the as designed operation of the standby power sources during loss of the offsite source. This test verifies all actions encountered from the loss of offsite power, including shedding of the nonessential loads and energization of the emergency buses and respective loads from the Class 1E GTG. It further demonstrates the capability of the Class 1E GTG to automatically achieve the required voltage and frequency within the specified time.

The Class 1E GTG autostart time of 100 seconds is derived from requirements of the accident analysis to respond to a design basis large break LOCA. The Surveillance should be continued for a minimum of 5 minutes in order to demonstrate that all starting transients have decayed and stability is achieved.

The Class 1E GTG autostart time of 100 seconds is derived from requirements of the accident analysis to respond to a design basis large

SURVEILLANCE REQUIREMENTS (continued)

break LOCA. The Surveillance should be continued for a minimum of 5 minutes in order to demonstrate that all starting transients have decayed and stability is achieved.

The requirement to verify the connection and power supply of permanent and autoconnected loads is intended to satisfactorily show the relationship of these loads to the Class 1E GTG loading logic. In certain circumstances, many of these loads cannot actually be connected or loaded without undue hardship or potential for undesired operation. For instance, Safety Injection System (SIS) injection valves are not desired to be stroked open, or safety injection systems are not capable of being operated at full flow. In lieu of actual demonstration of connection and loading of loads, testing that adequately shows the capability of the Class 1E GTG systems to perform these functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire connection and loading sequence is verified.

[The Frequency of 24 months is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3), takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths. The reliability proved in Technical Report MUAP-07024 for Class 1E GTG is based on operating experience of non-nuclear gas turbine generator with reduced surveillance and its frequency from emergency generator of nuclear plant. The Class 1E GTG in US-APWR should be more reliable by performing the SRs. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint. ~~OR~~ Or ~~The~~ the Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

This SR is modified by a Note. The reason for the Note is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems. This restriction from normally performing the Surveillance in MODE 1 or 2 is further amplified to allow portions of the Surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with a failed partial Surveillance, a successful partial Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the partial Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when portions of the Surveillance are performed in MODE 1 or 2. Risk insights or

SURVEILLANCE REQUIREMENTS (continued)

deterministic methods may be used for the assessment. Credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.11

This Surveillance demonstrates that the Class 1E GTG automatically starts and achieves the required voltage and frequency within the specified time (100 seconds) from the design basis actuation signal (ECCS actuation signal) and operates for ≥ 5 minutes. The 5 minute period provides sufficient time to demonstrate stability. SR 3.8.1.11.d and SR 3.8.1.11.e ensure that permanently connected loads and emergency loads are energized from the offsite electrical power system on an ECCS actuation signal without loss of offsite power.

The requirement to verify the connection of permanent and autoconnected loads is intended to satisfactorily show the relationship of these loads to the Class 1E GTG loading logic. In certain circumstances, many of these loads cannot actually be connected or loaded without undue hardship or potential for undesired operation. For instance, SIS injection valves are not desired to be stroked open, or safety injection systems are not capable of being operated at full flow. In lieu of actual demonstration of connection and loading of loads, testing that adequately shows the capability of the Class 1E GTG system to perform these functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire connection and loading sequence is verified.

[The Frequency of 24 months takes into consideration unit conditions required to perform the Surveillance and is intended to be consistent with the expected fuel cycle lengths. The reliability proved in Technical Report MUAP-07024 for Class 1E GTG is based on operating experience of non-nuclear gas turbine generator with reduced surveillance and its frequency from emergency generator of nuclear plant. The Class 1E GTG in US-APWR should be more reliable by performing the SRs. ~~Operating experience has shown that these components usually pass the SR when performed at the 24 month Frequency.~~ Therefore, the Frequency was concluded to be acceptable from a reliability standpoint. ~~OR~~ Or ~~The~~ the Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

SURVEILLANCE REQUIREMENTS (continued)

This SR is modified by a Note. The reason for the Note is that during operation with the reactor critical, performance of this Surveillance could cause perturbations to the electrical distribution systems that could challenge continued steady state operation and, as a result, unit safety systems. This restriction from normally performing the Surveillance in MODE 1 or 2 is further amplified to allow portions of the Surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with a failed partial Surveillance, a successful partial Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the partial Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when portions of the Surveillance are performed in MODE 1 or 2. Risk insights or deterministic methods may be used for the assessment. Credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.12

This Surveillance demonstrates that Class 1E GTG noncritical protective functions) are bypassed on a loss of voltage signal concurrent with an ESF actuation test signal. Noncritical automatic trips are all automatic trips except:

a. Overspeed;

b. Generator differential current;

c. High exhaust temperature; and

d. Fail to start.

The noncritical trips are bypassed during PA and provide an alarm on an abnormal engine condition. This alarm provides the operator with sufficient time to react appropriately. The Class 1E GTG availability to mitigate the PA is more critical than protecting the engine against minor problems that are not immediately detrimental to emergency operation of the Class 1E GTG.

SURVEILLANCE REQUIREMENTS (continued)

[The 24 month Frequency is based on engineering judgment, taking into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths. The reliability proved in Technical Report MUAP-07024 for Class 1E GTG is based on operating experience of non-nuclear gas turbine generator with reduced surveillance and its frequency from emergency generator of nuclear plant. The Class 1E GTG in US-APWR should be more reliable by performing the SRs. ~~Operating experience has shown that these components usually pass the SR when performed at the 24 month Frequency.~~ Therefore, the Frequency was concluded to be acceptable from a reliability standpoint. ~~OR~~ Or ~~The~~ the Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

The SR is modified by a Note. The reason for the Note is that performing the Surveillance would remove a required Class 1E GTG from service. This restriction from normally performing the Surveillance in MODE 1 or 2 is further amplified to allow the Surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with a failed Surveillance, a successful Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when the Surveillance is performed in MODE 1 or 2. Risk insights or deterministic methods may be used for this assessment. Credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.13

Regulatory Guide 1.9 (Ref. 3), requires demonstration that the Class 1E GTGs can start and run continuously at full load capability for an interval of not less than 24 hours, ≥ 2 hours of which is at a load equivalent to 110% of the continuous duty rating and the remainder of the time at a load equivalent to the continuous duty rating of the Class 1E GTG. The Class 1E GTG starts for this Surveillance can be performed either from standby or hot conditions. The provisions for prelubricating and warmup, discussed in SR 3.8.1.2, and for gradual loading, discussed in SR 3.8.1.3, are applicable to this SR.
The load band is provided to avoid routine overloading of the Class 1E GTG. Routine overloading may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain Class 1E GTG OPERABILITY.

SURVEILLANCE REQUIREMENTS (continued)

[The 24 month Frequency is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3), takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths. The reliability proved in Technical Report MUAP-07024 for Class 1E GTG is based on operating experience of non-nuclear gas turbine generator with reduced surveillance and its frequency from emergency generator of nuclear plant. The Class 1E GTG in US-APWR should be more reliable by performing the SRs. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint. ~~OR~~ Or ~~The~~ the Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

This Surveillance is modified by three Notes. Note 1 states that momentary transients due to changing bus loads do not invalidate this test. Similarly, momentary power factor transients above the power factor limit will not invalidate the test. The reason for Note 2 is that during operation with the reactor critical, performance of this Surveillance could cause perturbations to the electrical distribution systems that could challenge continued steady state operation and, as a result, unit safety systems. This restriction from normally performing the Surveillance in MODE 1 or 2 is further amplified to allow the Surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with a failed Surveillance, a successful Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when the Surveillance is performed in MODE 1 or 2. Risk insights or deterministic methods may be used for this assessment. Credit may be taken for unplanned events that satisfy this SR. Note 3 ensures that the Class 1E GTG is tested under load conditions that are as close to design basis conditions as possible. When synchronized with offsite power, testing should be performed at a power factor of ≤ 0.9. This power factor is representative of the actual inductive loading a Class 1E GTG would see under design basis accident conditions. Under certain conditions, however, Note 3 allows the Surveillance to be conducted as a power factor other than ≤ 0.9. These conditions occur when grid voltage is high, and the additional field excitation needed to get the power factor to ≤ 0.9 results in voltages on the emergency busses that are too high. Under these conditions, the power factor should be maintained as close as practicable to 0.9 while still maintaining acceptable voltage limits on the emergency busses. In other circumstances, the grid voltage may be

SURVEILLANCE REQUIREMENTS (continued)

such that the Class 1E GTG excitation levels needed to obtain a power factor of 0.9 may not cause unacceptable voltages on the emergency busses, but the excitation levels are in excess of those recommended for the Class 1E GTG. In such cases, the power factor shall be maintained close as practicable to 0.9 without exceeding the Class 1E GTG excitation limits.

SR 3.8.1.14

This Surveillance demonstrates that the Class 1E GTG can restart from a hot condition, such as subsequent to shutdown from normal Surveillances, and achieve the required voltage and frequency within 100 seconds. The 100 second time is derived from the requirements of the accident analysis to respond to a design basis large break LOCA.

[The 24 month Frequency of this SR is based on engineering judgment, taking into consideration the unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths. The reliability proved in Technical Report MUAP-07024 for Class 1E GTG is based on operating experience of non-nuclear gas turbine generator with reduced surveillance and its frequency from emergency generator of nuclear plant. The Class 1E GTG in US-APWR should be more reliable by performing the SRs. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint. The 24 month Frequency is also consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3). ~~OR~~ Or ~~The~~ the Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

This SR is modified by a Note. The Note ensures that the test is performed with the Class 1E GTG sufficiently hot. The load band is provided to avoid routine overloading of the Class 1E GTG. Routine overloads may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain Class 1E GTG OPERABILITY. The requirement that the Class 1E GTG has operated for at least 2 hours at full load conditions prior to performance of this Surveillance is based on manufacturer recommendations for achieving hot conditions. Momentary transients due to changing bus loads do not invalidate this test.

SR 3.8.1.15

As required by Regulatory Guide 1.9 (Ref. 3), this Surveillance ensures that the manual synchronization and automatic load transfer from the Class 1E GTG to the offsite source can be made and the Class 1E GTG can be returned to ready to load status when offsite power is restored. It also ensures that the autostart logic is reset to allow the Class 1E GTG to

SURVEILLANCE REQUIREMENTS (continued)

reload if a subsequent loss of offsite power occurs. The Class 1E GTG is considered to be in ready to load status when the Class 1E GTG is at rated speed and voltage, the output breaker is open and can receive an autoclose signal on bus undervoltage, and the load sequence timers are reset.

[The Frequency of 24 months is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3), and takes into consideration unit conditions required to perform the Surveillance. The reliability proved in Technical Report MUAP-07024 for Class 1E GTG is based on operating experience of non-nuclear gas turbine generator with reduced surveillance and its frequency from emergency generator of nuclear plant. The Class 1E GTG in US-APWR should be more reliable by performing the SRs. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint. ~~OR~~ Or ~~The~~ the Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

This SR is modified by a Note. The reason for the Note is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems. This restriction from normally performing the Surveillance in MODE 1 or 2 is further amplified to allow the Surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with a failed Surveillance, a successful Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when the Surveillance is performed in MODE 1 or 2. Risk insights or deterministic methods may be used for this assessment. Credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.16

Demonstration of the test mode override ensures that the Class 1E GTG availability under accident conditions will not be compromised as the result of testing and the Class 1E GTG will automatically reset to ready to load operation if an ECCS actuation signal is received during operation in the test mode. Ready to load operation is defined as the Class 1E GTG running at rated speed and voltage with the Class 1E GTG output breaker

SURVEILLANCE REQUIREMENTS (continued)

open. These provisions for automatic switchover are required by IEEE-308 (Ref. 11), paragraph 5.2.4.6(b).

The requirement to automatically energize the emergency loads with offsite power is essentially identical to that of SR 3.8.1.11. The intent in the requirement associated with SR 3.8.1.16.b is to show that the emergency loading was not affected by the Class 1E GTG operation in test mode. In lieu of actual demonstration of connection and loading of loads, testing that adequately shows the capability of the emergency loads to perform these functions is acceptable.

This testing may include any series of sequential, overlapping, or total steps so that the entire connection and loading sequence is verified.

[The 24 month Frequency is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3), takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths. The reliability proved in Technical Report MUAP-07024 for Class 1E GTG is based on operating experience of non-nuclear gas turbine generator with reduced surveillance and its frequency from emergency generator of nuclear plant. The Class 1E GTG in US-APWR should be more reliable by performing the SRs. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint. ~~OR~~ Or ~~The~~ the Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

This SR is modified by a Note. The reason for the Note is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems. This restriction from normally performing the Surveillance in MODE 1 or 2 is further amplified to allow portions of the Surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with a failed partial Surveillance, a successful partial Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the partial Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when portions of the Surveillance are performed in MODE 1 or 2. Risk insights or deterministic methods may be used for the assessment. Credit may be taken for unplanned events that satisfy this SR.

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.17

Under accident and loss of offsite power conditions loads are sequentially connected to the bus by the automatic load sequencer. The sequencing logic controls the permissive and starting signals to motor breakers to prevent overloading of the Class 1E GTGs due to high motor starting currents. The 10% load sequence time interval tolerance ensures that sufficient time exists for the Class 1E GTG to restore frequency and voltage prior to applying the next load and that safety analysis assumptions regarding ESF equipment time delays are not violated. Reference 2 provides a summary of the automatic loading of Class 1E 6.9kV buses.

[The Frequency of 24 months is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3), takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths. The reliability proved in Technical Report MUAP-07024 for Class 1E GTG is based on operating experience of non-nuclear gas turbine generator with reduced surveillance and its frequency from emergency generator of nuclear plant. The Class 1E GTG in US-APWR should be more reliable by performing the SRs. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint. ~~OR~~ Or ~~The~~ the Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

This SR is modified by a Note. The reason for the Note is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems. This restriction from normally performing the Surveillance in MODE 1 or 2 is further amplified to allow the Surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with a failed Surveillance, a successful Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when the Surveillance is performed in MODE 1 or 2. Risk insights or deterministic methods may be used for this assessment. Credit may be taken for unplanned events that satisfy this SR.

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.18

In the event of PA coincident with a loss of offsite power, the Class 1E GTGs are required to supply the necessary power to ESF systems so that the fuel, RCS, and containment design limits are not exceeded.

This Surveillance demonstrates the Class 1E GTG operation, as discussed in the Bases for SR 3.8.1.10, during a loss of offsite power actuation test signal in conjunction with an ESF actuation signal. In lieu of actual demonstration of connection and loading of loads, testing that adequately shows the capability of the Class 1E GTG system to perform these functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire connection and loading sequence is verified.

[The Frequency of 24 months takes into consideration unit conditions required to perform the Surveillance and is intended to be consistent with an expected fuel cycle length of 24 months. The reliability proved in Technical Report MUAP-07024 for Class 1E GTG is based on operating experience of non-nuclear gas turbine generator with reduced surveillance and its frequency from emergency generator of nuclear plant. The Class 1E GTG in US-APWR should be more reliable by performing the SRs. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint. ~~OR~~ Or ~~The~~ the Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

This SR is modified by a Note. The reason for the Note is that the performance of the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems. This restriction from normally performing the Surveillance in MODE 1 or 2 is further amplified to allow portions of the Surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with a failed partial Surveillance, a successful partial Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the partial Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when portions of the Surveillance are performed in MODE 1 or 2. Risk insights or deterministic methods may be used for the assessment. Credit may be taken for unplanned events that satisfy this SR.

ACTIONS (continued)

With both of the required offsite circuits inoperable, sufficient onsite ac sources are available to maintain the unit in a safe shutdown condition in the event of AOO or PA. In fact, a simultaneous loss of offsite ac sources, a LOCA, and a worst case single failure were postulated as a part of the design basis in the safety analysis. Thus, the 24 hour Completion Time provides a period of time to effect restoration of one of the offsite circuits commensurate with the importance of maintaining an ac electrical power system capable of meeting its design criteria.

According to Reference 6, with the available offsite ac sources, two less than required by the LCO, operation may continue for 24 hours. If two offsite sources are restored within 24 hours, unrestricted operation may continue. If only one offsite source is restored within 24 hours, power operation continues in accordance with Condition A. The Class 1E GTGs connect to Class 1E buses when other all ac power sources are unavailable, until one required offsite circuit is restored to OPERABLE status. COMPRETION TIME of subsequent CONDITION is limited by maximum COMPLETION TIME in accordance with administrative control.

[Required Action C.2 allows the option to apply the requirements of Specification 5.5.18 to determine a Risk Informed Completion Time (RICT). This Requied Action is not applicable in MODE 4.]

ACTIONS (continued)

With both of the required offsite circuits inoperable, sufficient onsite ac sources are available to maintain the unit in a safe shutdown condition in the event of AOO or PA. In fact, a simultaneous loss of offsite ac sources, a LOCA, and a worst case single failure were postulated as a part of the design basis in the safety analysis. Thus, the 24 hour Completion Time provides a period of time to effect restoration of one of the offsite circuits commensurate with the importance of maintaining an ac electrical power system capable of meeting its design criteria.

According to Reference 6, with the available offsite ac sources, two less than required by the LCO, operation may continue for 24 hours. If two offsite sources are restored within 24 hours, unrestricted operation may continue. If only one offsite source is restored within 24 hours, power operation continues in accordance with Condition A. The Class 1E GTGs connect to Class 1E buses when other all ac power sources are unavailable, until one required offsite circuit is restored to OPERABLE status. COMPRETION TIME of subsequent CONDITION is limited by maximum COMPLETION TIME in accordance with administrative control.

[Required Action C.2 allows the option to apply the requirements of Specification 5.5.18 to determine a Risk Informed Completion Time (RICT). This Requied Action is not applicable in MODE 4.]

B. One or more required Class 1E GTG inoperable.	B.1	Suspend CORE ALTERATIONS.	Immediately
	AND		
	B.2	Suspend movement of irradiated fuel assemblies.	Immediately
	AND		
	B.3	Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration.	Immediately
	AND		
	B.4	Initiate action to restore required Class 1E GTGs to OPERABLE status.	Immediately

BASES

APPLICABILITY

The dc electrical power sources are required to be OPERABLE in MODES 1, 2, 3, and 4 to ensure safe unit operation and to ensure that:

a. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of AOOs or abnormal transients and

b. Adequate core cooling is provided, and containment integrity and other vital functions are maintained in the event of PA.

The dc electrical power requirements for MODES 5 and 6 are addressed in the Bases for LCO 3.8.5, "DC Sources - Shutdown."

ACTIONS

A.1, A.2, [and A.3]

Condition A represents two trains with battery chargers inoperable (e.g., the voltage limit of SR 3.8.4.1 is not maintained). The ACTIONS provide a tiered response that focuses on returning the battery to the fully charged state and restoring a fully qualified charger to OPERABLE status in a reasonable time period. Required Action A.1 requires that the battery terminal voltage be restored to greater than or equal to the minimum established float voltage within 2 hours. This time provides for returning the inoperable charger to OPERABLE status or providing an alternate means of restoring battery terminal voltage to greater than or equal to the minimum established float voltage. Restoring the battery terminal voltage to greater than or equal to the minimum established float voltage provides good assurance that, within 24 hours, the battery will be restored to its fully charged condition (Required Action A.2) from any discharge that might have occurred due to the charger inoperability. The minimum established float voltage will be selected from manufacturer's recommendation float voltage range and controlled by administrative control.

A discharged battery having terminal voltage of at least the minimum established float voltage indicates that the battery is on the exponential charging current portion (the second part) of its recharge cycle. The time to return a battery to its fully charged state under this condition is simply a function of the amount of the previous discharge and the recharge characteristic of the battery. Thus there is good assurance of fully recharging the battery within 24 hours, avoiding a premature shutdown with its own attendant risk.

If established battery terminal float voltage cannot be restored to greater than or equal to the minimum established float voltage within 2 hours, and the charger is not operating in the current-limiting mode, a faulty charger is indicated. A faulty charger that is incapable of maintaining established battery terminal float voltage does not provide assurance that it can revert to and operate properly in the current limit mode that is necessary during

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.4.1

Verifying battery terminal voltage while on float charge helps to ensure the effectiveness of the battery chargers, which support the ability of the batteries to perform their intended function. Float charge is the condition in which the charger is supplying the continuous charge required to overcome the internal losses of a battery and maintain the battery in a fully charged state while supplying the continuous steady state loads of the associated dc subsystem. On float charge, battery cells will receive adequate current to optimally charge the battery. The voltage requirements are based on the nominal design voltage of the battery and are consistent with the minimum float voltage established by the battery manufacturer (2.17 Vpc or 130.2 V at the battery terminals). This voltage is controlled by administrative control. This voltage maintains the battery plates in a condition that supports maintaining the grid life (expected to be approximately 20 years). [The 7 day Frequency is consistent with manufacturer recommendations and IEEE-450 (Ref. 8). ~~OR~~ Or ~~The~~ the Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

SR 3.8.4.2

This SR verifies the design capacity of the battery chargers. According to Regulatory Guide 1.32 (Ref. 9), the battery charger supply is recommended to be based on the largest combined demands of the various steady state loads and the charging capacity to restore the battery from the design minimum charge state to the fully charged state, irrespective of the status of the unit during these demand occurrences. The minimum required amperes and duration ensure that these requirements can be satisfied.

This SR provides two options. One option requires that each battery charger be capable of supplying 800 amps at the minimum established float voltage for 8 hours. The ampere requirements are based on the output rating of the chargers. The voltage requirements are based on the charger voltage level after a response to a loss of ac power. The time period is sufficient for the charger temperature to have stabilized and to have been maintained for at least 2 hours.

The other option requires that each battery charger be capable of recharging the battery after a service test coincident with supplying the largest coincident demands of the various continuous steady state loads (irrespective of the status of the plant during which these demands occur). This level of loading may not normally be available following the battery service test and will need to be supplemented with additional

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One ~~or more~~ required dc electrical power distribution subsystems inoperable.	C.1 Restore required dc electrical power distribution subsystem(s) to OPERABLE status.	2 hours
D. Required Action and associated Completion Time not met.	D.1 Be in MODE 3. AND D.2 Be in MODE 5.	6 hours 36 hours
E. Two or more required electrical power distribution subsystems inoperable that result in a loss of safety function.	E.1 Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.9.1	Verify correct breaker alignments and voltage to required ac, dc, and ac vital bus electrical power distribution subsystems.	[7 days OR In accordance with the Surveillance Frequency Control Program]

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.6.4

This Surveillance verifies that the pilot cell temperature is greater than or equal to the minimum established design limit (i.e., 40°F). Pilot cell electrolyte temperature is maintained above this temperature to assure the battery can provide the required current and voltage to meet the design requirements. Temperatures lower than assumed in battery sizing calculations act to inhibit or reduce battery capacity. [The Frequency is consistent with IEEE-450 (Ref. 1). ~~OR~~ Or ~~The~~ the Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.] The minimum established design limits are determined based on manufacturer's recommendation and controlled by administrative control.

SR 3.8.6.6

A battery performance discharge test is a test of constant current capacity of a battery, normally done in the as found condition, after having been in service, to detect any change in the capacity determined by the acceptance test. The test is intended to determine overall battery degradation due to age and usage.

Either the battery performance discharge test or the modified performance discharge test is acceptable for satisfying SR 3.8.6.6; however, only the modified performance discharge test may be used to satisfy the battery service test requirements of SR 3.8.4.3.

A modified discharge test is a test of the battery capacity and its ability to provide a high rate, short duration load (usually the highest rate of the duty cycle). This will often confirm the battery's ability to meet the critical period of the load duty cycle, in addition to determining its percentage of rated capacity. Initial conditions for the modified performance discharge test should be identical to those specified for a service test.

It may consist of just two rates; for instance the one minute rate for the battery or the largest current load of the duty cycle, followed by the test rate employed for the performance test, both of which envelope the duty cycle of the service test. Since the ampere-hours removed by a one minute discharge represents a very small portion of the battery capacity, the test rate can be changed to that for the performance test without compromising the results of the performance discharge test. The battery terminal voltage for the modified performance discharge test must remain above the minimum battery terminal voltage specified in the battery service test for the duration of time equal to that of the service test.

BASES

SURVEILLANCE REQUIREMENTS (continued)

The acceptance criteria for this Surveillance are consistent with IEEE-450 (Ref. 1) and IEEE-485 (Ref. 5). These references recommend that the battery be replaced if its capacity is below 80% of the manufacturer's rating. A capacity of 80% shows that the battery rate of deterioration is increasing, even if there is ample capacity to meet the load requirements. Furthermore, the battery is sized to meet the assumed duty cycle loads when the battery design capacity reaches this 80% limit. Manufacturer's rating of the battery capacity for an acceptance criterion is determined based on manufacturer's recommendation and controlled by administrative control.

[The Surveillance Frequency for this test is normally 60 months. ~~OR~~ Or ~~The~~ the Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.] If the battery shows degradation, or if the battery has reached 85% of its expected life and capacity is < 100% of the manufacturer's rating, the Surveillance Frequency is reduced to [12 months. ~~OR~~ Or in accordance with the Surveillance Frequency Control Program.] However, if the battery shows no degradation but has reached 85% of its expected life, the Surveillance Frequency is [only] reduced [to 24 months ~~OR~~ or in accordance with the Surveillance Frequency Control Program.] for batteries that retain capacity ≥ 100% of the manufacturer's ratings. Degradation is indicated, according to IEEE-450 (Ref. 1), when the battery capacity drops by more than 10% relative to its capacity on the previous performance test or when it is ≥ 10% below the manufacturer's rating. These Frequencies are consistent with the recommendations in IEEE-450 (Ref. 1). Battery expected life for setting the performance FREQUENCY is determined based on manufacturer's recommendation and controlled by administrative control.

This SR is modified by a Note. The reason for the Note is that performing the Surveillance would perturb the electrical distribution system and challenge safety systems. This restriction from normally performing the Surveillance in MODE 1 or 2 is further amplified to allow portions of the Surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with a failed partial Surveillance, a successful partial Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the partial Surveillance; as well as the operator procedures available to cope with these outcomes.

BASES

SURVEILLANCE REQUIREMENTS (continued)

This SR is modified by a Note that states the float current requirement is not required to be met when battery terminal voltage is less than the minimum established float voltage of SR 3.8.4.1. When this float voltage is not maintained the Required Actions of LCO 3.8.4 ACTIONS A are being taken, which provide the necessary and appropriate verifications of the battery condition. Furthermore, the float current limit of [5] amps is established based on the nominal float voltage value and is not directly applicable when this voltage is not maintained.

SR 3.8.6.2 and SR 3.8.6.5

Optimal long term battery performance is obtained by maintaining a float voltage greater than or equal to the minimum established design limits provided by the battery manufacturer, which corresponds to ~~130.5~~135 V at the battery terminals, or 2.25 Vpc. This provides adequate over-potential, which limits the formation of lead sulfate and self discharge, which could eventually render the battery inoperable. Float voltages in this range or less, but greater than 2.07 Vpc, are addressed in Specification 5.5.17. SRs 3.8.6.2 and 3.8.6.5 require verification that the cell float voltages are equal to or greater than the short term absolute minimum voltage of 2.07 V. [The Frequency for cell voltage verification every 31 days for pilot cell and 92 days for each connected cell is consistent with IEEE-450 (Ref. 1). OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

SR 3.8.6.3

The limit specified for electrolyte level ensures that the plates suffer no physical damage and maintains adequate electron transfer capability. [The Frequency of 31 days is consistent with IEEE-450 (Ref. 1). OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.] The minimum established design limits are determined based on manufacturer's recommendation and controlled by administrative control.

BASES

ACTIONS (continued)

Since Required Action B.1 only specifies "perform," a failure of SR 3.8.4.1 acceptance criteria does not result in the Required Action not met. However, if SR 3.8.4.1 is failed, the appropriate Condition(s), depending on the cause of the failure, is entered.

C.1, C.2, and C.3

With one battery in one train with one or more cells electrolyte level above the top of the plates, but below the minimum established design limits, the battery still retains sufficient capacity to perform the intended function. Therefore, the affected battery is not required to be considered inoperable solely as a result of electrolyte level not met. Within 31 days the minimum established design limits for electrolyte level must be re-established. The minimum established design limits are determined based on manufacturer's recommendation and controlled by administrative control.

With electrolyte level below the top of the plates there is a potential for dryout and plate degradation. Required Actions C.1 and C.2 address this potential (as well as provisions in Specification 5.5.17, Battery Monitoring and Maintenance Program). They are modified by a Note that indicates they are only applicable if electrolyte level is below the top of the plates. Within 8 hours level is required to be restored to above the top of the plates. The Required Action C.2 requirement to verify that there is no leakage by visual inspection and the Specification 5.5.17.b item to initiate action to equalize and test in accordance with manufacturer's recommendation are taken from Annex D of IEEE-450. They are performed following the restoration of the electrolyte level to above the top of the plates. Based on the results of the manufacturer's recommended testing the battery may have to be declared inoperable and the affected cells replaced.

D.1

With one or more batteries in one train with pilot cell temperature less than the minimum established design limits, 12 hours is allowed to restore the temperature to within limits. A low electrolyte temperature limits the current and power available. Since the battery is sized with margin, while battery capacity is degraded, sufficient capacity exists to perform the intended function and the affected battery is not required to be considered inoperable solely as a result of the pilot cell temperature not met. The minimum established design limits are determined based on manufacturer's recommendation and controlled by administrative control.

BASES

ACTIONS (continued)

E.1

With one or more batteries in redundant trains with battery parameters not within limits there is not sufficient assurance that battery capacity has not been affected to the degree that the batteries can still perform their required function, given that redundant batteries are involved. With redundant batteries involved this potential could result in a total loss of function on multiple systems that rely upon the batteries. The longer Completion Times specified for battery parameters on non-redundant batteries not within limits are therefore not appropriate, and the parameters must be restored to within limits on at least one train within 2 hours. The battery parameters limits are determined based on manufacturer's recommendation and controlled by administrative control.

F.1

With one or more batteries with any battery parameter outside the allowances of the Required Actions for Condition A, B, C, D, or E, sufficient capacity to supply the maximum expected load requirement is not assured and the corresponding battery must be declared inoperable. Additionally, discovering one or more batteries in one train with one or more battery cells float voltage less than 2.07 V and float current greater than [5] amps indicates that the battery capacity may not be sufficient to perform the intended functions. The battery must therefore be declared inoperable immediately.

SURVEILLANCE REQUIREMENTS

SR 3.8.6.1

Verifying battery float current while on float charge is used to determine the state of charge of the battery. Float charge is the condition in which the charger is supplying the continuous charge required to overcome the internal losses of a battery and maintain the battery in a charged state. The float current requirements are based on the float current indicative of a charged battery. Use of float current to determine the state of charge of the battery is consistent with IEEE-450 (Ref. 1). [The 7 day Frequency is consistent with IEEE-450 (Ref. 1). OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

BASES

SURVEILLANCE REQUIREMENTS (continued)

This SR is modified by a Note that states the float current requirement is not required to be met when battery terminal voltage is less than the minimum established float voltage of SR 3.8.4.1. When this float voltage is not maintained the Required Actions of LCO 3.8.4 ACTIONS A are being taken, which provide the necessary and appropriate verifications of the battery condition. Furthermore, the float current limit of [5] amps is established based on the nominal float voltage value and is not directly applicable when this voltage is not maintained.

SR 3.8.6.2 and SR 3.8.6.5

Optimal long term battery performance is obtained by maintaining a float voltage greater than or equal to the minimum established design limits provided by the battery manufacturer, which corresponds to ~~130.5~~135 V at the battery terminals, or 2.25 Vpc. This provides adequate over-potential, which limits the formation of lead sulfate and self discharge, which could eventually render the battery inoperable. Float voltages in this range or less, but greater than 2.07 Vpc, are addressed in Specification 5.5.17. SRs 3.8.6.2 and 3.8.6.5 require verification that the cell float voltages are equal to or greater than the short term absolute minimum voltage of 2.07 V. [The Frequency for cell voltage verification every 31 days for pilot cell and 92 days for each connected cell is consistent with IEEE-450 (Ref. 1). OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

SR 3.8.6.3

The limit specified for electrolyte level ensures that the plates suffer no physical damage and maintains adequate electron transfer capability. [The Frequency of 31 days is consistent with IEEE-450 (Ref. 1). OR The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.] The minimum established design limits are determined based on manufacturer's recommendation and controlled by administrative control.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.6.4

This Surveillance verifies that the pilot cell temperature is greater than or equal to the minimum established design limit (i.e., 40°F). Pilot cell electrolyte temperature is maintained above this temperature to assure the battery can provide the required current and voltage to meet the design requirements. Temperatures lower than assumed in battery sizing calculations act to inhibit or reduce battery capacity. [The Frequency is consistent with IEEE-450 (Ref. 1). ~~OR~~ Or ~~The~~ the Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.] The minimum established design limits are determined based on manufacturer's recommendation and controlled by administrative control.

SR 3.8.6.6

A battery performance discharge test is a test of constant current capacity of a battery, normally done in the as found condition, after having been in service, to detect any change in the capacity determined by the acceptance test. The test is intended to determine overall battery degradation due to age and usage. This test is implemented in accordance with IEEE-450 (Ref. 1)

Either the battery performance discharge test or the modified performance discharge test is acceptable for satisfying SR 3.8.6.6; however, only the modified performance discharge test may be used to satisfy the battery service test requirements of SR 3.8.4.3.

A modified discharge test is a test of the battery capacity and its ability to provide a high rate, short duration load (usually the highest rate of the duty cycle). This will often confirm the battery's ability to meet the critical period of the load duty cycle, in addition to determining its percentage of rated capacity. Initial conditions for the modified performance discharge test should be identical to those specified for a service test.

It may consist of just two rates; for instance the one minute rate for the battery or the largest current load of the duty cycle, followed by the test rate employed for the performance test, both of which envelope the duty cycle of the service test. Since the ampere-hours removed by a one minute discharge represents a very small portion of the battery capacity, the test rate can be changed to that for the performance test without compromising the results of the performance discharge test. The battery terminal voltage for the modified performance discharge test must remain above the minimum battery terminal voltage specified in the battery service test for the duration of time equal to that of the service test.

BASES

ACTIONS (continued)

A.1

In this Condition, the 7 day fuel oil supply for a Class 1E GTG is not available. However, the Condition is restricted to fuel oil level reductions that maintain at least a 6 day supply. These circumstances may be caused by events, such as full load operation required after an inadvertent start while at minimum required level, or feed and bleed operations, which may be necessitated by increasing particulate levels or any number of other oil quality degradations. This restriction allows sufficient time for obtaining the requisite replacement volume and performing the analyses required prior to addition of fuel oil to the tank. A period of 48 hours is considered sufficient to complete restoration of the required level prior to declaring the Class 1E GTG inoperable. This period is acceptable based on the remaining capacity (> 6 days), the fact that procedures will be initiated to obtain replenishment, and the low probability of an event during this brief period. Fuel oil storage tank inventory is controlled to restore following any operation of a gas turbine, including maintenance and testing runs by administrative control.

B.1

With lube oil inventory < 81 gallons, sufficient lubricating oil to support 7 days of continuous Class 1E GTG operation at full load conditions may not be available. However, the Condition is restricted to lube oil volume reductions that maintain at least a 6 day supply. This restriction allows sufficient time to obtain the requisite replacement volume. A period of 48 hours is considered sufficient to complete restoration of the required volume prior to declaring the Class 1E GTG inoperable. This period is acceptable based on the remaining capacity (> 6 days), the low rate of usage, the fact that procedures will be initiated to obtain replenishment, and the low probability of an event during this brief period.

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. One or more Class 1E GTGs with starting air receiver pressure < ~~270~~398 psig and ≥ ~~185~~ 228 psig.	E.1 Restore starting air receiver pressure to ≥ 270 psig.	48 hours
F. Required Action and associated Completion Time not met. OR One or more Class 1E GTGs with gas turbine fuel oil, lube oil, or starting air subsystem not within limits for reasons other than Condition A, B, C, D, or E.	F.1 Declare associated Class 1E GTG inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.3.1	Verify each fuel oil storage tank contains ≥ 91,000 gallons of fuel.	[31 days OR In accordance with the Surveillance Frequency Control Program]

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.3.2	Verify lubricating oil inventory is ≥ 81 gallons.	[31 days OR In accordance with the Surveillance Frequency Control Program]
SR 3.8.3.3	Verify fuel oil properties of new and stored fuel oil are tested in accordance with, and maintained within the limits of, the GTG Fuel Oil Testing Program.	In accordance with the GTG Fuel Oil Testing Program
SR 3.8.3.4	Verify each Class 1E GT/G air start receiver pressure is ≥ ~~270~~ 398 psig.	[31 days OR In accordance with the Surveillance Frequency Control Program]
SR 3.8.3.5	Check for and remove accumulated water from each fuel oil storage tank.	[31 days OR In accordance with the Surveillance Frequency Control Program]

BASES

ACTIONS (continued)

C.1

This Condition is entered as a result of a failure to meet the acceptance criterion of SR 3.8.3.5. Normally, trending of particulate levels allows sufficient time to correct high particulate levels prior to reaching the limit of acceptability. Poor sample procedures (bottom sampling), contaminated sampling equipment, and errors in laboratory analysis can produce failures that do not follow a trend. Since the presence of particulates does not mean failure of the fuel oil to burn properly in the gas turbine engine, and particulate concentration is unlikely to change significantly between Surveillance Frequency intervals, and proper engine performance has been recently demonstrated (within 31 days), it is prudent to allow a brief period prior to declaring the associated Class 1E GTG inoperable. The 7 day Completion Time allows for further evaluation, resampling and re-analysis of the Class 1E GTG fuel oil.

D.1

With the new fuel oil properties defined in the Bases for SR 3.8.3.4 not within the required limits, a period of 30 days is allowed for restoring the stored fuel oil properties. This period provides sufficient time to test the stored fuel oil to determine that the new fuel oil, when mixed with previously stored fuel oil, remains acceptable, or to restore the stored fuel oil properties. This restoration may involve feed and bleed procedures, filtering, or combinations of these procedures. Even if a Class 1E GTG start and load was required during this time interval and the fuel oil properties were outside limits, there is a high likelihood that the Class 1E GTG would still be capable of performing its intended function.

E.1

With starting air receiver pressure < ~~270~~ 398 psig, sufficient capacity for three successive Class 1E GTG start attempts does not exist. However, as long as the receiver pressure is > ~~185~~ 228 psig, there is adequate capacity for at least one start attempt, and the Class 1E GTG can be considered OPERABLE while the air receiver pressure is restored to the required limit. A period of 48 hours is considered sufficient to complete restoration to the required pressure prior to declaring the Class 1E GTG inoperable. This period is acceptable based on the remaining air start capacity, the fact that most Class 1E GTG starts are accomplished on the first attempt, and the low probability of an event during this brief period.

Table 9.5.6-1 Starting System Component Data

Compressors	
Quantity (per GT)	6
Type	Reciprocating, air cooled
Capacity	776.9 cu-ft/hr
Discharge pressure (normal)	426.4 psiapsig
Pressure in receiver after 3 starts	~~188~~170.6 psiapsig
Air Compressor on/off	On: ~~384.~~4398.2 psiapsig; Off: 435.1 psiapsig
Air Compressor Low Alarm	On: ~~311.~~8378.3 psiapsig; Off: ~~362.~~6398.2 psiapsig
Air temperature leaving cooler °F	120-135
Number of stages/cylinders	2/3 (2 low pressure, 1 high pressure)
Revolutions per minute	790
Regulation	Dual control
Design code	Manufacturer's standard
Driver	
Type	Electric motor (totally enclosed, fan cooled)
Horsepower	7.5
Revolutions per minute	1200
Power supply	460-V, 60-Hz, 3-phase
Seismic Category	II
Air receivers	
Quantity (per GTG)	2
Type	Vertical, cylindrical
Capacity (ft^3)	~~318~~353 cu-ft
Design pressure/temperature (psig/°F)	440/150
Operating pressure/temperature (psig/°F)	410/120
Material	Carbon steel SA 516-70
Code	ASME Section III, Class 3
Seismic Category	I
Air Start Necessary Air Vol/one start	120 Nm^3
Lower limit pressure at inlet	142 psig
Numbers of starts/GTG	3
Piping, fittings, and valves (safety-related)	
Material	Carbon steel and stainless steel
Design code	ASME Section III, Class 3
Seismic Category	I
Piping, fittings, and valves (non safety related)	
Material	Carbon steel and stainless steel
Design code	Manufacturer's standard or ANSI B31.1

BASES

ACTIONS (continued)

For this reason a Note has been included in Condition A requiring the entry into the Conditions and Required Actions of LCO 3.8.9, "Distribution Systems - Operating." This ensures that the vital bus is re-energized within 2 hours.

Required Action A.1 allows 24 hours to fix the inoperable inverter and return it to service. [Required Action A.2 allows the option to apply the requirements of Specification 5.5.18 to determine a Risk Informed Completion Time (RICT). This Requied Action is not applicable in MODE 4.] The 24 hour limit is based upon engineering judgment, taking into consideration the time required to repair an inverter and the additional risk to which the unit is exposed because of the inverter inoperability. This has to be balanced against the risk of an immediate shutdown, along with the potential challenges to safety systems such a shutdown might entail. When the ac vital bus is powered from its transformer, it is relying upon interruptible ac electrical power sources (offsite and onsite). The uninterruptible inverter source to the ac vital buses is the preferred source for powering instrumentation trip setpoint devices.

B.1 and B.2

If the inoperable devices or components cannot be restored to OPERABLE status within the required Completion Time, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.8.7.1

This Surveillance verifies that the inverters are functioning properly with all required circuit breakers closed and ac vital buses energized from the inverter. The verification of proper voltage and frequency output ensures that the required power is readily available for the instrumentation of the RPS and ESFAS connected to the ac vital buses. The proper voltage and frequency of inverter and breaker alignment are controlled by administrative control. [The 7 day Frequency takes into account the redundant capability of the inverters and other indications available in the control room that alert the operator to inverter malfunctions. ~~OR~~ Or ~~The~~ the Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

BASES

ACTIONS (continued)

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required inverters should be completed as quickly as possible in order to minimize the time the unit safety systems may be without power or powered from a transformer.

SURVEILLANCE REQUIREMENTS

SR 3.8.8.1

This Surveillance verifies that the inverters are functioning properly with all required circuit breakers closed and ac vital buses energized from the inverter. The verification of proper voltage and frequency output ensures that the required power is readily available for the instrumentation connected to the ac vital buses. The proper voltage and frequency of inverter and breaker alignment are controlled by administrative control. [The 7 day Frequency takes into account the redundant capability of the inverters and other indications available in the control room that alert the operator to inverter malfunctions. ~~OR~~ Or ~~The~~ the Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.]

REFERENCES

1. Chapter 6.
2. Chapter 15.

3.8 ELECTRICAL POWER SYSTEMS

3.8.7 Inverters - Operating

LCO 3.8.7 Inverters in three trains shall be OPERABLE.

----------NOTE----------
One inverter may be disconnected from its associated dc bus for ≤ 24 hours to perform an equalizing charge on its associated battery, provided:

a. The associated ac vital bus is energized from its Class 1E transformer, and

b. All other ac vital buses are energized from their associated OPERABLE inverters.

Train A and B or Train C and D ac vital buses shall not be supplied from Class 1E transformer concurrently.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required inverter inoperable.	A.1 ----------NOTE---------- Enter applicable Conditions and Required Actions of LCO 3.8.9, "Distribution Systems - Operating" with any ac vital bus de-energized. ---------- Restore inverter to OPERABLE status.	24 hours
	[OR	
	A.2 ----------NOTE---------- This Required Action is not applicable in MODE 4. ---------- Apply the requirements of Specification 5.5.18	24 hours]

BASES

LCO (continued)

Maintaining these portions of the distribution system energized ensures the availability of sufficient power to operate the unit in a safe manner to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents). The necessary portions in each mode are controlled by administrative control.

APPLICABILITY

The ac and dc electrical power distribution subsystems required to be OPERABLE in MODES 5 and 6, and during movement of irradiated fuel assemblies, provide assurance that:

a. Systems to provide adequate coolant inventory makeup are available for the irradiated fuel in the core,

b. Systems needed to mitigate a fuel handling accident are available,

c. Systems necessary to mitigate the effects of events that can lead to core damage during shutdown are available, and

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition and refueling condition.

The ac, dc, and ac vital bus electrical power distribution subsystems requirements for MODES 1, 2, 3, and 4 are covered in LCO 3.8.9, "Distribution Systems - Operating."

ACTIONS

LCO 3.0.3 is not applicable while in MODE 5 or 6. However, since irradiated fuel assembly movement can occur in MODE 1, 2, 3, or 4, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 5 or 6, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, 3, or 4, the fuel movement is independent of reactor operations. Entering LCO 3.0.3, while in MODE 1, 2, 3, or 4 would require the unit to be shutdown unnecessarily.