

Baca, Bernadette

From: Jayroe, Peter
Sent: Tuesday, April 19, 2011 1:31 PM
To: Baca, Bernadette
Subject: 2011-157

From: Reynoso, John
Sent: Tuesday, February 22, 2011 3:58 PM
To: Jayroe, Peter
Subject: White paper on Licensee position Inverter Issue



Document (6).pdf

D/A

Problem Statement:

The Bases to Technical Specification (TS) 3.8.8 state that at least two inverters are required to be OPERABLE for the Limiting Condition for Operation (LCO) to be met. Can fuel movement and/or Core Alterations be performed with less than 2 inverters OPERABLE?

Licensing Opinion:

Yes, provided that none of the inoperable inverters are supporting required features, that the LCO is declared not met, and that Required Action A.1 is taken for the inoperable required inverter.

Relevant TSs and Bases

LCO 3.8.8

SONGS Units 2 and 3 LCO 3.8.8, "Inverters - Shutdown," states that "Required Inverters shall be OPERABLE to support the onsite Class 1E AC vital bus electrical power distribution subsystems required by LCO 3.8.10, "Distribution Systems - Shutdown."

LCO 3.8.8 is applicable during Modes 5 and 6, and during movement of irradiated fuel assemblies.

The LCO Bases for LCO 3.8.8 state in part, "OPERABILITY of at least two of the four inverters and the associated vital buses is required."

The Background Section of the Bases for LCO 3.8.8 state, in part, that, "The DC to AC inverters are designed to provide the required capacity, capability, redundancy, and reliability to ensure the availability of necessary power to the Reactor Protective System and Engineered Safety Features Actuation System instrumentation and controls so that the fuel, Reactor Coolant System, and containment design limits are not exceeded."

The Standard Technical Specification (STS) LCO 3.8.8 is similar to SONGS LCO 3.8.8. The STS LCO 3.8.8 LCO Bases are different than SONGS Bases. Instead of the statement described above, the STS Bases state, "Operability of the Inverter[s] requires that the vital bus be powered by the inverter."

SONGS LCO 3.8.8 Condition A Required Actions are as follows:

With one or more required inverters inoperable:

Action #	Required Action	Completion Time
A.1 OR	Declare affected required feature[s] inoperable.	Immediately
A.2.1 AND	Suspend CORE ALTERATIONS	Immediately
A.2.2 AND	Suspend movement of irradiated fuel assemblies	Immediately
A.2.3 AND	Suspend operations involving positive reactivity additions that result in loss of required SDM or boron concentration.	Immediately
A.2.4	Initiate action to restore required inverters to OPERABLE status.	Immediately

Analysis:

Inverter Function

As described in the Bases to LCO 3.8.8, the inverters function to provide an uninterrupted power source to the Reactor Protective System (RPS) and Engineered Safety Features Actuation System (ESFAS) instrumentation and controls. Each inverter is associated with an instrumentation channel A, B, C, or D. The four channels are split into two trains, with the A and C channels associated with the A train, and the B and D channels associated with the B train.

In MODES 1 through 4, RPS and ESFAS requirements for 4 OPERABLE channels results in the need for 4 OPERABLE inverters, as described in LCO 3.8.7. In lower MODES, the need for OPERABILITY of the components supported by the inverters is variable, based on the plant configuration. For example, in MODE 5, which is within the Applicability of LCO 3.8.8, four channels of Reactor Protection Instrumentation may required by LCO 3.3.2, "RPS Instrumentation - Shutdown." At other times, only one instrumentation channel may be required for the relevant protective functions (e.g., one channel of Control Room Isolation Signal as required by LCO 3.3.9).

LCO 3.8.8 reflects the variability in the number of required inverters based on plant configuration in both the SONGS TSs and the Standard TSs. The Standard TS Bases also reflect the variability in the number of required inverters. SONGS LCO 3.8.8 Bases, however, also include a minimum requirement of at least two OPERABLE inverters. This requirement is more restrictive than the text of the LCO (Inverters shall be OPERABLE to support the required vital bus electrical power distribution systems). The Bases are intended to provide additional clarification of the Technical Specifications, not

provide additional requirements. As currently written, however, the LCO 3.8.8 Bases require that if there are less than 2 OPERABLE inverters while the unit is within the applicability, the LCO is not met and the Conditions and Actions must be entered.

The Required Actions provide 2 alternate paths. The first path (A.1) is to declare the affected required features inoperable. That is, if inverter Y001 is a required inverter and it becomes inoperable, associated vital bus Y01 and its supported equipment must be declared inoperable.

The second path (A.2) is to suspend fuel movement, CORE ALTERATIONS, and positive additions to Spent Fuel Pool reactivity, and to restore the inoperable required inverter.

If the plant were to be in a configuration in which 2 inverters were OPERABLE (satisfying the LCO Bases requirement) but only one inverter had supported features that are required to be OPERABLE, loss of the other inverter would result in failure to meet the LCO. Because the second inverter had no required supported features, however, Required Action A.1 (declare affected required features inoperable) would have no impact on the plant, there would be no additional actions necessary, and fuel movement could continue.

For example, assume the A channel inverter Y001 is supporting the A channel of instrumentation, and the C channel inverter Y003 is not supporting any required features but is OPERABLE to meet the LCO 3.8.8 requirement of two OPERABLE inverters. If Y003 were to become inoperable, associated Vital Bus Y03 would have to be declared inoperable to meet Required Action A.1, but because Y03 is not supporting loads that are required to be OPERABLE, there is no further impact to the plant.

Therefore, for the limited case where only one inverter has required supported features, fuel movement can continue with less than 2 OPERABLE inverters provided that LCO 3.8.8 is declared not met, and Required Action A.1 is taken.