Stephen Monarque

From: Stephen Monarque
Sent: Monday, May 05, 2008 5:08 PM
To: Algama Don (Mitsubishi_Nuclear_Energy_Systems.Inc. (MNES) Nuclear_Services) DCD Licensing Engineer; Don Woodlan; masanori_onozuka@mnes-us.com
Subject: RAI on USAPWR Gas Turbine Generators

RAI-08.03.01-001 In the SRP Section 9.5.6, "Emergency Diesel Engine Starting system," the starting air requirements are: As a minimum, the air starting system should be capable of cranking a cold diesel engine five times without recharging the receiver(s). The air starting system capacity should be determined as follows: (i) each cranking cycle duration should be approximately three seconds, (ii) consist of two to three engine revolutions, or (iii) air start requirements per engine start provided by the engine manufacturer, whichever air start requirement is larger. Since the GTGs are being proposed as class 1E power sources instead of diesel engines, they need to meet the same requirements. The applicant is requested to discuss the safety significance and provide bases why the 3 Air-start attempts are adequate for the GTG compared to 5 Air-starts required for the emergency diesel generators per SRP Section 9.5.6.

RAI-08.03.01-002 The reliability analysis data provided in Section 7.0 of the "Qualification and test Plan of Class 1E Gas Turbine Generator System," comprises of 375 generator package units. The 375 generator package units consist of varying sizes with single and double gas turbines. The class 1E gas turbine generators (GTG) that are being proposed for the nuclear unit have dual turbines and are rated at 4500 kW. Therefore, the reliability data provided in Section 7.0 of the Technical Report on GTG may not be directly applicable to the class 1E GTGs. The applicant is requested to provide a detailed breakdown comparison of the 375 GTG units with regard to size (kW), starting method (air vs battery), components including number of turbines per generator and reliability data for each type and discuss how this data is applicable to the proposed class 1E GTGs. The applicant is requested to furnish run reliability data of GTGs that are similar to the GTGs proposed as class 1E power sources.

RAI-08.03.01-003 In Section 7.0 of the Qualification and test Plan of Class 1E Gas Turbine Generator System the stated reliability of the GTG is 99.9% based on the accumulative start data of the 375 units. As stated in the report, there were 7394 starts for the 375 units, or 19.7 starts per unit. For reliability calculations of individual units this is a very small number of starts. Based on the two failures cited in the report and assuming that these failures were on different GTGs, the reliability for these two GTG units would be 95% and not 99.9% as indicated in the report. The applicant is requested to discuss how the reliability data given in Section 7 of the report complies with the requirements of the IEEE-387 of 100 starts with no failures.

RAI-08.03.01-004 The applicant for USPWR has chosen to use IEEE-387 and NRC RG 1.9, documents that were written for qualifying emergency diesel generators (EDGs), since there are no industry standards or NRC guides for qualifying gas turbine generators as onsite Class 1E power sources. The current version of IEEE-387 calls for 100 starts with no failures for qualification of onsite class 1E diesel generators. However it should be understood that the earlier versions of IEEE 387 and NRC regulatory guides for qualifying EDGs as class 1E power sources used 300 starts with 3 failures. The majority of current fleet of US nuclear power plants used this criterion for qualifying EDGs. It was deemed prudent to relax the criterion of 300 starts to 100 starts because manufacturers of EDGs and the nuclear users of EDGs had gained considerable experience in the manufacturer, application and testing of the EDGs as applied Class 1E power sources in nuclear power plants. As a comparison, there is no such experience base of GTG applications in nuclear power plants. The proposed GTG application as class 1E power sources for the USAPWR is first of a kind application in the world. The applicant is requested to justify and provide a basis why the qualification tests for the GTG should be less than 300 tests that were originally required for EDG qualification.

RAI-08.03.01-005 The manufacturer published information on the allowable ambient temperature range for the GTG from 41 degrees F to 104 degrees F. The NEMA standard MG-1 "Motors and Generators" specifies the maximum ambient temperature of 40 degrees C (104F) without specifying the minimum temperature. The applicant is requested to discuss the significance of the lower range temperature on the performance of the GTG. Also, the applicant should discuss the derating factors associated with the GTG for locations where the ambient temperature may exceed the 104 degrees F.

RAI-08.03.01-006 In SECY-90-16, "Evolutionary Light Water Reactor (LWR) Certification Issues and Their Relationships to Current Regulatory requirements," the NRC Commissioners approved the staff's position that all evolutionary ALWR's have an AAC power source of diverse design capable of powering at least one set of normal shutdown loads. Also, RG 1.206 provides guidance on meeting 10 CFR 50.63 (station Blackout rule) for evolutionary designs. Similar to SECY-90-16, it requires the installation of an AAC power source of diverse design with sufficient capacity, capability, and reliability that will be available on a timely basis for powering at least one complete set of normal safe shutdown loads (nondesign-basis accident) to bring the plant to safe shutdown. In SECY-91-078, item 5.2.3, "Power Rating of the Combustion Turbine Generators," the staff concluded that, as a minimum, the GTG should be capable of powering one safety division and one division of permanent non-safety loads during worst-case shutdown (to cold shutdown) and that it should have capability to power these loads with some margin for load growth when operating within its continuous rating. In the USAPWR design, The GTG proposed for meeting 10CFR50.63 is rated at 4000 kW and are of the same design and manufacture as the class 1E onsite GTG power sources. The applicant has claimed that AAC GTGs and class 1E GTGs are diverse because AAC GTGs use battery for starting whereas the class 1E GTGs use air starting. The applicant is requested to discuss and elaborate on limiting common mode failure potential in the safety and non-safety GTGs since they are of the same manufacture and design. Also, the applicant is asked to discuss whether the 4000 kW GTG is sized to power one safety division and one division of permanent non-safety loads during worst-case shutdown (to cold shutdown) and that it has the capability to power these loads with some margin for load growth when operating within its continuous rating.

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