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SOUTHERN NUCLEAR
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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555-0001

Edwin I. Hatch Nuclear Plant Units 1 and 2
Response to Request for Additional Information on Technical Specifications
Revision Request to Implement TSTF-500, "DC Electrical Re-Write"

Ladies and Gentlemen:

By letter dated August 11, 2015, Southern Nuclear Operating Company (SNC) submitted a license amendment request (LAR) to revise Technical Specifications (TS) to adopt TSTF-500, Direct Current (DC) Electrical Re-write, for the Edwin I. Hatch Nuclear Plant (HNP) Units 1 and 2.

By letter dated February 3, 2016 the Nuclear Regulatory Commission (NRC) requested for SNC to supplement their amendment request. SNC responded to that request in two separate letters, dated March 16, 2016 and April 4, 2016.

SNC withdrew the request to increase the Completion Time of the station service batteries from 2 to 12 hours by letter dated June 17, 2016.

Via electronic correspondence dated July 13, 2016, the NRC requested further information. The responses to that request for additional information are provided in the Enclosure to this letter. Changes to Technical Specifications pages resulting from this response will be provided to NRC on a mutually agreed upon date.

This letter contains no new Regulatory Commitments.

If you have any questions, please contact Ken McElroy at 205-992-7369.

Mr. J. T. Wheat states he is Nuclear Licensing Manager of Southern Nuclear Operating Company, is authorized to execute this oath on behalf of Southern Nuclear Operating and, to the best of his knowledge and belief, the facts set forth in this letter are true.

Respectfully submitted,

J. T. Wheat
Nuclear Licensing Manager

JTW/OCV/

Sworn to and subscribed before me this 12th *day of* August, *2016.*

Notary Public

My commission expires: 1/2/2018

Enclosure: Response to Request for Additional Information

cc: Southern Nuclear Operating Company
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Edwin I. Hatch Nuclear Plant Unit 1 and 2
Response to Request for Additional Information on Technical Specifications
Revision Request to Implement TSTF-500, "DC Electrical Re-Write"

Enclosure

Response to Request for Additional Information

NRC Question #1

In Attachment 3 of the LAR, the licensee proposed revised TS 3.8.5, Condition C that states: "One or more required diesel generators (DG) or station service DC electrical power subsystems inoperable for reasons other than Condition A or B." Condition A applies to DG DC subsystems and Condition B applies to station service DC subsystems.

Since Conditions A and B are applicable to two different subsystems (i.e., DG and station service), please address the conditions for inoperable station service subsystems in two separate action statements, for consistency with TS 3.8.4. Please justify why two separate actions are not proposed.

SNC Response

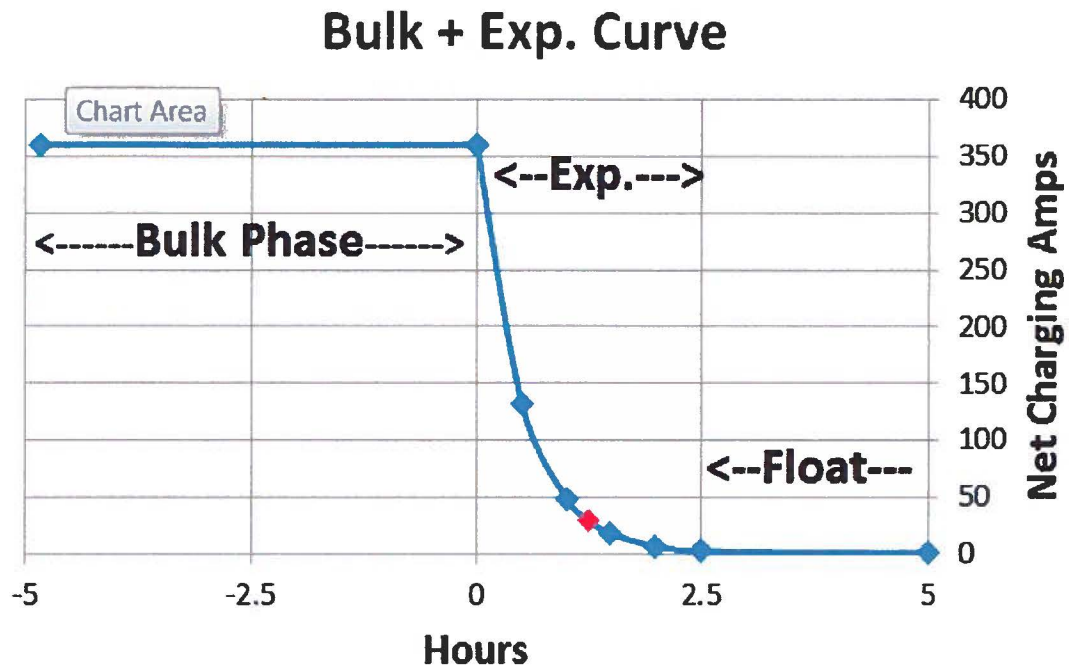
SNC will modify the proposed HNP TS LCO 3.8.5 to provide two separate ACTION statements for the DG and station service batteries when the subsystem(s) are inoperable for reasons other than Conditions A or B, respectively.

NRC Question #2

In Attachment 3 of the LAR, the licensee proposed revised TS 3.8.5, Condition B, which requires that the DG battery float current be verified to see whether it is less than or equal to 5 amps. The licensee explains that the HNP Units 1 and 2 station service batteries and DG batteries have different required float currents for determining that their respective batteries are charged. This requires different conditions for station service battery chargers inoperable and DG battery chargers inoperable, since different values of battery float current are required to be verified. In the proposed TS 3.8.4, Condition B requires that the DG battery float current be verified to see whether it is less than or equal to 5 amps. Similarly, in TS 3.8.4, Condition D requires that the station service battery float current be verified to see whether it is less than or equal to 20 amps. In the revised TS Bases, B3.8.4 states that the 5-amp and 20-amp values for the DG and station service battery float currents, respectively, is based on returning the battery to 95% charge and assumes a 5% design margin for the battery. However, the licensee did not provide an explanation of how the actual values for the float current for the station service and diesel generator batteries were derived.

SNC Response

The return-to-service (RTS) current values for the station service and diesel generator batteries were determined in a similar manner using the following process.



The total charge under the exponential portion of a battery recharge current curve is calculated by multiplying the net charging current (amps) by the time constant (hours) of the exponential curve. Therefore, for this calculation, the maximum amount of charge remaining under the exponential curve is determined using the maximum charger output current or current limit rating.

A value in the middle of the exponential curve (2 to 3 time constants) provides the best discrimination for measurements. NUREG/CR-7148, *Confirmatory Battery Testing*, confirmed the use of the three (3) time constant limit. Therefore, for conservatism, 3 time constants, corresponding to 5% of the total charge under the exponential curve is used for these calculations. The actual RTS limits were then calculated as follows:

For the station service batteries:

Charger Rated DC Output amps = 400A, with current limit at 440A.

Net Charging Amps (NCA) = 440A maximum at current limit

RTS current limit at 3 time constants, $t = 3\tau$

RTS current limit = $NCAe^{(-3t/\tau)}$ = 440A*(0.05) = 22A, rounded down to 20A.

For the diesel generator batteries:

Charger Rated DC Output amps = 100A, with current limit at 110A

Net Charging Amps = 110A maximum at current limit

RTS current limit at 3 time constants, $t = 3\tau$

RTS current limit = 110A*(0.05) = 5.5A, rounded down to 5A.

Bounding calculations were done for various time constants to verify the adequacy of the limits under those conditions.

The actual calculations are available to NRC for inspection.

NRC Question #3

In Attachment 1 of the LAR, the licensee proposed a variation with respect to pilot cell selection. The license stated that HNP will not take temperature into account when selecting the battery pilot cells because the HNP station service and diesel generator batteries do not exhibit a temperature deviation across the battery of greater than 5 degrees Fahrenheit in accordance with the IEEE Standard 450-2002. As discussed in the TSTF-500, Section 4.0, "Technical Analysis," batteries are normally sized with temperature, aging, and design correction margins. Regarding the selection of pilot cells, the TSTF-500 states: "Previously, average battery temperature was monitored instead of pilot cell temperature. As a result, temperature was not a criterion with selecting a pilot cell. [...] For batteries where it could be shown that the maximum temperature deviation across the battery did not exceed the IEEE 450 recommended maximum of 5 F [degrees Fahrenheit], the NRC has accepted that the cell temperature was not a critical parameter. Therefore, for these batteries, cell temperature did not have to be taken into account when selecting pilot cells."

The licensee has not provided information to support the fact that HNP station service and diesel generator batteries do not exhibit a temperature deviation across the battery of greater than 5 degrees Fahrenheit. Please provide temperature deviations for the batteries based on operation experience. Also, please provide the method for selection of pilot cells.

SNC Response

The current HNP procedure for the battery load profile discharge test (service test) requires taking initial and post-test cell electrolyte temperature data. Battery inspection procedures also require recording cell temperature data.

Accordingly, following is randomly selected historical data for these temperatures for the various station service and diesel generator batteries. Where data was used from the discharge test data packages, the initial cell readings were reported below, rather than the post-test cell temperature readings. Also, note that the station service batteries have 120 cells; the diesel generator batteries have 60 cells.

(Unless otherwise noted, data for every cell was read).

Station Service Battery 1A
March, 2002

Hi Cell: 88, Lo Cell: 85.2

Difference: 2.8 F

Station Service Battery 2B
March 2003

Hi Cell: 78.8, Lo Cell: 76.4

Difference: 2.4 F

Station Service Battery 2A
February, 2005:

Hi Cell: 83, Lo Cell: 80

Difference: 3 F

Station Service Battery 1A
February, 2012

Hi Cell: 82, Lo Cell: 81

Difference: 1 F

Station Service Battery 1B
March, 2012

Hi Cell: 79, Lo Cell : 77

Greatest Individual Difference: 2 F

Station Service Battery 2B
October, 2013

Hi Cell: 87, Lo Cell: 83

Difference: 4 F

Station Service Battery 1A
February, 2014

HI Cell: 77, Lo Cell: 76

Difference 1 F

Station Service Battery 2A
February, 2015

Hi Cell: 75, Lo Cell: 75

Difference: 0 F

Diesel Generator Battery 2C
September, 2001

Hi Cell: 81.7, Lo Cell: 80.8

Difference: 0.9
(Only 10 of the 60 cells were read: Cells 1, 7, 13, 19, 25, 31, 37, 43, 49, and 55 were read)

Diesel Generator Battery 1A
March, 2002

Hi Cell: 77.1, Lo Cell: 75.9

Difference: 1.2 F

Diesel Generator Battery 2A
March, 2003

Hi Cell: 75.0, Lo Cell: 74.5

Difference: 0.5 F

Diesel Generator Battery 1B
June, 2003

Hi Cell: 84.7, Lo Cell: 84.1

Difference: 0.6 F

Diesel Generator Battery 1B
May, 2010

Hi Cell: 82, Lo Cell: 82

Difference: 0 F

Diesel Generator Battery 1A
August, 2011

Hi Cell: 83, Lo Cell: 82

Difference: 1 F

Diesel Generator Battery 2A
July, 2014

Hi Cell: 87, Lo Cell: 87

Difference: 0 F

Diesel Generator Battery 1C
January, 2016

Hi Cell: 74, Lo Cell: 73

Difference: 1 F

Diesel Generator Battery 1B
May, 2016

Hi Cell: 82.1, Lo Cell: 80.3

Difference: 1.8 F

Diesel Generator Battery 2C
July, 2016

Hi Cell: 89.3, Lo Cell: 88.1

Difference: 1.2 F

The data presented above indicates that the HNP station service and diesel generator DC systems do not exhibit cell electrolyte temperature variations across the batteries of greater than 5 F.

Finally, the cells selected as pilot cells are currently those whose temperature, voltage, and electrolyte specific gravity approximate the condition of the entire battery. Assuming the optional variation of not requiring the use of temperature in pilot selection is granted, pilot cells will be selected using voltage and specific gravity to determine those cells that best approximate the condition of the entire battery.

NRC Question #4

In HNP LAR, the licensee proposed a new SR 3.8.6.6 (relocation and revision of current SR 3.8.4.8), where the DG and station service battery capacity is greater than 80 percent of the manufacturer's rating. The licensee proposed to specify the surveillance frequency for new SR 3.8.6.6 in the Surveillance Frequency Control Program (SFCP) per the provisions of TSTF-425, Revision 3, "Relocate Surveillance Frequencies to Licensee Control – RITSTF Initiative 5b." Thus, new SR 3.8.6.6 frequency states "In accordance with the Surveillance Frequency Control Program." However, current SR 3.8.4.8 has 3 frequencies, as follows:

In Accordance with the Surveillance Frequency Control Program

AND

12 months when battery shows degradation or has reached 85% of expected life with capacity less than 100% of the manufacturer's rating.

AND

24 months when battery has reached 85% of expected life with capacity is greater than or equal to 100% of the manufacturer's rating.

The staff notes that the proposed frequency for new SR 3.8.6.6 from the HNP current TS and a deviation from TSTF-500, Rev. 2 (Improved Standard TS (ISTS) Rev. 1) SR 3.8.6.6. TSTSF-500, SR 3.8.6.6 frequencies states: "60 months AND 12 months when battery shows degradation or has reached 85% of expected life with capacity less than 100% of the manufacturer's rating AND 24 months when battery has reached 85% of expected life with capacity is greater than or equal to 100% of the manufacturer's rating.

Furthermore, according to TSTF-425, all frequencies can be relocated to the SFCP except frequencies that are related to specific conditions (e.g., battery degradation, age and capacity). The 12 month and 24-month frequencies of HNP current SR 3.8.4.8 and TSTF-500, SR 3.8.6.6 are related to battery degradation and age and, therefore, should not be relocated to the SFCP.

Please provide justification for the deviation from HNP current TS and TSTF-500, Rev. 2 (ISTS Rev. 1) with regards to the frequency for new SR 3.8.6.6. Also, if the 12-month and 24-month frequencies for HNP current SR 3.8.4.8 are relocated to the SFCP for new SR 3.8.6.6, provide justification for relocating these degradation and age-related frequencies to the SFCP.

SNC Response

The 60 month frequency was changed in the HNP TS to read, "In accordance with the Surveillance Frequency Control Program" under TSTF-425, which was approved for HNP by the NRC under amendments 266 and 210 for HNP-1 and HNP-2, respectively. In actual practice, the 60 month frequency has not changed; it is still 60 months per the HNP Surveillance Interval Test List. Any changes which may, in the future, be made to the 60 month frequency will be performed under the provisions of the Surveillance Frequency Control Program (SFCP) which requires, per HNP Administrative Control Section 5.5.13, that changes to surveillance frequencies be made in accordance with NEI 04-10, "Risk Informed Method for Control of Surveillance Frequencies", Revision 1.

However, SNC agrees that the other two portions of the SR should not be changed. Accordingly, SNC will not propose a change to the 12 and 24 month provisions of current SR 3.8.4.8. SNC proposes that the frequency of new SR 3.8.6.6, under the proposed changes of TSTF-500, read exactly the same as current HNP SR 3.8.4.8.

NRC Question #5

In Attachment 3 of the LAR, the licensee proposed adopting new Condition E to TS 3.8.6 that applies to a battery found with a pilot cell electrolyte temperature less than the minimum established design limit. The required action associated with new Condition E requires the licensee to restore the pilot cell electrolyte temperature to greater than or equal to the minimum established design limits within 12 hours. In Attachment 1 of the LAR, the licensee states: "SNC verifies that temperature excursions could reasonably be expect to be detected and corrected prior to the average battery electrolyte temperature dropping below the minimum electrolyte temperature."

Please discuss how the battery room temperature is periodically monitored at HNP, and provide the minimum frequency at which the temperature of the battery room is monitored. Also, please explain how the licensee would restore battery room temperature if it was outside the temperature design limits.

SNC Response

The temperature of the diesel generator and station service battery rooms are monitored and recorded at a minimum once per day on the dayshift. The four station service battery room temperatures are monitored and recorded in accordance with the daily inside rounds procedure for the Control Building. The five diesel generator battery room temperatures are monitored and recorded per the *outside* daily rounds procedure.

Each room has a high and low administrative temperature limit provided in the procedure. If either of the limits are exceeded, control room shift management is immediately notified. If the room temperature is found below the administrative limit, the procedure requires compliance with TS SR 3.8.6.3, which is the surveillance requirement for monitoring of the electrolyte temperature. This SR is being deleted but will be replaced with SR 3.8.6.4 which will also require periodic monitoring of pilot cell electrolyte temperature. Per the Surveillance Frequency Control Program, electrolyte temperature is surveilled (under TS 3.8.6.3) once per 92 days. If the temperature in a room is found at a value less than the administrative limit, shift management could make a decision to increase the surveillance frequency to some appropriate value, beyond the routine once per day check, until the room temperature returned to normal. The above is true for all Station Service and Diesel Generator battery rooms.

A heating coil is installed in the Unit 2 Station Service battery rooms such that, if temperature is found below the administrative limit, the coil is confirmed to be in service, or is placed in service.

Heaters are mounted on the walls of the Unit 1 Station Service battery rooms which could be used to mitigate cold temperatures

An Operations Departmental Instruction, "Cold Weather Checks", is entered when outside temperatures drop below 40 F, or are expected to drop below 40 F. There are no heaters in the diesel generator battery rooms, however, there are heaters in the diesel generator rooms and switchgear rooms which are confirmed to be operating when the previously mentioned Departmental Instruction is entered.

Also included in the cold weather check instruction is an action to close diesel generator room and switchgear room louvers. This is done to shut off outside air from inside the rooms. The diesel generator battery rooms are located within the switchgear rooms inside the diesel generator building.

NRC Question #6

In Attachment 3 of the LAR, the licensee proposed adopting TSTF-500 TS 3.8.4, Condition A and Condition E as new Condition B and revised Condition G, respectively, for HNP TS 3.8.4. HNP TS 3.8.4 new Condition B applies when the DG DC battery charger on one subsystem is inoperable. When the required action and associated completion time associated with the new Condition B are not met, revised Condition G requires the plant to be in Mode 3 in 12 hours and Mode 4 in 36 hours. However, TSTF-500, Condition E requires the DG associated with the battery charger to be declared inoperable immediately when the required action and completion time of Condition A are not met.
Please provide justification for deviating from the required action and completion time for TSTF-500, TS 3.8.4, Condition E.

SNC Response

The justification is provided on page A1-3 of the August 11, 2015 HNP submittal. It is repeated here, with some elaboration, for convenience.

The 12 hour Completion Time (CT) for one DG DC electrical power subsystem inoperable (current TS 3.8.4 Condition B) is consistent with the CT for one required off-site circuit inoperable concurrent with one required DG inoperable (HNP TS 3.8.1, Condition E). Similarly, the default Condition Required Actions (RA) for the CT of current TS 3.8.4 Condition B not being met are the same as the default Condition's RAs for the CT of TS 3.8.1 Condition E not being met (MODE 3 in 12 hours, MODE 4 in 36 hours). This is significant because the DG batteries provide control and instrumentation power for emergency bus breakers as well as for the DGs. The default condition for the NUREG-1433 TS marked-up for TSTF-500 requires the associated DG to be declared inoperable if the CT for one DG subsystem battery charger is not met. The HNP TS is therefore conservative and more limiting than the TSTF-500 for the case of an inoperable DG battery. The TSTF would require declaring the associated diesel generator inoperable at the end of the CT, which would provide at least another 72 hours of operation. On the other hand, at the end of the CTs for Conditions B or C for the HNP TSTF-500 mark-up, an immediate shutdown would be required with MODE 3 required in 12 hours or less. Furthermore, the Condition to declare the DG inoperable upon failure to meet the Required Actions and Completion Time of an inoperable DG battery is not a change resulting from TSTF-500; that requirement was in the Standard prior to TSTF-500. HNP therefore prefers to keep its current

licensing basis and go into an immediate shutdown condition rather than declaring the DG inoperable upon failure to meet the CT for an inoperable DG DC system component. These differences do not affect the applicability of the model SE for HNP.

NRC Question #7

In Attachment 3 of the LAR, the licensee proposed adding new Conditions A and B to HNP Units 1 and 2 TS 3.8.5.

New Condition B states: "One or more required battery chargers on one required station service DC subsystems inoperable AND the redundant subsystem battery and required chargers operable."

The actions statements for new Conditions A and B are based on the adoption of TSTF-500 TS 3.8.5 Condition A. Per TSTF-500, Condition A is included in the TS only when the plant specific implementation of TS 3.8.5 may require both a DC electrical subsystem and its redundant subsystem to be operable.

Please clarify whether HNP Units 1 and 2 TS requires the above-mentioned redundant subsystems to be operable. If the redundant subsystems are required to be operable, please consider adding the terms "required DG DC" and "required station service DC" to the redundant subsystems in Condition A and Condition B, respectively for consistency with the first parts of the Conditions. If the redundant subsystems are not required per TS 3.8.5, please justify the adoption of TSTF-500, TS 3.8.5, Condition A.

SNC Response

TSTF-500-A, Rev. 2 states:

"ACTION A is included only when plant-specific implementation of LCO 3.8.5 includes the potential to require both subsystems of the DC System to OPERABLE."

At HNP, redundant DC electrical subsystems may be required to be Operable during shutdown conditions. It would depend on the schedule and circumstances of the particular shutdown, e.g., a refueling outage. TS 3.8.5 was included in the HNP TSTF-500 mark-up recognizing that redundant systems could be required to be Operable at some point during a scheduled or unscheduled outage. The current HNP TS also recognizes this. The LCO 3.8.5 states: " ... The Unit 1 [2] electrical power subsystems needed to support the DC electrical power distribution subsystem(s) required by LCO 3.8.8, "Distribution Systems – Shutdown" ..." shall be OPERABLE. The specs recognize that more than one electrical power subsystem may be required Operable, which could result in more than one subsystem of a particular DC source system, i.e., station service or Diesel Generator systems, being required Operable.

Furthermore, inclusion of TSTF-500, LCO 3.8.5, Condition A is benign. If the redundant system is not Operable, then the provisions of Condition A cannot be

used and TSTF-500 Condition B (proposed HNP LCO 3.8.5 Condition C) must be entered, likely resulting in cessation of Core Alterations, if they are in progress. So, presuming that the redundant system is never Operable during a particular shutdown, TSTF-500, LCO 3.8.5, Condition A, or Proposed HNP Conditions A and B could not be used and Condition B of the TSTF (Condition C of the proposed HNP TS) would have be entered upon the inoperability of a required DC subsystem.

SNC therefore prefers to keep the provisions of TSTF-500, LCO 3.8.5 Condition A.

SNC will modify Conditions A and B to say: " ... AND the redundant required DG DC subsystem battery and required charger OPERABLE", and, "... AND the redundant required station service DC subsystem battery and required charger OPERABLE".

NRC Question #8

In Attachment 3 of the LAR, the licensee proposed a battery cell float voltage limit of "greater than 2.07 Volt" as reflected in proposed TS 3.8.6 required action A.3, SR 3.8.6.2, and SR 3.8.6.5. According to TSTF-500 TS 3.8.6, the battery cell float voltage limit is "greater than or equal to 2.07 Volt".
Please provide a justification for deviating from the TSTF-500 TS 3.8.6 with respect to the battery cell float voltage limit.

SNC Response

Table 3.8.6-1, "Battery Cell Parameter Requirements", of current HNP TS LCO 3.8.6, "Battery Cell Parameters", contains Category A, B, and C limits for the HNP battery pilot cells and connected cells. Category A and B limits provide the normal parameter limits for pilot and connected cells, respectively. Category C represents limits beyond which Operability cannot be assured. The Category C Float Voltage limit for connected cells is given as "> 2.07 V" in current TS Table 3.8.6-1. This, therefore, is the HNP Licensing Basis for cell float voltage. Consequently, "greater than 2.07 Volts" was chosen as the battery cell float voltage limit for the TSTF-500 TS change as opposed to "greater than or equal to 2.07 Volts".

NRC Question #9

In Attachment 3 of the LAR, the licensee proposed an alternative criterion for new TS SR 3.8.4.2 which states, "Verify each battery charger can recharge the battery to the fully charged state within 24 hours while supplying the largest combined demands of the various continuous steady state loads, after a battery discharge to the bounding design basis event discharge state." 24 hours is bracketed in TSTF-500.

Please explain the basis for 24 hours.

SNC Response

The HNP battery sizing calculations for the station service and emergency diesel generator batteries indicate that the battery chargers are capable of fully charging the batteries within 24 hours, while simultaneously supporting the connected loads.

Furthermore, HNP procedures for the station service and diesel generator batteries already have provisions for recharging the batteries following a battery load profile discharge test. The recharge data, including the time to recharge the battery to 95% capacity, is documented in the battery discharge procedure to return the battery to service.

The procedure currently requires that the station service batteries be re-charged within 24 hours or less.

Proposed SR 3.8.4.2 will allow HNP to take credit for this existing procedure to satisfy the battery charger surveillance, as well as the battery discharge test.

The diesel generator batteries are required to be charged to 95% capacity, but there currently is no time requirement for these batteries as part of the post discharge test.

The revised procedure to take credit for SR 3.8.4.2, or the procedure created to take credit for it, will contain the 24-hour requirement for all diesel generator battery chargers, as well as the station service battery chargers.

References

1) TSTF-500-A, Rev 2, "DC Electrical Rewrite – Update to TSTF-360"
2) Calculation MC-H-14-0009, "Station Service 1A – Sizing and Voltage Profile"
3) Calculation MC-H-14-0010, "Station Service 1B – Sizing and Voltage Profile"
4) Calculation MC-H-14-0013, "Station Service 2B – Sizing"
5) Calculation MC-H-14-0014, "Emergency Diesel Batteries 1A, 1B, & 1C Sizing"
6) Calculation MC-H-14-0015, "Emergency Diesel Batteries 2A & 2C Sizing"
7) Calculation MC-H-14-0016, "Station Service Battery 2A – Sizing"
8) 42SV-R42-009-0, "Combined Service-Performance Tests and Modified Performance Tests"
9) Procedure 52SV-R42-006-0, "Battery Load Profile Discharge Test (Service Test)"
10) 52SV-R42-004-0, "Safety Related Battery Inspection"
11) Procedure 34GO-OPS-030-1,2; "Daily Inside Rounds"
12) Procedure 34GO-OPS-031-1,2; "Daily Outside Rounds"
13) Departmental Instruction DI-OPS-36-0989, "Cold Weather Checks"