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U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Director, Division of Spent Fuel Storage and Transportation
Office of Nuclear Materials and Safeguards
Washington, DC 20555-0001

Salem Generating Station Units 1 and 2
Facility Operating License Nos. DPR-70 and DPR-75
NRC Docket Nos, 50-272 and 50-311

Hope Creek Generating Station
Facility Operating License No. NPF-57
NRC Docket No. 50-354

Salem/Hope Creek Generating Station Independent Spent Fuel Storage Installation
NRC Docket No. 72-0048

Subject: HI-STORM 100 Cask Supplemental Cooling System Validation Testing Using Air Mass Flow Rate

References:
1) Entergy Letter to NRC 0CAN090902, HI-STORM-100 Cask System Supplemental Cooling System Validation Test, Arkansas Nuclear One, September 29, 2009
2) Entergy Letter to NRC, GNRO-2011/00086, HI-STORM-100 Cask System Supplemental Cooling System Validation Test, Grand Gulf Nuclear Station, Unit 1, October 14, 2011
3) Holtec Report HI-2002444, "HI-STORM 100 Cask System Final Safety Analysis Report", Revision 7

Condition 9, Special Requirements for First Systems in Place, of the Holtec HI-STORM 100 System Certificate of Compliance (CoC), requires a report of the Supplemental Cooling System (SCS) validation test and analysis for each first time user of a HI-STORM 100 Cask System SCS that uses components or a system that is not essentially identical to components or a system that has been previously tested. The SCS was first utilized during the initial Salem Unit 1 dry fuel storage loading campaigns that took place in September and October 2010. Each of the four systems loaded had heat loads that exceeded 28.74kW and/or included high burnup fuel assemblies, thus required the use of SCS.

NMSS26

Prior SCS submittals (References 1 and 2) were reviewed to determine applicability for the use of SCS at Salem. These were deemed not to be applicable as neither had a configuration that could be considered essentially identical to the Salem SCS.

A summary of the review performed of the SCS performance during its initial use at PSEG Nuclear is provided in the Attachment. The results demonstrate that the SCS performance limits the coolant temperature to below 180 degrees Fahrenheit under steady-state conditions for the design basis heat load at an ambient air temperature of 100 degrees Fahrenheit as required by Reference 3. Therefore, the results for the MPCs loaded in 2010 validate the thermal methods described in the HI-STORM FSAR used to determine the SCS requirements.

There are no commitments contained in this letter.

If you have any questions or require additional information, please contact Paul Bonnett at 856-339-1923.

Sincerely,

John F. Perry
Site Vice President – Hope Creek

Attachment – Validation of PSEG Nuclear Supplemental Cooling System (SCS) Performance

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Attachment

Validation of PSEG Nuclear
Supplemental Cooling System (SCS) Performance

The following tables provide the Supplemental Cooling System (SCS) temperature and water flow rate information as recorded during the initial use of the system for the Salem Unit 1 2010 dry fuel storage campaign:

MPC-93

Date/time	Time after SCS initiated (hours)	SCS T-inlet (deg-F)	SCS T-outlet (deg-F)	Flow-rate (gpm)
10/7/10 14:30	0	162	136	14.49
10/7/10 15:30	1.0	156	130	14.38
10/7/10 17:30	3.0	152	120	11.00
10/7/10 20:30	6.0	150	130	13.54
10/7/10 22:30	8.0	142	118	13.26
10/8/10 0:30	10.0	138	114	13.37
10/8/10 2:30	12.0	132	110	13.37
10/8/10 4:30	14.0	130	108	13.35
10/8/10 6:30	16.0	126	106	13.35
10/8/10 8:30	18.0	123	102	13.33

MPC-94

Date/time	Time after SCS initiated (hours)	SCS T-inlet (deg-F)	SCS T-outlet (deg-F)	Flow-rate (gpm)
10/2/10 2:00	0	170	140	13.63
10/2/10 4:00	2.0	158	130	13.67
10/2/10 6:00	4.0	152	128	14.51
10/2/10 8:45	6.8	158	130	13.48
10/2/10 10:00	8.0	148	124	14.40
10/2/10 11:00	9.0	144	122	14.38
10/2/10 13:00	11.0	139	118	14.38

MPC-95

Date/time	Time after SCS initiated (hours)	SCS T-inlet (deg-F)	SCS T-outlet (deg-F)	Flow-rate (gpm)
9/23/10 15:35	0	150	128	14.10
9/23/10 17:30	1.9	154	132	14.42
9/23/10 19:30	3.9	158	131	14.41
9/23/10 21:30	5.9	160	135	14.96
9/23/10 23:30	7.9	158	124	13.78
9/24/10 1:30	9.9	144	122	13.76
9/24/10 3:30	11.9	140	120	13.67
9/24/10 5:30	13.9	136	116	13.54
9/24/10 7:30	15.9	134	114	13.71

MPC-96

Date/time	Time after SCS initiated (hours)	SCS T-inlet (deg-F)	SCS T-outlet (deg-F)	Flow-rate (gpm)
9/17/10 4:00	0	170	145	14.10
9/17/10 6:00	2.0	163	137	14.42
9/17/10 8:00	4.0	157	132	14.41
9/17/10 9:05	5.1	157	132	14.96
9/17/10 10:00	6.0	162	138	13.78
9/17/10 12:00	8.0	150	126	13.76
9/17/10 14:00	10.0	144	124	13.67

Note: SCS T-inlet or T-outlet measurements are taken from the inlet and outlet of the SCS heat-exchanger.

MPC helium backfill data

MPC	Final Measured He Pressure (psig)	Helium Backfill Pressure Adjusted to 70 deg-F (psig)
93	52.8	37.53
94	63.5	44.48
95	52.2	37.23
96	64.1	44.63

Fuel Handling Building temperature during the time of the 2010 dry storage campaign ranged from 67 to 81 degrees Fahrenheit.

The MPC heat generation was calculated initially as part of the fuel selection for cask loading effort.

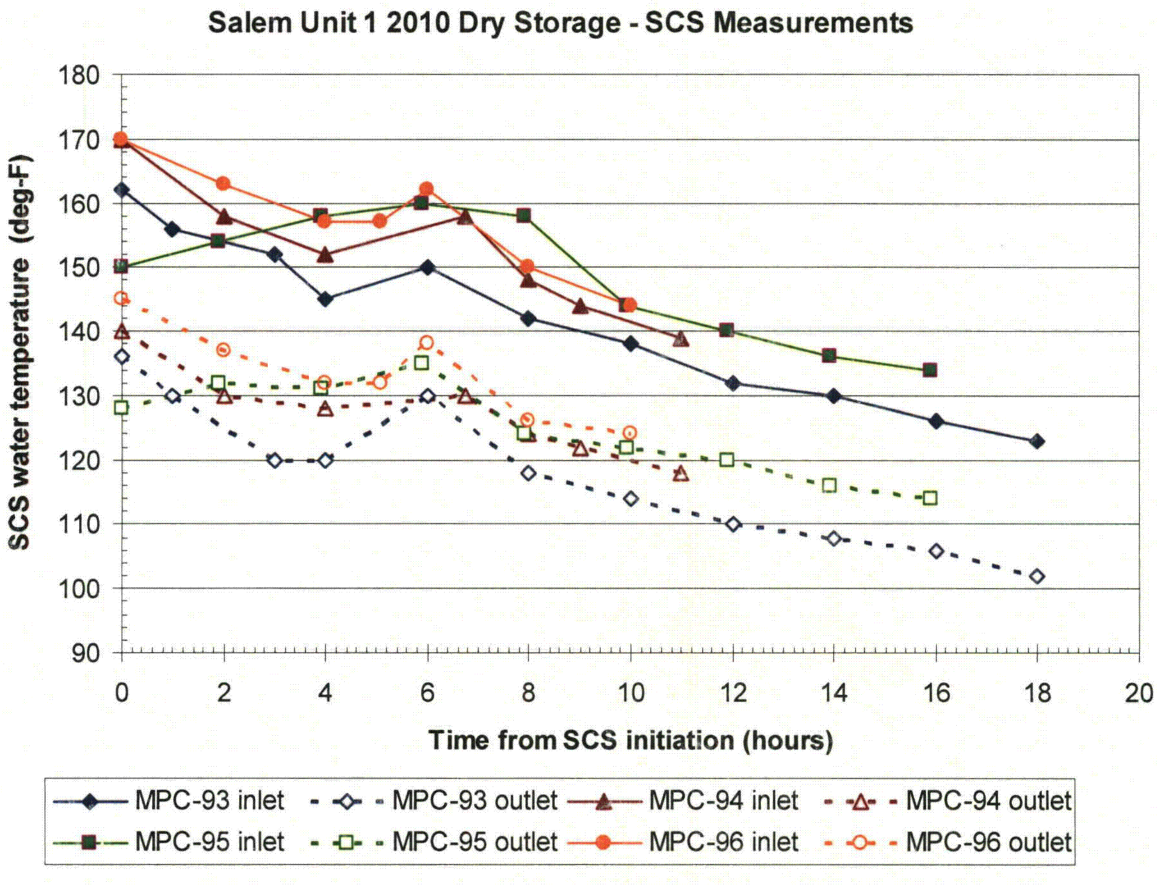
MPC Heat Loads

MPC	Q_{total}[1] (kW)	Q_{CoC}[2] (kW)
93	24.03	33.77
94	23.66	33.34
95	22.85	33.44
96	22.72	33.44

Notes:
(1) Q_{total} is the summation of the decay heat loads in each of the MPC 32 cells. This includes the individual assembly and contained component decay heat values at the time the MPC was loaded.

(2) Q_{CoC} is the MPC heat generation used to demonstrate CoC compliance per HI-STORM 100 FSAR Revision 7 Section 2.1.9.1.2. It is determined by taking the highest loaded fuel assembly heat generation (includes fuel and inserted component) multiplied by the total number of MPC cells.

The combined SCS performance results for the initial system use are shown below:



During the 2010 Salem dry fuel storage campaign, the SCS maintained the coolant water temperate below 180 degrees Fahrenheit at all times the system was running for all four canisters. As previously noted, the ambient air temperature in the fuel handling building remained below 100 degrees Fahrenheit during these evolutions. An additional assessment was performed to determine the system capability over a range of ambient conditions for a number of SCS water temperatures. This provides an additional validation for this aspect of the CoC Condition 9 SCS requirement.

The heat exchanger utilized in the Salem SCS is sized to remove 110,000 BTU/hour from the cooling water to an ambient air temperature of 100 degrees Fahrenheit. Per Holtec SCS specification, the heat exchanger was sized to remove sufficient heat to maintain fuel cladding temperatures below 400 degrees Celsius at an ambient air

temperature of 100 degrees Fahrenheit (assuming maximum fouling factors for the process liquids).

To maintain a lower outlet water temperature, the heat exchanger needs to transfer more heat to ambient. Also, as the difference between the water temperature (inside the annulus between the HI-TRAC (transfer cask) and MPC) and ambient air temperature increases, more of the MPC heat is rejected through the HI-TRAC, thus reducing the required heat exchanger capability.

Heat exchanger required capacity is shown below over a given range of ambient air and SCS water temperatures:

	Required heat transfer rate (BTU/hour)			
T-ambient ->	80	90	100	110
T-scs | V				
140	93,210	97,020	100,820	104,620
150	88,930	92,740	96,540	100,340
160	84,360	88,460	92,260	96,060
170	80,090	84,180	87,980	91,780
180	75,610	79,420	83,320	87,500

Note, both T-ambient and T-SCS are in degrees Fahrenheit

All the above cases consider a total MPC heat generation of 34 kW. In all cases, the heat exchanger capacity exceeds the system requirements over the expected range of ambient conditions and required SCS water temperature. This is consistent with the SCS recorded data that that shows a reduction in water temperature while the system was in operation. Thus, the SCS in use at PSEG Nuclear, as demonstrated during the initial Salem DCS campaign, meets the necessary HI-STORM FSAR Revision 7 Appendix 2.C design criteria.