Progress Energy

Serial: NPD-NRC-2010-082
November 5, 2010

10 CFR 52.80

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

SHEARON HARRIS NUCLEAR POWER PLANT, UNITS 2 AND 3
DOCKET NOS. 52-022 AND 52-023
RESPONSE TO ACTIONS FROM OCTOBER 1, 2010 PUBLIC TELECONFERENCE CONCERNING TRITIUM MODELING

Reference: Letter from Donald Palmrose (NRC) to Paul Snead (PEC), dated October 7, 2010, "Actions from October 1, 2010, Public Teleconference"

Ladies and Gentlemen:

Progress Energy Carolinas, Inc. (PEC) hereby submits our response to the action items in the Nuclear Regulatory Commission's (NRC) letter referenced above. A response to each action item is addressed in the enclosure.

In support of this response, native files for the CE-QUAL-W2 tritium evaluation are provided on the attached CD. A list of files on the attached CD is provided as Attachment H-0640-C. The supplemental information contained in the files on the attached CD is provided to support the NRC's review of the HAR COL application but does not comply with the requirements for electronic submission. The NRC staff requested the files be submitted in their native formats, required for utilization in the software employed to support the COL application development. PEC understands that converting the information to PDF output files would not serve the underlying purpose of the submittal; i.e., to provide the raw, unprocessed data to enable reviewers to evaluate software used in the HAR application.

If you have any further questions, or need additional information, please contact Bob Kitchen at (919) 546-6992, or me at (727) 820-4481.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on November 5, 2010.

Sincerely,

John Elnitsky
Vice President
New Generation Programs & Projects

Enclosure/Attachments

Progress Energy Florida, Inc.
P.O. Box 14042
St. Petersburg, FL 33733

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NRO

cc : U.S. NRC Region II, Regional Administrator (without attached CD)
U.S. NRC Resident Inspector, SHNPP Unit 1 (without attached CD)
Mr. Brian Hughes, U.S. NRC Project Manager (without attached CD)
Dr. Donald Palmrose, U.S. NRC Environmental Project Manager (with 2 copies of attached CD)

NRC Letter: Actions from October 10, 2010 Public Teleconference

NRC Letter Date: October 7, 2010

NRC Review of Environmental Report

NRC RAI #: Supplemental RAIs 5.2.2-5, 5.4-1, and 5.4.2-2

Text of NRC RAI:

An October 7, 2010 letter from Don Palmrose (NRC) to Paul Snead (PEC) noted the actions that Progress Energy Carolinas, Inc. (PEC) agreed to during a public teleconference held on October 1, 2010. The requested items are the following:

1. Progress Energy Carolinas, Inc. (PEC) will provide a summary of the statistical data used which illustrates the calibration results for the CE-QUAL-W2 model of Harris Reservoir.
2. PEC will provide electronic copies of the output files for the CE-QUAL-W2 model runs of tritium concentration in Harris Reservoir.
3. PEC will provide an explanation of why a 30 percent reduction loading of tritium was necessary to calibrate the CE-QUAL-W2 modeled tritium results with measured tritium concentration in Harris Reservoir.

PGN RAI ID #: H-0640

PGN Response to NRC RAI:

The following responses are provided as a supplement to RAIs provided previously in letters NPD-NRC-2009-238 sent December 3, 2009 (RAI 5.4.2-2), NPD-NRC-2010-073 sent September 15, 2010 (RAI 5.2.2-5), and as a response to the October 7, 2010 letter from Don Palmrose (NRC) to Paul Snead (PEC).

1. The observed tritium data at the spillway station (Station SW-26) and levels predicted by the Harris Reservoir CE-QUAL-W2 model for the spillway segment are provided as Attachment H-0640-A. These data provide a summary of the statistical data used to illustrate the calibration results for the CE-QUAL-W2 model of Harris Reservoir.

2. During the discussion requesting the electronic files, an issue with the executable was noted by the NRC. The model runs were performed with a CE-QUAL-W2 v3.2 executable that had been modified by Loginetics, Inc to output detailed results for use in their AGPM post-processor. The executable is not modified in any way related to the analytical solutions. However, the executable was recompiled by Loginetics, Inc. after the output specifications were changed. This could result in minor differences in numerical results. It has been verified that the Loginetics version of the model can be run without the proprietary post-processor and does not have the stability issue that occurred with the publicly available version of the model. The response for RAI 5.2.2-5, noted that the Dynamic Array Viewer needed to be downloaded according to directions on the CE-QUAL-W2 model developers website. For the sake of simplicity, the Dynamic Array Viewer was downloaded and is provided with this supplemental RAI response. A complete set of the model executable, Dynamic Array Viewer installer, model inputs, and model outputs used to evaluate tritium levels are provided on the attached CD,

Attachment H-0640-B. A list and description of the native files is provided as Attachment H-0640-C.

3. As described in RAI 5.4.2-2 (H-0513), a 30 percent reduction in tritium loading was selected during the model calibration. Monthly tritium concentration measurements are collected in Harris Lake near the Main Dam spillway at Station SW-26. These data were used for calibration of the CE-QUAL-W2 model. The initial calibration run showed consistent replication of trends in tritium concentrations, but overestimated levels by 30 to 50 percent, as shown on Figure 1.

The model includes a radioactive decay term and a loss of tritium through evaporation from the cooling tower. The model does not include the return of tritium load from the cooling tower blowdown and does not include the loss associated with evaporation from the reservoir surface.

Reductions to the source term were tested to calibrate the model to the observed data. The two droughts in the 2000s were some of the most extreme since drought conditions have been monitored in North Carolina. These are critical periods since inflows are limited but tritium loading continues. While a reduction of approximately 50 percent resulted in the most consistent fit, a reduction of 30 percent was selected since it most closely matched the peak in the observed data during the critical periods. A 30 percent reduction provides a conservative estimate of tritium losses since the predictions are generally higher than the observed. With a few exceptions, the model closely matches or over-estimates the observed data. This result was preferred compared to frequently under-estimating tritium levels. Figure 1 includes a comparison of the simulated tritium with no loss term (red line), the simulated tritium with a 30 percent loss term (green line), and the observed data at SW-26 (blue line).

Tritium has a half-life of 12.3 years. This loss is directly accounted for by the model as a decay term. It is believed that the majority of the tritium loss that was required to calibrate the model was associated with evaporation. A calculation of average annual potential losses due to evaporation from the cooling tower and reservoir surface was performed to quantify this pathway.

Since this evaluation is on an average annual basis, an average tritium concentration is required to be assumed over the analysis period. Based on Figure 1, an average concentration between 4000 and 6000 pCi/l can be assumed. The calculated losses for these concentrations are provided in Table 1. This table includes loss estimates for the annual average release for the simulation period, January 2001 through December 2008.

Table 1. Estimated Annual Average Tritium Loss Based on In-lake Concentration

Average In-lake Concentration (pCi/L)	Percent Lost via Evaporation (428 Ci/yr)
4,000	37%
5,000	47%
6,000	56%

These results support the use of a 30 percent reduction in tritium loading to calibrate the model. As noted above, a greater reduction would be possible but the 30 percent reduction provides a conservative estimate of loss.

Additionally, note that the basis for the availability of water for withdrawal from the Cape Fear River was discussed during the October 7, 2010 public teleconference. There was a question regarding the source of the flow information used to determine the availability of water in the Cape Fear River. The tritium analysis relies on measured flow at the USGS gage at Lillington (USGS 02102500) to determine the availability of water for pumping from the Cape Fear River. The Cape Fear River Basin Hydrologic model was not used for the tritium analysis.

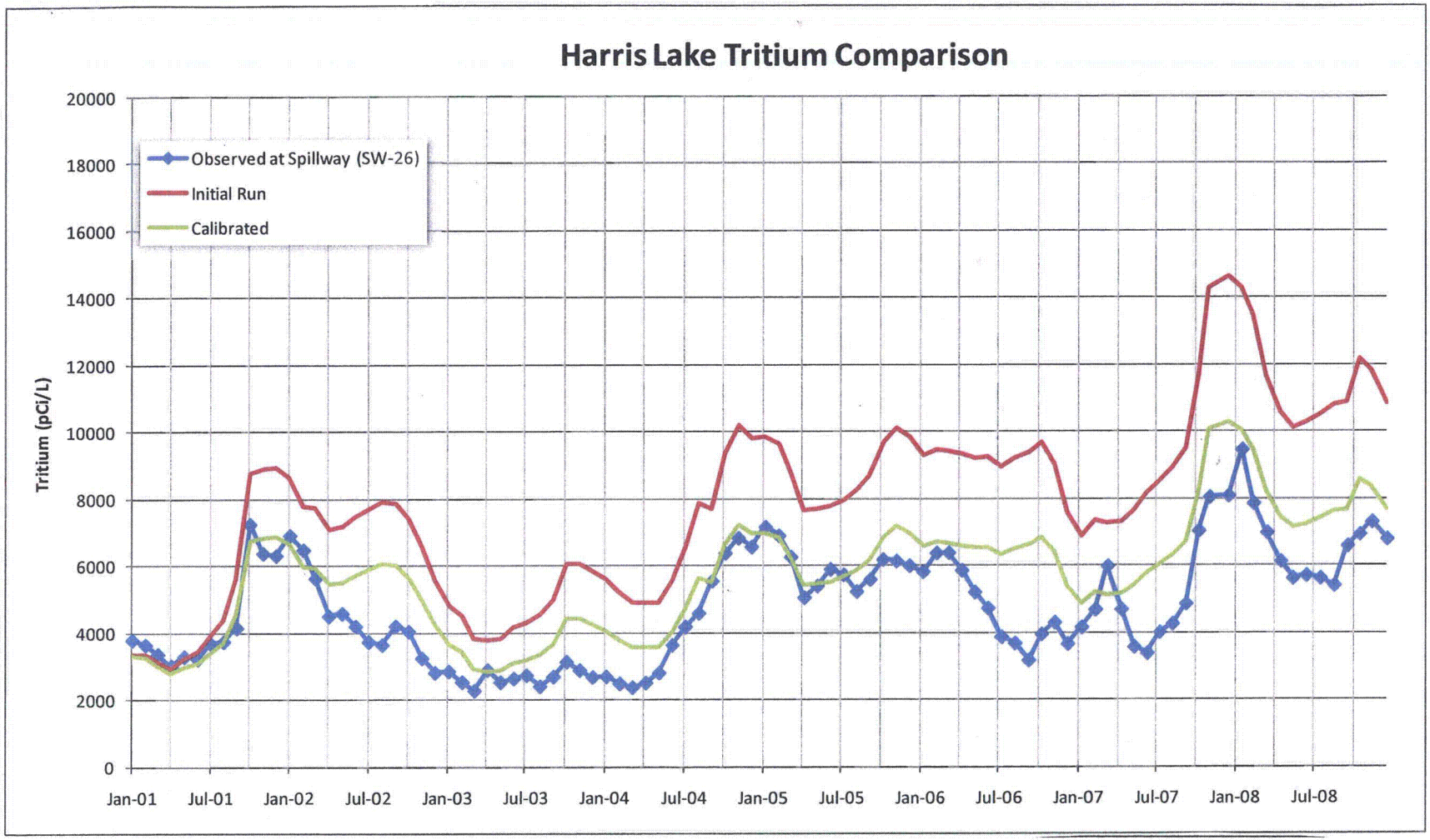

FIGURE 1.
Comparison of Observed Tritium Data to Initial and Calibrated Model Results

Associated HAR COL Application Revisions:

No COLA changes have been identified associated with this response.

Attachments/Enclosures:

Attachment H-0640-A – Observed vs. Calibrated Model Results

Attachment H-0640-B – CE-QUAL-W2 Native Files CD

Attachment H-0640-C – CE-QUAL-W2 Native Files List

Attachment H-0640 – A
Observed vs. Calibrated Model Results

Month	Observed at Spillway (SW-26)	Calibrated	Monthly Absolute Error
Jan-01	3780	3285	495
Feb-01	3630	3246	384
Mar-01	3350	3009	341
Apr-01	3010	2758	252
May-01	3280	2943	337
Jun-01	3210	3085	125
Jul-01	3680	3374	306
Aug-01	3730	3699	31
Sep-01	4140	4554	414
Oct-01	7240	6747	493
Nov-01	6370	6833	463
Dec-01	6300	6880	580
Jan-02	6910	6641	269
Feb-02	6470	5971	499
Mar-02	5620	5913	293
Apr-02	4490	5433	943
May-02	4570	5477	907
Jun-02	4190	5717	1527
Jul-02	3720	5889	2169
Aug-02	3630	6047	2417
Sep-02	4190	5993	1803
Oct-02	4030	5635	1605
Nov-02	3230	4994	1764
Dec-02	2800	4236	1436
Jan-03	2840	3654	814
Feb-03	2520	3443	923
Mar-03	2260	2895	635
Apr-03	2880	2802	78
May-03	2510	2843	333
Jun-03	2620	3071	451
Jul-03	2720	3154	434
Aug-03	2390	3350	960
Sep-03	2680	3645	965
Oct-03	3120	4398	1278
Nov-03	2870	4393	1523
Dec-03	2660	4230	1570
Jan-04	2680	4026	1346

Month	Observed at Spillway (SW-26)	Calibrated	Monthly Absolute Error
Feb-04	2470	3774	1304
Mar-04	2360	3548	1188
Apr-04	2490	3531	1041
May-04	2790	3534	744
Jun-04	3620	4010	390
Jul-04	4160	4712	552
Aug-04	4570	5600	1030
Sep-04	5530	5484	46
Oct-04	6370	6604	234
Nov-04	6820	7232	412
Dec-04	6550	6945	395
Jan-05	7150	6966	184
Feb-05	6890	6811	79
Mar-05	6250	6199	51
Apr-05	5030	5418	388
May-05	5380	5439	59
Jun-05	5880	5510	370
Jul-05	5710	5643	67
Aug-05	5210	5835	625
Sep-05	5570	6134	564
Oct-05	6170	6822	652
Nov-05	6120	7146	1026
Dec-05	5980	6943	963
Jan-06	5800	6562	762
Feb-06	6360	6678	318
Mar-06	6370	6661	291
Apr-06	5840	6573	733
May-06	5190	6508	1318
Jun-06	4710	6517	1807
Jul-06	3850	6302	2452
Aug-06	3660	6485	2825
Sep-06	3150	6623	3473
Oct-06	3930	6824	2894
Nov-06	4280	6381	2101
Dec-06	3640	5349	1709
Jan-07	4140	4863	723
Feb-07	4670	5173	503
Mar-07	5970	5117	853
Apr-07	4670	5157	487

Month	Observed at Spillway (SW-26)	Calibrated	Monthly Absolute Error
May-07	3550	5410	1860
Jun-07	3360	5763	2403
Jul-07	3990	5998	2008
Aug-07	4240	6304	2064
Sep-07	4840	6685	1845
Oct-07	7020	8195	1175
Nov-07	8030	10047	2017
Dec-07	8070	10280	2210
Jan-08	9440	10028	588
Feb-08	7840	9465	1625
Mar-08	6960	8200	1240
Apr-08	6100	7431	1331
May-08	5600	7117	1517
Jun-08	5680	7220	1540
Jul-08	5600	7380	1780
Aug-08	5380	7605	2225
Sep-08	6570	7644	1074
Oct-08	6910	8551	1641
Nov-08	7280	8323	1043
Dec-08	6770	7626	856
Total	458850	547149	98819

Total Absolute Error	21.5%

Attachment H-0640-C – CE-QUAL-W2 Native Files List

Filename	Purpose
agpm.npt	Control file for AGPM post processor
CAVDEMO-X86-160.EXE	Dynamic Array Viewer installer
ctr_bd.npt	Blowdown water quality constituent file
ctr_CF.npt	Cape Fear water quality constituent file
ctr_PE.npt	Progress Energy WWTP water quality constituent file
ctr_WRF01.npt	Western Wake Regional Water Reclamation Facility water quality constituent file (not used in tritium test)
cwo_12.opt	Withdrawal constituent output
dwo_12.opt	Withdrawal temperature output
E_Br1.npt	Watershed water quality constituent file for Branch 1
E_Br2.npt	Watershed water quality constituent file for Branch 2
E_Br3.npt	Watershed water quality constituent file for Branch 3
E_Br4.npt	Watershed water quality constituent file for Branch 4
E_Br5.npt	Watershed water quality constituent file for Branch 5
E_Trib1.npt	Watershed water quality constituent file for Tributary 1
graph.npt	Output descriptor file
Har_bth.npt	Bathymetry file
harmetcl.npt	Hourly meteorology file
kfl_wb1.opt	Constituent flux file
makeup.npt	Withdrawal file
Qin_Br1.npt	Watershed flow file for Branch 1
Qin_Br2.npt	Watershed flow file for Branch 2
Qin_Br3.npt	Watershed flow file for Branch 3
Qin_Br4.npt	Watershed flow for Branch 4
Qin_Br5.npt	Watershed flow for Branch 5
Qot_Br1.npt	Reservoir outflow file
Qtr_bd.npt	Blowdown flow file
Qtr_CF.npt	Cape Fear flow file
Qtr_PE.npt	Progress Energy WWTP flow file
Qtr_tr1.npt	Watershed flow file for Tributary 1
Qtr_WRF0.npt	Western Wake Regional Water Reclamation Facility flow file (not used in tritium test)
qwo_12.opt	Withdrawal flow output
rso.opt	Restart file
shd.npt	Shade coefficient file
snp_wb1.opt	Snapshot output file
spr_wb1.opt	Spreadsheet output file
Tin_br1.npt	Watershed temperature file for Branch 1

Filename	Purpose
Tin_br2.npt	Watershed temperature file for Branch 2
Tin_br3.npt	Watershed temperature file for Branch 3
Tin_br4.npt	Watershed temperature for Branch 4
Tin_br5.npt	Watershed temperature for Branch 5
Ttr_bd.npt	Blowdown temperature file
tritium_HARW1.W2P	AGPM post-processor output file
Ttr_CF.npt	Cape Fear temperature file
Ttr_PE.npt	Progress Energy WWTP temperature file
ttr_tr1.npt	Watershed temperature file for Tributary 1
Ttr_WRF.npt	Western Wake Regional Water Reclamation Facility temperature file (not used in tritium test)
Two_12.opt	Withdrawal temperature output
w2.exe	CE-QUAL-W2 executable
w2_con.npt	CE-QUAL-W2 control file
w2.wrn	Warning file
wsc.npt	Wind sheltering coefficient file