ENCLOSURE 2 TO PLA-6748

SSES Replacement Steam Dryer Report

Unit 2 Start-Up

107% Power Test Plateau

July 14, 2011

Non-Proprietary Information

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Reviewed By: [signature] 7/15/11

Approved by: J.E. Krais per telecon 7/15/11

This report provides a summary of the SSES Unit 2 replacement steam dryer monitoring instrumentation (Main Steam Line Strain Gage) measurements at the 107% CLTP test plateau. This data was collected at a power level of 3733 MW_{th} and a core flow of 101.58 M lb_m/hr. The main steam line (MSL) strain gage locations are documented in Reference 1. The plant data log sheet for this power plateau is contained in Appendix A. The data log sheets provide a record of plant conditions during at this plateau.

Figures 1 through 8 provide power spectral density (PSD) plots of MSL strain gage readings. The Level 1 and Level 2 limit curves for each strain gage location are also plotted on each figure. The strain values represent average strain values observed over a 180 second test time period. A data sampling rate of 2500 Hz was used in the data processing. The test data was bandpass filtered between 3 and 250 Hz to be consistent with the load definition used in the replacement dryer structural analysis in Reference 2. There is substantial noise from the 60 Hz alternating current and the recirculation pump power supply, thus filtering of this electrical noise was performed. Also the reactor recirculation pump vane passing frequencies were filtered from the data sets. Testing on the instrumented Unit 1 steam dryer {{{

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Reference 2 documented that the {{{

[(2)]}}} The filters applied to the 3733 MW_{th} data are contained in Table 1 below:

Table 1: PSD Notch Filter Specifications

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Frequency	Width	Origin

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A noise peak at approximately 137 Hz and 142.5 Hz were noted during the primary system hydrostatic test prior to plant start-up. This is a condition where systems are pressurized to operating levels but no steam flow exists. As Unit 1 ascended in power, this noise peak did not increase in amplitude. The source of this noise could not be determined but it has been conclusively shown that it is not related to power and/or steam flow and therefore filters have been applied to eliminate them.

PSDs were calculated on 2 second blocks of data from the test time period (180 seconds). In order to increase the number of spectral averages, the data blocks were overlapped by 50%. The PSDs were calculated using a Hanning window and a 0.5 Hz bin size. The resulting PSDs were

then linearly averaged and are presented as Figures 1 through 8. This method of data processing was used to provide the results in a format consistent with the processing used to develop the monitoring curves.

There are also two monitoring curves included with the PSD plots. The Level 1 monitoring curve represents the response of the SSES dryer finite element (FE) model under the design acoustic load conditions factored by the minimum component analysis margin to the endurance limit. The Level 2 monitoring curve is based on 80% of the Level 1 curve. A more complete description is included in Reference 3 and Reference 4. The Limit Curves were generated in accordance with Reference 3 using a baseline data set from Unit 2 collected at 3733 MW_{th} during the current power ascension. These monitoring curves provide guidance for evaluating the measured dryer response with respect to the structural analysis results and represent the acceptance criteria for the power ascension.

Table 2 below shows the maximum strain gage reading as a percent of acceptance limits generated in accordance with Reference 3 using a baseline data set from Unit 2 collected at 3733 MWth. All values of strain are below the Level 1 and Level 2 acceptance limits.

Table 2: Maximum MSL Strain Gage Readings @ 3733 MW_{th}
Expressed as a Ratio of the Acceptance Limits

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For trending purposes, filtered MSL strain gage PSDs for powers up to 107% of CLTP (3733MW_{th}) have been plotted in a waterfall format and are presented in Figures 9 through 16. Figure 17 is a trend plot of the RMS value of the sample time histories plotted against total steam flow. Figures 9 through 17 show that MSL stresses are {{{
[2]}}}

MSL strain gages mounted on the A and D steam lines have the highest magnitude readings. This is attributed to the large 15 HZ peak being generated by the SRV dead-legs on these two steam lines. The magnitude and frequency of the MSL strain gage PSDs is similar to the PSDs measured on Unit 2 in 2009 in both frequency content and magnitude. The Level 1 and Level 2 limit curves, Figures 1 through 8, are based on Unit 2 strain gage PSD's recorded at 3733 MW_{th}.

Summary

Based on the current margin to dryer acceptance limits shown in Table 1 and in Figures 1 through 8, there is adequate projected margin to the dryer acceptance limits for continued power ascension to 3952 MW_{th}.

References:

1. PPL Letter To USNRC, PLA-6176 (Figure 31-1), "Susquehanna Steam Electric Station Proposed License Amendment No. 285 For Unit 1 Operating License No. NPF-14 And Proposed License Amendment No. 253 For Unit 2 Operating License No. NPF-22 Extended Power Update Application Regarding Steam Dryer And Flow Effects Request For Additional Information Responses", dated 4/27/2007

2. GE-Hitachi Nuclear Energy Engineering Report 0000-0095-2113-P-R0, "Susquehanna Replacement Steam Dryer Updated Stress Analysis At Extended Power Uprate Conditions", Class III, February 2009 (Provided via PPL Letter To USNRC, PLA-6484, dated 2/27/09)

3. GE-Hitachi Nuclear Energy Engineering Report 0000-0096-5766-P-R1, "Revised Susquehanna Replacement Steam Dryer Limit Curves - Main Steam Line Mounted Instrumentation", Class III, February 2009 (Provided via PPL Letter To USNRC, PLA-6484, dated 2/27/09)

4. GE-Hitachi Nuclear Energy Engineering Report 0000-0101-0766-P-R0, "Main Steam Line Limit Curve Adjustment During Power Ascension", Class III, April 2009 (Provided via PPL Letter To USNRC, PLA-6510, dated 5/12/09)

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Figure 1: MSL A Upper Strain Gage PSD Plot

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Figure 2: MSL A Lower Strain Gage PSD Plot

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Figure 3: MSL B Upper Strain Gage Plot PSD Plot

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Figure 4: MSL B Lower Strain Gage PSD Plot

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Figure 5: MSL C Upper Strain Gage PSD Plot

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Figure 6: MSL C Lower Strain Gage PSD Plot

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Figure 7: MSL D Upper Strain Gage PSD Plot

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Figure 8: MSL D Lower Strain Gage PSD Plot

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Figure 9: MSL A Upper Strain Gage PSD Waterfall Plot

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Figure 10: MSL A Lower Strain Gage PSD Waterfall Plot

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Figure 11: MSL B Upper Strain Gage PSD Waterfall Plot

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Figure 12: MSL B Lower Strain Gage PSD Waterfall Plot

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Figure 13: MSL C Upper Strain Gage PSD Waterfall Plot

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Figure 14: MSL C Lower Strain Gage PSD Waterfall Plot

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Figure 15: MSL D Upper Strain Gage PSD Waterfall Plot

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$^{(2)}$}}}

Figure 16: MSL D Lower Strain Gage PSD Waterfall Plot

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Figure 17: MSL Strain Gage Time History RMS Trends

Appendix A

Plant Data Log Sheets

Steam Dryer Data Log Sheets
Start

Date/Time	7/14/2011 9:29	(Start)

	Computer ID	Value	Units
Thermal Power (Instantaneous)	u02.nba01	3732.50	MWth
Thermal Power (15 min Ave.)	u02.nba101	3711.90	MWth
Electrical Power	u02.tra178	1236.57	Mwe
Total Core Flow	u02.tra026	101.53	M lbm/hr
Recirc Loop Flow A	u02.tra028	48.94	M lbm/hr
Recirc Loop Flow B	u02.tra029	49.32	M lbm/hr
Recirc Loop A Suction Temperature	u02.nrt01	524.69	°F
Recirc Loop B Suction Temperature	u02.nrt02	525.27	°F
Core Plate D/P	u02.tra027	15.26	PSI
Indicated Steam Flow Line A	u02.tra153	3.91	M lbm/hr
Indicated Steam Flow Line B	u02.tra154	4.10	M lbm/hr
Indicated Steam Flow Line C	u02.tra155	3.98	M lbm/hr
Indicated Steam Flow Line D	u02.tra156	3.91	M lbm/hr
Indicated Total Steam Flow	u02.tra097	15.89	M lbm/hr
Indicated Feedwater Flow	u02.tra098	15.47	M lbm/hr
Feedwater Temperature Line A	u02.tra102	396.44	°F
Feedwater Temperature Line B	u02.tra103	398.05	°F
Feedwater Temperature Line C	u02.tra104	397.54	°F
Rx Dome Pressure Narrow Range	u02.tra208	1019.38	PSIG
Rx Dome Pressure Wide Range	u02.tra209	1019.56	PSIG
Steam Dome Temperature	u02.nfa05	548.68	°F
Recirculation Pump A Speed	vm.2p401a/2a_rrp_tac	1449.00	RPM
Recirculation Pump B Speed	vm.2p401b/2b_rrp_tac	1438.00	RPM
Recirculation Pump A Power	u02.nrj51	3.74	MWe
Recirculation Pump B Power	u02.nrj52	3.64	MWe
CRD Cooling Header Flow	u02.nef03	61.44	GPM
CRD System Flow	u02.nef01	61.87	GPM
CRD System Temperature	u02.ndt05	132.63	°F
Bottom Head Drain Temp	u02.tra206	528.78	°F
Reactor Water Level Narrow Range	u02.tra142	35.06	Inches H2O
Reactor Water Level Narrow Range	u02.nfl02	35.89	Inches H2O
Reactor Water Level Narrow Range	u02.nfl03	34.44	Inches H2O
Reactor Water Level Wide Range	u02.tra143	31.46	Inches H2O
Recirculation Pump A Vane Passing Freq.	n/a	120.75	Hz
Recirculation Pump B Vane Passing Freq.	n/a	119.83	Hz
Recirculation Pump A Motor Frequency	n/a	48.79	Hz
Recirculation Pump B Motor Frequency	n/a	48.42	Hz

Enhanced Steam Flow Calculations

Feed Flow Line A (LEFM)	u02.nff77	5.18	M lbm/hr
Feed Flow Line B (LEFM)	u02.nff78	5.16	M lbm/hr
Feed Flow Line C (LEFM)	u02.nff79	5.13	M lbm/hr
CRD Flow	u02.ndf01	0.03	M lbm/hr
Total Feedwater Flow	n/a	15.49	M lbm/hr
Steam Flow Line A	n/a	*3.81*	M lbm/hr
Steam Flow Line B	n/a	*4.00*	M lbm/hr
Steam Flow Line C	n/a	*3.88*	M lbm/hr
Steam Flow Line D	n/a	*3.81*	M lbm/hr
Total Steam Flow	n/a	*15.49*	M lbm/hr

Steam Dryer Data Log Sheets
Finish

Date/Time	7/14/2011 9:32	(Finish)

	Computer ID	Value	Units
Thermal Power (Instantaneous)	u02.nba01	3732.72	MWth
Thermal Power (15 min Ave.)	u02.nba101	3717.38	MWth
Electrical Power	u02.tra178	1237.26	Mwe
Total Core Flow	u02.tra026	101.58	M lbm/hr
Recirc Loop Flow A	u02.tra028	48.99	M lbm/hr
Recirc Loop Flow B	u02.tra029	49.33	M lbm/hr
Recirc Loop A Suction Temperature	u02.nrt01	524.72	°F
Recirc Loop B Suction Temperature	u02.nrt02	525.29	°F
Core Plate D/P	u02.tra027	15.24	PSI
Steam Flow Line A	u02.tra153	3.92	M lbm/hr
Steam Flow Line B	u02.tra154	4.11	M lbm/hr
Steam Flow Line C	u02.tra155	3.99	M lbm/hr
Steam Flow Line D	u02.tra156	3.92	M lbm/hr
Total Steam Flow	u02.tra097	15.91	M lbm/hr
Feedwater Flow	u02.tra098	15.48	M lbm/hr
Feedwater Temperature Line A	u02.tra102	396.58	°F
Feedwater Temperature Line B	u02.tra103	398.19	°F
Feedwater Temperature Line C	u02.tra104	397.55	°F
Rx Dome Pressure Narrow Range	u02.tra208	1019.43	PSIG
Rx Dome Pressure Wide Range	u02.tra209	1019.54	PSIG
Steam Dome Temperature	u02.nfa05	548.70	°F
Recirculation Pump A Speed	vm.2p401a/2a_rrp_tac	1449.00	RPM
Recirculation Pump B Speed	vm.2p401b/2b_rrp_tac	1439.00	RPM
Recirculation Pump A Power	u02.nrj51	3.75	MWe
Recirculation Pump B Power	u02.nrj52	3.64	MWe
CRD Cooling Header Flow	u02.nef03	61.59	GPM
CRD System Flow	u02.nef01	61.91	GPM
CRD System Temperature	u02.ndt05	132.67	°F
Bottom Head Drain Temp	u02.tra206	528.79	°F
Reactor Water Level Narrow Range	u02.tra142	35.18	Inches H2O
Reactor Water Level Narrow Range	u02.nfl02	35.83	Inches H2O
Reactor Water Level Narrow Range	u02.nfl03	34.29	Inches H2O
Reactor Water Level Wide Range	u02.tra143	31.44	Inches H2O
Recirculation Pump A Vane Passing Freq.	n/a	120.75	Hz
Recirculation Pump B Vane Passing Freq.	n/a	119.92	Hz
Recirculation Pump A Motor Frequency	n/a	48.79	Hz
Recirculation Pump B Motor Frequency	n/a	48.45	Hz

Enhanced Steam Flow Calculations

Feed Flow Line A (LEFM)	u02.nff77	5.18	M lbm/hr
Feed Flow Line B (LEFM)	u02.nff78	5.17	M lbm/hr
Feed Flow Line C (LEFM)	u02.nff79	5.13	M lbm/hr
CRD Flow	u02.ndf01	0.03	M lbm/hr
Total Feedwater Flow	n/a	15.51	M lbm/hr
Steam Flow Line A	n/a	*3.81*	M lbm/hr
Steam Flow Line B	n/a	*4.00*	M lbm/hr
Steam Flow Line C	n/a	*3.88*	M lbm/hr
Steam Flow Line D	n/a	*3.81*	M lbm/hr
Total Steam Flow	n/a	*15.51*	M lbm/hr

ENCLOSURE 3 TO PLA-6748

Affidavit

CONFIDENTIAL INFORMATION
SUBMITTED UNDER 10 C.F.R. §2.390

AFFIDAVIT OF RICHARD D. PAGODIN

I, Richard D. Pagodin General Manager-Nuclear Engineering PPL Susquehanna, LLC, do hereby affirm and state:

1. I am authorized to execute this affidavit on behalf of PPL Susquehanna, LLC (hereinafter referred to as "PPL").

2. PPL requests that the information attached and identified by text inside triple brackets {{{This sentence is an example.}}} be withheld from public disclosure under the provisions of 10 C.F.R. 2.390(a)(4).

3. The PPL Documents contain confidential commercial information, the disclosure of which would adversely affect PPL.

4. This information has been held in confidence by PPL. To the extent that PPL has shared this information with others, it has done so on a confidential basis.

5. PPL customarily keeps such information in confidence and there is a rational basis for holding such information in confidence. The information is not available from public sources and could not be gathered readily from other publicly available information.

6. Public disclosure of this information would cause substantial harm to the competitive position of PPL, because such information has significant commercial value to PPL.

7. The information identified in paragraph (2) above is classified as proprietary because it details the results of test data derived from test instrumentation installed specifically to collect this data. This instrumentation was installed at a significant cost to PPL. The data and the conditions under which it was collected constitute a major PPL asset.

8. Public disclosure of the information sought to be withheld is likely to cause substantial harm to PPL by foreclosing or reducing the availability of profit-making opportunities. The information is of value to other BWR Licensee's and would support evaluations and analyses associated with extended power uprate license amendment submittals. Making this information available to other BWR Licensee's would represent a windfall and deprive PPL the opportunity to recover a portion of its large investment in the test instrumentation from which this data is derived.

PPL SUSQUEHANNA, LLC

Richard D. Pagodin

Commonwealth of Pennsylvania
County of Luzerne

Subscribed and sworn before me,
a Notary Public in and for the
Commonwealth of Pennsylvania
This 15th day of July, 2011

Pamela M. Vincent

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Pamela M. Vincent, Notary Public
Sugarloaf Twp., Columbia County
My Commission Expires May 31, 2014
Member, Pennsylvania Association of Notaries