

05/31/2010

Resubmitted to B. Vaidya
via large file transfer 7/22/2010.

Rich:

The purpose of this electronic submittal is to provide the attached evaluation of Susquehanna SES Unit 1 steam dryer performance based on the data collected at the 110.5% power test plateau as required by the Operating License Condition.

DLF

License Condition 2.C.(36)(a)3 requires:

“PPL shall hold the facility at each 3.5% ascension step to collect data from License Condition 2.C.(36)(a) and conduct plant inspections and walk-downs, and evaluate steam dryer performance based on the data; shall provide the evaluation to the NRC staff by facsimile or electronic transmission to the NRC project manager upon completion of the evaluation; and shall not increase power above each hold point until 96 hours after the NRC project manager confirms receipt of the transmission.”

Summary:

This report provides a summary of the SSES Unit 1 replacement steam dryer monitoring instrumentation (Main Steam Line Strain Gage) measurements at the 110.5% CLTP test plateau. This data was collected at a power level of 3850 MWth and a core flow of 99.4 M lb_m/hr. Based on the current margin to dryer acceptance limits shown in the report, there is adequate projected margin to the dryer acceptance limits for continued power ascension to 3952 MWth.

Enclosure 1 contains proprietary information of PPL and is furnished in confidence solely for the purpose(s) stated in the report. No other use, direct or indirect, of the document or the information it contains is authorized. Furnishing this enclosure does not convey any license, expressed or implied, to use any patented invention or, except as specified above, any proprietary information of PPL disclosed herein or any right to publish or make copies of the enclosure without prior written permission of PPL.

The enclosed information contains proprietary information as defined by 10CFR2.390. PPL, as the owner of the proprietary information, has executed the enclosed affidavit, which identifies that the enclosed proprietary information has been handled and classified as proprietary, is customarily held in confidence, and has been withheld from public disclosure. PPL hereby requests that the enclosed proprietary information be withheld from public disclosure in accordance with the provisions of 10CFR2.390.

The header on each page in this enclosure carries the notation “PPL Proprietary Information”. PPL proprietary information is identified inside triple brackets. {{{This sentence is an example.⁽²⁾}}}. In each case, the superscript notation ⁽²⁾ refers to Paragraph (2) of the PPL affidavit, which provides the basis for the proprietary determination. Specific information that is not so marked is not PPL proprietary.



Duane Filchner

Enclosure 1 – SSES Replacement Steam Dryer Report, Unit 1 Start-Up, 110.5% Power Test Plateau, May 31, 2010 – PPL Proprietary Information.

Enclosure 2 – SSES Replacement Steam Dryer Report, Unit 1 Start-Up, 110.5% Power Test Plateau, May 31, 2010 – Non-Proprietary Information.

Enclosure 3 – Affidavit

ENCLOSURE 1

SSES Replacement Steam Dryer Report

Unit 1 Start-Up

110.5% Power Test Plateau

May 31, 2010

PPL Proprietary Information

WITHHELD FROM PUBLIC DISCLOSURE
IN ACCORDANCE WITH 10 CFR 2.390

ENCLOSURE 2

SSES Replacement Steam Dryer Report

Unit 1 Start-Up

110.5% Power Test Plateau

May 31, 2010

Non-Proprietary Information

SSES Replacement Steam Dryer Report

Unit 1 Start-Up

110.5 % Power Test Plateau

May 31, 2010

Prepared By: *John A. Barton* 5/31/2010

Reviewed By: *Kent W. [unclear]* 5/31/2010

Approved by: *John Harris* 5/31/2010

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 a filter has been applied to eliminate it.

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 1 collected at 3726 MW_{th} during the 2010 power ascension in early May. 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 1 collected at 3733 MW_{th}. All values of strain are below the Level 1 and Level 2 acceptance limits.

Table 2: Maximum MSL Strain Gage Readings @ 3850 MW_{th}
Expressed as a Ratio of the Acceptance Limits

{{{

(2)}}}

Table 2 above shows a 135 HZ peak approaching the Level 2 limit curve on the MSL A Lower set of strain gages. This peak is close to the non-acoustic peak which occurs at approximately 136 HZ. The 135 HZ peak could be bin bleed through from the adjacent 136 HZ peak but will be treated as an acoustic peak. A new acoustic peak has formed at 141 HZ on strain gages MSL B Lower, MSL C Upper and MSL C Lower. These peaks are small in magnitude but account for large percentages of the acceptance limits since the limits at this frequency are based on the noise floor. For the final power ascension to 114%, the limit curves will be generated in accordance

with Reference 3 using a baseline data set from Unit 1 collected at 3850 MW_{th}. The incorporation of these peaks into the limit curves will result in a slight overall reduction in margin to the limit curves. This will not impact the final power ascension to 114% since the new Unit 1 replacement steam dryer has stress margins in excess of 100% as measured by on dryer instrumentation installed for the 2008 start-up and power ascension.

For trending purposes, filtered MSL strain gage PSDs for powers up to 110.5% of CLTP (3850 MW_{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 shows that MSL strains are {{{⁽²⁾}}}

The magnitude and frequency of the MSL strain gage PSDs is similar to the PSDs measured on Unit 1 in 2008 in both frequency content and magnitude. As previously stated, the Level 1 and Level 2 limit curves, Figures 1 through 8, are based on Unit 1 strain gage PSD's recorded at 3726 MW_{th} during the 2010 start-up in early May.

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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Figure 16: MSL D Lower Strain Gage PSD Waterfall Plot

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Figure 17: MSL Strain Gage Time History RMS Trends

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Appendix A

Plant Data Log Sheets

Steam Dryer Data Log Sheets

Start

Date/Time	5/31/2010 1:12		(Start)
	Computer ID	Value	Units
Thermal Power (Instantaneous)	u01.nba01	3850.04	MWth
Thermal Power (15 min Ave.)	u01.nba101	3848.49	MWth
Electrical Power	u01.tra178	1275.27	Mwe
Total Core Flow	u01.tra026	99.39	M lbm/hr
Recirc Loop Flow A	u01.tra028	49.78	M lbm/hr
Recirc Loop Flow B	u01.tra029	49.44	M lbm/hr
Recirc Loop A Suction Temperature	u01.nrt01	524.83	°F
Recirc Loop B Suction Temperature	u01.nrt02	525.16	°F
Core Plate D/P	u01.tra027	15.71	PSI
Indicated Steam Flow Line A	u01.nff01	4.14	M lbm/hr
Indicated Steam Flow Line B	u01.nff02	4.24	M lbm/hr
Indicated Steam Flow Line C	u01.nff03	4.27	M lbm/hr
Indicated Steam Flow Line D	u01.nff04	4.13	M lbm/hr
Indicated Total Steam Flow	u01.tra097	16.81	M lbm/hr
Indicated Feedwater Flow	u01.tra098	16.32	M lbm/hr
Feedwater Temperature Line A	u01.tra102	399.13	°F
Feedwater Temperature Line B	u01.tra103	400.42	°F
Feedwater Temperature Line C	u01.tra104	401.10	°F
Rx Dome Pressure Narrow Range	u01.tra208	1028.38	PSIG
Rx Dome Pressure Wide Range	u01.tra209	1027.78	PSIG
Steam Dome Temperature	u01.nfa05	549.64	°F
Recirculation Pump A Speed	vm.1p401a/1a_rrp_tac	1453.00	RPM
Recirculation Pump B Speed	vm.1p401b/1b_rrp_tac	1462.00	RPM
Recirculation Pump A Power	u01.nrj51	3.91	MWe
Recirculation Pump B Power	u01.nrj52	3.94	MWe
CRD Cooling Header Flow	u01.nef03	64.39	GPM
CRD System Flow	u01.nef01	63.28	GPM
CRD System Temperature	u01.ndt05	138.13	°F
Bottom Head Drain Temp	u01.tra206	532.87	°F
Reactor Water Level Narrow Range	u01.tra142	35.16	Inches H2O
Reactor Water Level Narrow Range	u01.nfl02	36.08	Inches H2O
Reactor Water Level Narrow Range	u01.nfl03	32.83	Inches H2O
Reactor Water Level Wide Range	u01.tra143	36.96	Inches H2O
Recirculation Pump A Vane Passing Freq.	n/a	121.08	Hz
Recirculation Pump B Vane Passing Freq.	n/a	121.83	Hz
Recirculation Pump A Motor Frequency	n/a	48.92	Hz
Recirculation Pump B Motor Frequency	n/a	49.23	Hz

Enhanced Steam Flow Calculations

Feed Flow Line A (LEFM)	u01.nff77	5.33	M lbm/hr
Feed Flow Line B (LEFM)	u01.nff78	5.39	M lbm/hr
Feed Flow Line C (LEFM)	u01.nff79	5.35	M lbm/hr
CRD Flow	u01.ndf01	0.03	M lbm/hr
Total Feedwater Flow	n/a	16.10	M lbm/hr
Steam Flow Line A	n/a	3.98	M lbm/hr
Steam Flow Line B	n/a	4.07	M lbm/hr
Steam Flow Line C	n/a	4.10	M lbm/hr
Steam Flow Line D	n/a	3.96	M lbm/hr
Total Steam Flow	n/a	16.10	M lbm/hr

**Steam Dryer Data Log Sheets
Finish**

Date/Time	5/31/2010 1:15	(Finish)	
	Computer ID	Value	Units
Thermal Power (Instantaneous)	u01.nba01	3849.49	MWth
Thermal Power (15 min Ave.)	u01.nba101	3849.07	MWth
Electrical Power	u01.tra178	1279.65	Mwe
Total Core Flow	u01.tra026	99.05	M lbm/hr
Recirc Loop Flow A	u01.tra028	49.79	M lbm/hr
Recirc Loop Flow B	u01.tra029	49.46	M lbm/hr
Recirc Loop A Suction Temperature	u01.nrt01	524.85	°F
Recirc Loop B Suction Temperature	u01.nrt02	525.17	°F
Core Plate D/P	u01.tra027	15.70	PSI
Steam Flow Line A	u01.nff01	4.14	M lbm/hr
Steam Flow Line B	u01.nff02	4.24	M lbm/hr
Steam Flow Line C	u01.nff03	4.28	M lbm/hr
Steam Flow Line D	u01.nff04	4.13	M lbm/hr
Total Steam Flow	u01.tra097	16.71	M lbm/hr
Feedwater Flow	u01.tra098	16.31	M lbm/hr
Feedwater Temperature Line A	u01.tra102	399.15	°F
Feedwater Temperature Line B	u01.tra103	400.46	°F
Feedwater Temperature Line C	u01.tra104	401.14	°F
Rx Dome Pressure Narrow Range	u01.tra208	1028.23	PSIG
Rx Dome Pressure Wide Range	u01.tra209	1027.58	PSIG
Steam Dome Temperature	u01.nfa05	549.65	°F
Recirculation Pump A Speed	vm.1p401a/1a_rrp_tac	1453.00	RPM
Recirculation Pump B Speed	vm.1p401b/1b_rrp_tac	1461.00	RPM
Recirculation Pump A Power	u01.nrj51	3.91	MWe
Recirculation Pump B Power	u01.nrj52	3.94	MWe
CRD Cooling Header Flow	u01.nef03	64.39	GPM
CRD System Flow	u01.nef01	63.27	GPM
CRD System Temperature	u01.ndt05	137.87	°F
Bottom Head Drain Temp	u01.tra206	530.00	°F
Reactor Water Level Narrow Range	u01.tra142	34.22	Inches H2O
Reactor Water Level Narrow Range	u01.nfl02	35.30	Inches H2O
Reactor Water Level Narrow Range	u01.nfl03	34.82	Inches H2O
Reactor Water Level Wide Range	u01.tra143	36.78	Inches H2O
Recirculation Pump A Vane Passing Freq.	n/a	121.08	Hz
Recirculation Pump B Vane Passing Freq.	n/a	121.75	Hz
Recirculation Pump A Motor Frequency	n/a	48.92	Hz
Recirculation Pump B Motor Frequency	n/a	49.19	Hz

Enhanced Steam Flow Calculations

Feed Flow Line A (LEFM)	u01.nff77	5.33	M lbm/hr
Feed Flow Line B (LEFM)	u01.nff78	5.39	M lbm/hr
Feed Flow Line C (LEFM)	u01.nff79	5.35	M lbm/hr
CRD Flow	u01.ndf01	0.03	M lbm/hr
Total Feedwater Flow	n/a	16.10	M lbm/hr
Steam Flow Line A	n/a	3.97	M lbm/hr
Steam Flow Line B	n/a	4.07	M lbm/hr
Steam Flow Line C	n/a	4.10	M lbm/hr
Steam Flow Line D	n/a	3.96	M lbm/hr
Total Steam Flow	n/a	16.10	M lbm/hr

ENCLOSURE 3

Affidavit

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 31st day of May, 2010


Laurie Minto

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Laurie M. Minto, Notary Public
Salem Twp., Luzerne County
My Commission Expires July 24, 2010
Member, Pennsylvania Association of Notaries