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U. S. Nuclear Regulatory Commission
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Mail Stop OP1-17
Washington, DC 20555

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 UPRATE APPLICATION
RE: MECHANICAL AND CIVIL ENGINEERING
TECHNICAL REVIEW REQUEST FOR ADDITIONAL INFORMATION RESPONSES
PLA-6200

Docket Nos. 50-387 and 50-388

References: 1) *PPL Letter PLA-6076, B. T. McKinney (PPL) to USNRC, "Proposed License Amendment Numbers 285 for Unit 1 Operating License No. NPF-14 and 253 for Unit 2 Operating License No. NPF-22 Constant Pressure Power Uprate," dated October 11, 2006.*

2) *Letter, R. V. Guzman (NRC) to B. T. McKinney (PPL), "Request for Additional Information (RAI) - Susquehanna Steam Electric Station, Units 1 and 2 (SSES 1 and 2) - Extended Power Uprate Application Regarding Turbine Generator Review (TAC Nos. MD3309 and MD3310)," dated April 30, 2007.*

3) *PPL Letter PLA-6176, B. T. McKinney (PPL) to USNRC, "Proposed License Amendment Numbers 285 for Unit 1 Operating License No. NPF-14 and 253 for Unit 2 Operating License No. NPF-22 Extended Power Uprate Application Regarding Steam Dryer and Flow Effects Request For Additional Information Responses," dated April 27, 2007.*

Pursuant to 10 CFR 50.90, PPL Susquehanna LLC (PPL) requested in Reference 1 approval of amendments to the Susquehanna Steam Electric Station (SSES) Unit 1 and Unit 2 Operating Licenses (OLs) and Technical Specifications (TS) to increase the maximum power level authorized from 3489 Megawatts Thermal (MWt) to 3952 MWt, an approximate 13% increase in thermal power. The proposed Constant Pressure Power Uprate (CPPU) represents an increase of approximately 20% above the Original Licensed Thermal Power (OLTP).

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NRC/NRR

The purpose of this letter is to provide responses to the "Request for Additional Information" transmitted to PPL in Reference 2.

The Enclosure contains the PPL responses.

The PPL responses in Attachment 1 contain information that General Electric Company and Continuum Dynamics Incorporated (CDI) consider proprietary. General Electric Company and CDI request that the proprietary information be withheld from public disclosure in accordance with 10 CFR 2.390 (a) 4 and 9.17 (a) 4. Affidavits supporting this request are provided in Attachment 3. A non-proprietary version of Attachment 1 is provided in Attachment 2.

There are no new regulatory commitments associated with this submittal.

PPL has reviewed the "No Significant Hazards Consideration" and the "Environmental Consideration" submitted with Reference 1 relative to the Enclosure. We have determined that there are no changes required to either of these documents.

If you have any questions or require additional information, please contact Mr. Michael H. Crowthers at (610) 774-7766.

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

Executed on: 6-1-07

B. T. McKinney

Attachment 1: Proprietary Version of the Request for Additional Information Responses
Attachment 2: Non-Proprietary Version of the Request for Additional Information Responses
Attachment 3: General Electric Company and Continuum Dynamics Incorporated (CDI) Affidavits

Copy: NRC Region I
Mr. A. J. Blamey, NRC Sr. Resident Inspector
Mr. R. V. Guzman, NRC Project Manager
Mr. R. R. Janati, DEP/BRP

Attachment 2 to PLA-6200
Non-Proprietary Version of the Request for Additional Information Responses

NRC Question 1:

Section 5.4 of General Electric (GE) GE-NE-0000-0061-0595-P-R0, "Susquehanna Replacement Steam Dryer Fatigue Analysis," dated December 2006, uses the results from the Susquehanna Steam Electric Station (SSES) plant specific scale model testing report (GENE-0000-0054-2552-01-P, "Test Report #1 Susquehanna Steam Electric Station, Unit 1 Scale Model Test," May 2006). Test Report #1 concludes that, to scale the stress results of 113% Original Licensed Thermal Power (OLTP) to the proposed Extended Power Uprate (EPU), the scale factor is [[ ]]. However, during the February 27, 2007 meeting, PPL informed the staff that it does not plan to use the GE report (GENE-0000-0054-2552-01-P) in the design development of the SSES replacement dryers. PPL is requested to clarify its use of the mentioned GE report. Considering PPL's determination to not use the 1/17th scale model test data, provide a detailed explanation and technical basis for scaling the resulting stresses from 113% OLTP to the EPU.

PPL Response:

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In addition to the scale model test results, the EPU scale factor is also based on the SSES 1985 instrumented dryer data trends documented in Section 3.1 of GE Report MDE #199-0985-P, Rev. 1 "Susquehanna – 1 Steam Dryer Vibration Steady State and Transient Response – Final Report," January 1986 and the main steam line measurements taken at SSES Unit 1 in April 2006. The April 2006 main steam line measurements include measurements taken during MSIV slow closure testing that approximated the steam line flow rates at 113% OLTP. [[

]]. A detailed discussion and technical basis for scaling the resulting stresses from 113% OLTP to EPU is provided in the response to RAI #7 in Reference 3.

As discussed in the responses to RAIs #3 & #5 in Reference 3, the Susquehanna Unit 1 steam dryer is to be instrumented for the first phase of power ascension. [[

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NRC Question 2:

Section 1 of the Continuum Dynamics Incorporated (CDI) Report #06-22, Rev. 0, "Hydrodynamic Loads at OLTP, CLTP [current licensed thermal power], and 113% OLTP on Susquehanna Unit 1 Steam Dryer to 250 Hz," September 2006, states, "This model [acoustic circuit model (ACM)], validated against the Exelon full scale data, is used in this effort." It should be noted that the staff's RAIs related to comparison of the ACM results with the Exelon full scale data were not resolved. The staff has determined that the worst-case combination of the bias error and the random uncertainties in predicting the dryer pressure loads using the ACM model would result in a bias of 75% and an uncertainty of 17%. (This bias error and random uncertainty were used by Vermont Yankee in determining the worst-case stresses in its dryer.) PPL is requested to consider this bias error and random uncertainty in determining the hydrodynamic loads on its dryers using the ACM and evaluate the resulting fatigue margins.

PPL Response:

The following discussion was provided in response to NRC Question 17 of Reference 3. The response describes CDI's approach in determining the bias and uncertainty of the ACM.

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PPL provided additional information regarding the means by which these factors are considered in the response to NRC Question 2 of Reference 3. In that response, PPL identified that a benchmarking effort of the hydrodynamic loads against SSES 1985 Unit 1 instrumented test data recognized that the CDI pressure load definition under-predicted dynamic loads at original license thermal power (OLTP) conditions. The discussion outlined the use of a stress under-prediction factor (SUPF) which was derived based on that benchmarking effort. The conclusion is that if the SUPF were treated as a negative bias in the uncertainty analysis, the SSES end-to-end uncertainty would bound those Vermont Yankee values cited in this question.

NRC Question 3:

GE Report MDE-199-0985-P, Rev. 1 presents the results for different test conditions including the transient response due to main steam isolation valve (MSIV) closure. On page 84 of the Summary and Conclusion section, Item No. 8 provides a numerical factor associated with MSIV operations. PPL is requested to explain how it plans to use this factor during associated testing to bound its dryer stress estimation approach.

PPL Response:

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]] Supporting information for the pressure load increase is provided in the response to RAI #7 in Reference 3. The measured increase in dryer stresses are consistent with the EPU scaling factor discussed in Section 5.4 of GE-NE-0000-0061-0595-P-R0, "Susquehanna Replacement Steam Dryer Fatigue Analysis," December 2006.

As discussed in the responses to RAIs #3 & #5 in Reference 3, the Susquehanna Unit 1 steam dryer is to be instrumented for the first phase of power ascension. [[

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NRC Question 4:

In Attachment 9 of PPL's submittal dated October 11, 2006 (or PLA-6076), PPL indicated that remote vibration accelerometers, hand-held vibration instrumentation, or visual observation programs will be used to monitor the vibration level of piping and components during EPU operation. PPL also indicated that vibration acceptance criteria have been defined and accelerometer data, to-date, indicates that no screening criteria will be exceeded due to EPU conditions. Provide a detailed explanation of vibration acceptance criteria as to how the acceptance criteria were established. Also, describe the vibration screening allowables. Confirm whether the screening allowables are generic or piping system specific, and how these allowables were defined.

PPL Response:

For the lines on which remote vibration accelerometers have been installed, piping system specific vibration screening allowables were developed in the following manner. Baseline vibration data was collected during the April 2005 (Unit 2) and April 2006 (Unit 1) power ascensions at eight power levels (ranging from 37% to 100%). In addition, main steam isolation valve slow closure tests were done for Unit 1 which increased the flow rates in the other three main steam lines. In this way, the effects of

flow rates corresponding to the first stage of EPU (113% OLTP) could be approximated. Data was taken at multiple accelerometers on main steam, high pressure coolant injection (HPCI), reactor core isolation cooling (RCIC), and Unit 1 feedwater lines inside the drywell (Unit 2 feedwater data will be recorded later in 2007). The data was analyzed and frequency spectra were developed. Bounding RMS acceleration values were determined for each channel, and peak accelerations at the bounding power levels were tabulated. The ratio of peak to RMS acceleration was determined for each channel at the bounding power levels.

Detailed piping computer analyses were run for each of the lines using vibration excitation inputs. The vibration input was developed from each accelerometer's acceleration versus frequency curve. The peaks were broadened to account for uncertainty and for an anticipated vibration frequency shift after CPPU is implemented. The curves were multiplied by the peak to RMS ratio for each channel. The curves were enveloped over the bounding power levels, and enveloped over all accelerometers on the particular line.

This vibration input spectrum is conservative for the following reasons:

1) It assumes that all vibration cycles occur at the peak value, whereas they average around the RMS value;
2) It assumes that all locations within a line vibrate at the highest acceleration of all of the accelerometers, at each frequency;
3) The peaks are broadened, whereas the highest measured accelerations tend to be very narrow peaks; and,
4) The maximum acceleration in any of the three orthogonal directions is applied to all three directions.

After an initial run to determine stress levels, the vibration input was then scaled up until the maximum stress was just below the endurance limit stress defined in ASME O&M Part 3.

Two vibration acceptance criteria were developed. The first specifies an acceptable overall RMS acceleration for each accelerometer channel. This is based on the maximum allowable peak acceleration divided by the peak-to-RMS ratio. The second criterion gives an acceptable frequency spectrum of peak accelerations that can be applied to any of the accelerometers on a particular line. This is based on scaling the baseline vibration data frequency curves up to the point where the piping stress just meets the material endurance limit. Both criteria include the conservatisms described above. If the vibration meets either criterion, it is considered acceptable. If it exceeds both, further evaluations will be performed and actions taken as appropriate.

For condensate, feedwater, feedwater heater drains, main steam, and extraction piping experiencing notable vibration, but not addressed above, local instrumentation is used and the acceptance criteria is determined using the guidance of the ASME OM3-S/G-2000 Code and generic original startup vibration criteria.

For the remaining piping, the acceptance criteria is visual confirmation of the absence of significant vibration in the following ways:

1) The walkdowns of the inaccessible piping in the Turbine Building not showing any evidence of excessive vibration using the walkdown criteria in Section 9, "Inspections and Walkdowns" of Attachment 9 to PPL's CPPU License Amendment Request (LAR) (Reference 1).
2) The observation of inaccessible piping in the Turbine Building with remote mobile cameras not showing evidence of excessive vibration.
3) The observation of accessible piping in the Turbine Building not showing evidence of excessive vibration.

NRC Question 5:

In Section 10 of Attachment 9 to the PLA-6076, amendment request, PPL indicated that modifications are needed to address the increased effects of flow-induced vibration at EPU conditions. PPL is requested to explain in detail the following modification aspects:

(a) the number and types of supports added in the feedwater heater drain lines and reason for the modification,

(b) the upgraded criteria that are used for the repair and replacement of socket welds for EPU operation, and

(c) technical basis in determining the expected frequency of replacement for valves listed in Table 5 for the EPU operation.

PPL Response:

(a) PPL added two Wire Energy Absorbing Restraints (WEAR) on the Unit 2 feedwater heater (FWH) drain line from the 1B FWH to Drain Cooler 6B as part of the resolution to a failure of two pipe supports on this piping that was attributed to flow-induced vibration. One of the failed supports was replaced by a WEAR support. The other was repaired to its original condition and a WEAR support was added to provide vibration mitigation. A subsequent inspection of this piping by a robotic mounted camera showed greatly reduced vibration levels from those observed prior to the support addition/changes.

(b) The upgraded criteria that are used for the inspection and replacement of socket welds located on small pipe (2" nominal pipe size and smaller) attached to the reactor recirculation system (RRS) utilizes volumetric NDE versus the ASME Code requirement to perform surface examinations. If either a subsurface flaw or initial weld defect is detected, the weld is reworked to an EPRI approved 2x1 configuration that is more resistant to vibration than a 1x1 equal leg fillet weld.

(c) The technical basis in determining the expected frequency of replacement for valves listed in Table 5 of Attachment 9 (Reference 1) for EPU operation is engineering judgment based on monitoring of the behavior of valve components both at SSES and the nuclear industry, especially at the nuclear plants that have been operating at CPPU conditions. The table was included to document the valves at SSES that already have frequent replacement rates.

NRC Question 6:

Attachment 9 of PLA-6076 describes an assessment of flow-induced vibration of systems and components in support of the EPU request for SSES 1 and 2. Attachment 9 indicates that some analyses remain underway for vibration susceptibility such as accelerometers on the extraction steam 4th stage and the vibration data for feedwater and extraction steam systems for Unit 2. PPL is requested to provide the results of those analyses and discuss the resulting modifications or procedure changes.

PPL Response:

The accelerometers on the Unit 2 feedwater piping were installed during this past refueling and inspection outage (U2-13th RIO) in Spring 2007. Some vibration data is available, but the full set of power level tests are not scheduled to be recorded and analyzed until later in 2007. The results are expected to be similar to the relatively low Unit 1 values shown in Table 4 of Attachment 9 (Reference 1).

Table 4 of Attachment 9 (Reference 1) indicates that the Unit 1 4th stage extraction steam is at 40% of the calculated screening criteria for CLTP conditions. The latest data taken measured accelerations well below the 40% value and the analysis concludes that there is significant margin available for CPPU conditions.

Table 4, Note 2 of Attachment 9 (Reference 1) states that, "the Unit 2 Extraction Steam System is being evaluated to determine if accelerometers are needed". At this time, no accelerometers are warranted on the Unit 2 piping based on the Unit 1 analysis results and the margins available at CLTP conditions.

There are no modifications or procedure changes required for these systems due to Flow-Induced Vibration.

NRC Question 7:

Section 5 of Attachment 10 to the PLA-6076 provides an overview of the Susquehanna EPU Power Ascension Test Plan. PPL stated in the February 27, 2007 public meeting that it will provide the detailed Power Ascension Test Plan to the NRC before increasing power above CLTP. PPL is requested to provide the test and instrumentation plan, and configuration of the new dryer as soon as it is available. PPL is also requested to provide its limit curves for power ascension, including the margin available from the fatigue stress limit if the curve is reached during power ascension.

PPL Response:

The discussion and appendix submitted to the staff in Reference 3 as the response to RAI #3 provides a detailed discussion of the planned CPPU power ascension test plan.

NRC Question 8:

In reference to Attachment 9 to the PLA-6076, provide (a) applicable types of accelerometers/instruments for each of Vibration Monitoring Groups, and (b) locations of instruments and technical basis for selection of the monitoring locations.

PPL Response:

The types of vibration accelerometers installed at remote locations are Endevco, Model 7703A-100 or Vibro-meter, Model CA-164, or equivalent. These are connected with remote charge converters Endevco, Model 2771B-1, or Vibro-meter, Model IPC-620, or equivalent. The data is collected using Structural Integrity Associates' VDAS remote data acquisition system. This system is capable of capturing 80 channels of simultaneous data streaming and is set at a sampling rate of 2048 samples per second.

The locations of the instruments may be found in Appendices A-E of Attachment 9 (Reference 1).

The process used to determine locations for the remote vibration accelerometers is as follows:

1) Create a detailed stress analysis model of the piping geometry,
2) Calculate frequencies of potentially significant vibration at both CLTP and CPPU conditions. These include the vortex shedding and acoustic frequencies at the primary branch lines,
3) Perform modal analysis and determine which modes have a significant contribution to stress in the piping,

4) Perform piping system dynamic stress analysis using a vibration input spectrum that is nominally flat, but with increased accelerations in the regions of the potentially significant vibration frequencies, including appropriate broadening to reflect uncertainty, and
5) Determine locations of maximum stress, displacement and acceleration, which are considered in determining locations for vibration sensors. The methodology for calculating the vibration stresses is based on guidance from ASME OM-S/G-2000 Part 3.

The sensors were placed at representative high stress or displacement locations on each line. Some judgment was used to distribute the accelerometers among the lines and regions to assure representative coverage.

In addition to the VDAS, PPL installed a continuous monitoring system manufactured by Vibro-meter that consists of a series of 16-channel Data Acquisition Units (DAU) installed locally in the reactor building. The Vibro-meter system updates its trend data in the SSES plant computer every 30 seconds. Time waveform and frequency spectra are collected and stored locally within the Vibro-meter system every hour. The last 1400 waveform and spectra are retained. The oldest data is pushed out of the storage buffer one-by-one using a First In - First Out (FIFO) process.

For piping experiencing more than nominal vibration, but not addressed above, the primary local instrumentation used is a hand-held vibration meter, a Vibration Analyzer CSI Model 2120 and 2130, or equivalent. These meters are used at specific locations whenever the visual observation identifies a need for quantitative data and evaluations.

NRC Question 9:

In Attachment 8, PLA-6076 indicated that the SSES acceptance criteria for vibration level of the main steam, feedwater, and other piping systems are based on the guidance of American Society of Mechanical Engineers (ASME) OM S/G Part 3 Code where it requires that the calculated stresses due to steady-state vibration shall not exceed the allowable stress limit as specified by the Code. However, Tables 3 through 5 show that the acceptance criteria are based on the root-mean-square (RMS) of acceleration for each piping. PPL is requested to demonstrate how the piping vibration level will be within the OM Code stress limit using the RMS acceleration value in place of the peak response spectrum used in the classical piping analysis.

PPL Response:

Note that the reference to Attachment 8 in the NRC Question should be Attachment 9.

As explained in the response to Question 4 above, the ratio of peak to RMS acceleration was determined for each accelerometer data set. Piping stress analysis to determine the allowable vibration stress was performed using the peak acceleration values. The acceptance criterion was determined in terms of RMS acceleration by calculating the allowable peak accelerations, then reducing these values by dividing by the peak-to-RMS ratio.

The above approach ensures that OM Code stress limits, calculated based on peak acceleration values, are met even when using measured RMS acceleration values.

NRC Question 10:

Attachment 7 of PLA-6076 lists and describes modifications of systems and components in support of the EPU request for Susquehanna. Attachment 7 indicates that feedwater heaters require modification to reduce the velocity and tube vibrations at the EPU conditions. Attachment 7 also indicates that piping supports will be modified as necessary in the main steam, feedwater, and extraction steam lines for EPU conditions. PPL is requested to confirm whether, and how those modifications are completed. If there are modifications for pipe supports, discuss the modifications and the reason for the modification.

PPL Response:

Three Unit 1 3rd stage feedwater heaters on each of the three heater strings (A, B, and C), were replaced in Spring 2002 and the three 4th stage feedwater heaters will be replaced in the upcoming refueling and inspection outage in Spring 2008 (U1-15th RIO). For Unit 2, six feedwater heaters were replaced during the recent refueling and inspection outage (U2-13th RIO) in Spring 2007. These were the 3rd and 4th stage heaters on each of the three heater strings (A, B, and C). These heaters required replacements to reduce fluid velocities and tube vibration to within acceptable values at CPPU conditions.

As discussed in the response to Question #19 below, for the Main Steam Piping, four new snubbers have been installed, and one replaced on Unit 2. On Unit 1, new supports will be installed, and two snubbers will be replaced. These modifications were required due to increased turbine control/stop valve closure loads that resulted from the higher main steam flow velocities at CPPU conditions.

Based on the vibration data taken and the piping/support walkdowns performed, it is not necessary to modify the feedwater and extraction steam piping supports for CPPU conditions.

NRC Question 11:

Explain, in detail, how the verification and validation of the ACM computer code was performed to satisfy the provisions of ASME NQA-1, "Quality Assurance Requirements for Nuclear Facility Applications," Subpart 2.7, "Quality Assurance Requirements for Computer Software for Nuclear Facility Applications," which has been accepted by the NRC in satisfying the requirements in Title 10 of the Code of Federal Regulations (10CFR) Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants." Your explanation should include how the benchmarking of the ACM computer code was accomplished.

PPL Response:

ACM model development followed the procedures for analysis and calculation generation, and computer code generation, as found in the CDI Nuclear Quality Assurance Manual (Revision 14). This manual requires compliance to applicable sections of ANSI N45.2, ANSI/ASME NQA-1, and reporting requirements of 10CFR Part 21. Model validation is detailed in CDI Report No. 05-28P, which was provided to the staff as Appendix 4 of Attachment 10 of Reference 1.

Model benchmarking is detailed in the attached (proprietary) appendix entitled "Bounding Methodology to Predict Full Scale Steam Dryer Loads from In-Plant Measurements."

PPL retains CDI on the SSES Quality Suppliers List (QSL) as an approved provider of Engineering Services And Analytical Computer Software. Validation of this status was most recently demonstrated via PPL's active participation in Nuclear Procurement Issues Committee (NUPIC) Audit #19434 (dated July 8, 2005), which concluded that CDI is effectively implementing its quality assurance program.

NRC Question 12:

Section 3.2.2 of Attachment 4 of the PLA-6076 indicates that: "Typically, new stresses are determined by scaling the "original" stresses based on the EPU/CPPU (Constant Pressure Power Uprate) conditions (pressure, temperature, and flow)." Explain how the scaling factor(s) are derived. Confirm whether more than one scaling factor was used. If yes, provide a list of these factors. Are the dead weight and seismic stresses (which should not change) also scaled up?

PPL Response:

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NRC Question 13:

Provide tabular data similar to Table 3-7 of Attachment 4 to PLA-6076 to document the maximum reactor recirculation system (RRS) pipe stresses and cumulative usage factors (CUFs) for the RRS piping during CPPU operation.

PPL Response:

Tables 7 and 8 of the responses to these questions contain tabular data similar to Table 3-7 of Attachment 4 (Reference 1). These tables show that the Units 1 & 2 Reactor Recirculation System (RRS) maximum pipe stresses and cumulative usage factors (CUFs) at CLTP and CPPU conditions are within existing ASME B&PV Code, Section III, Subsection NB 3650 allowables.

NRC Question 14:

Section 8 of Attachment 9 to PLA-6076 notes that recorded accelerations for the recirculation/RHR piping are about 60% of the screening criteria, because, "These vibration levels reflect the system response to recirculation pump vane passing frequencies." Explain the predicted vibratory response of the recirculation pump and piping for the increased system flow rate due to CPPU.

PPL Response:

The vibration recorded at the accelerometers on the recirculation/RHR piping is almost entirely at the recirculation pump vane pass frequency. It is not associated with main steam or feedwater flow effects and their frequencies. [[ ]]. This is expected to result in an increase in flow-induced vibration of [[ ]], which is significantly less than the 40% margin available.

NRC Question 15:

PPL is requested to augment Attachment 4 to PLA-6076 to discuss: (1) the code of record for the recirculation pumps and supports; (2) the design basis loads for the recirculation pumps and supports, and any changes to these loads, including flow rate, due to CPPU; (3) the adequacy of the original analyses (stress and fatigue)/tests to qualify the recirculation pumps and supports, or any changes to these analyses/tests for CPPU, and (4) the potential for higher pump vibration levels due to greater flow rate for CPPU.

PPL Response:

(1) The code of record for the recirculation pumps and supports is the ASME Boiler and Pressure Vessel Code, Section III. As described in SSES FSAR Section 3.9.3.1.6, Section VIII, Division 1, 1971 Edition, with latest Addenda was used as a guide determine the thickness of pressure-retaining parts, and in sizing the pressure-retaining bolting.

(2) The design basis loads for the recirculation pumps and supports are those used for the Nuclear Steam Supply Systems (NSSS), as listed in Table 3.9-2 of the SSES FSAR. The OBE/SSE and the hydrodynamic loads are not changed by CPPU as stated in Section 3.5.1 of the Attachment 4 (Reference 1).

(3) The SSES FSAR described analyses and tests are adequate to qualify the recirculation pumps and supports. The CLTP analyses results for the recirculation pumps are summarized in Tables 3.9-2e and 3.9-2e.1 of the SSES FSAR. The pump support analyses are included with the piping qualification calculations. These analyses are applicable to CPPU conditions because [[

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The RRS CLTP and CPPU temperatures, pressures, and flow rates are presented in the SSES Attachment 4 (Reference 1), Section 3.5.1. The changes from CLTP to CPPU are a [[

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(4) The [[

]], which is considered to be negligible. The vibration of the pump itself is not expected to change significantly, as the operating speed will remain within the range of speeds qualified for current operation. In addition to the expected [[

]], the primary frequency of vibration of the piping will shift in proportion to recirculation pump speed changes. However, vibration measurements have been taken at the higher pump speeds associated with increased core flow operation. The vibration levels at these higher speeds were found to remain within acceptable levels.

NRC Question 16:

Provide results of the piping analyses of the main steam and feedwater lines inside and outside containment for the increased flow rates during CPPU operation for SSES 2.

PPL Response:

Tables 3-6 and 3-7 of Attachment 4 (Reference 1) show that the four main steam and two feedwater lines inside containment in each unit will continue to meet the ASME B&PV Code, Section III, Subsection NB 3650 allowables at CPPU conditions. The increased flow rates in the feedwater lines outside containment during CPPU operation have negligible effects on the piping analysis.

The increased flow rates in the main steam lines outside containment during CPPU operation have significant effects on the piping transient analysis, as discussed in the response to Question #17 below. The results of completed analyses for Unit 1 & 2 main steam outside containment are provided in the attached Tables 2 through 5.

NRC Question 17:

Provide the evaluation of the turbine stop valve closure transient at CPPU conditions for SSES 2.

PPL Response:

The Turbine Stop Valve Closure (TSVC) transient loading is considered one of the most significant loads for the qualification of piping and supports to CPPU conditions because the TSVC load was already a significant load at transient CLTP conditions. The increase in the main steam flow rate for CPPU will increase this load. The CPPU evaluations contained in Attachment 4 (Reference 1), Tables 3-10 through 3-14 used very conservative scaling factors to identify the components, pipe stress, and support loads that might exceed their allowable. These analyses and supports were input to the PPL modification process where the first step was to analyze the CPPU mass flows with the corresponding pressures with the same computer program and model as in the CLTP analysis. The analysis removed unnecessary conservatisms by using more detailed bounding Turbine Control Valve (TCV)/TSV closing inputs. Detailed forcing functions at CPPU conditions were determined for the piping inside and outside containment.

These CPPU forcing functions were applied to the piping stress calculations and the revised results were evaluated against existing criteria. The results showed increases in some pipe support loads and decreases in others. In addition, the analysis results were compared to original plant startup test loads scaled up to CPPU conditions. The higher of the analyzed or the scaled test values are used as the final CPPU results.

Tables 3-12 and 3-13 of Attachment 4 (Reference 1) show that by using conservative scaling factors, thirteen (13) supports in each unit could exceed their allowable. The results of the subsequent detailed computer analysis (discussed above) showed that the original CPPU scaling factors were overly conservative for most of the supports. The

number of required Unit 2 support modifications were reduced from thirteen (13) to one (1), and the Unit 1 support modifications were reduced to two (2).

In addition, four (4) new snubbers were added in Unit 2 to the piping running from main steam to the reactor feed-pump turbines (RFPTs) to eliminate exceeding the existing vendor load criteria as shown in Table 3-14 of Attachment 4 (Reference 1). Table 6 in the Appendix to these responses provides an update to that table. Table 6 shows that the analyzed CPPU TSVC loads, with 4 snubbers added on the Unit 2 main steam piping to the RFPTs, results in loads on the RFPTs that are within the existing vendor allowables. Similarly, the corresponding Unit 1 calculation is in development to support installation of additional supports during the U1-15th refueling and inspection outage in Spring 2008.

NRC Question 18:

Table 3-14 of Attachment 4 to PLA-6076 lists allowable reactor feed-pump (RFP) turbine nozzle forces and moments. Provide the basis for these allowables and the interaction formula.

PPL Response:

The reactor feed-pump turbine (RFPT) nozzle load allowables are the original values supplied by the vendor, General Electric, during the initial design of Units 1 & 2. The interaction formula is a commonly used relationship of forces and moments that are applied to rotating equipment. The resultants combine normal and the transient turbine Stop and Control Valve Closure (TSVC/TCVC) loadings and are resolved at the point of the intersection of the RFPT shaft centerline and the vertical centerline of the exhaust.

There are two load combination criteria. These are as follows:

1) The combined forces and moments applied at any one connection (the highest loads from one connection is the supply from the high pressure main steam system):

   $(F_r/3{,}000) + (M_r/18{,}000) \leq 1.0$ where

   F_r = The resultant of the forces of the three orthogonal directions from the high pressure steam supply piping (lbs).

   M_r = The resultant of the moments of the three orthogonal directions from the high pressure steam supply piping (ft-lbs).

2) The combined resultant of all forces and moments applied at all connections to the turbine. (There are 2 connections to the turbine: from the main steam and from the low pressure turbine.)

$(F_r/6{,}000) + (M_r/36{,}000) \leq 1.0$ where

F_r = The Total resultant of the forces of the three orthogonal directions from the high & low pressure steam supply piping (lbs).

M_r = The Total resultant of the moments of the three orthogonal directions from the high & low pressure steam supply piping (ft-lbs).

Note: The loads from the turbine exhaust flange are excluded from the load combination checks described above.

NRC Question 19:

Tables 3-11 through 3-14 of Attachment 4 to PLA-6076 list piping and supports that will be modified for CPPU. Provide a summary list that identifies the nature of these modifications for the affected components.

PPL Response:

The following provides a summary listing of the tables provided in the Appendix to these responses. These Tables identify the nature of the modifications required to mitigate the effects of the increased turbine stop or control valve rapid closure at CPPU conditions.

In many cases, the tables provided in the Appendix are updates of tables originally provided in Attachment 4 of Reference 1. The updated results reflect refined analyses performed to support the development of plant modifications.

Table 1 An update of Table 3-11 (Attachment 4, Ref. 1) shows Unit 2 stress at CPPU conditions are within ANSI allowable. The addition of 4 new snubbers along the high pressure steam supply to the reactor feed-pump turbine (RFPT) piping reduces stresses and loads to within allowable.

Table 2 An update of Table 3-12 (Attachment 4, Ref. 1) shows Unit 1 loads at CPPU conditions within allowable for 11 of 13 supports. This is due to a more detailed computer analysis as explained in the response to Question #17 above.

Table 3 Reflects the replacement of two Unit 1 overloaded single 100 PSA mechanical snubbers with higher capacity Lisega hydraulic snubbers. The loads at CPPU conditions for the two new Lisega snubbers are within allowable.

Table 4 An update of Table 3-13 (Attachment 4, Ref. 1) shows Unit 2 loads at CPPU conditions within allowable for twelve of thirteen supports. This is due to a more detailed computer analysis as explained in the response to Question #17 above.

Table 5 Reflects the replacement of one Unit 2 overloaded single 100 PSA mechanical snubber with a higher capacity Lisega hydraulic snubber. The loads at CPPU conditions for the new Lisega snubber are within allowable.

Table 6 An update of Table 3-14 (Attachment 4, Ref. 1) shows CPPU loads within allowable for the Unit 2 reactor feed-pump turbines (RFPT). The addition of 4 new hydraulic snubbers on the high pressure steam supply piping reduces pipe stresses and loads on the RFPTs at CPPU conditions to within allowable.

The refinement of Unit 1 analyses, as denoted in Tables 1 and 6, is ongoing in accordance with PPL's engineering change process to support plant changes during the Unit 1 15th refueling and inspection outage in Spring 2008. These modifications will add new hydraulic snubbers to ensure that the loads on the RFPT nozzles meet the existing vendor allowable at CPPU conditions.

NRC Question 20:

Note 6 of Table 3-8 of Attachment 4 to PLA-6076 indicates that: "In order to reduce conservatism, credit was taken for the seismic pins to resist lateral loads, which results in the elimination of bending stress in the shroud head bolts." Provide a description of the evaluation of the seismic pins for CPPU.

PPL Response:

The shroud head assembly in the SSES Unit 1 and 2 are provided with [[ ]] seismic pins, [[ ]], mounted vertically on the shroud flange. These fit into corresponding close-fitting blind holes in the shroud head flange. The pins do not prevent lifting of the shroud head, but provide redundant capacity to the shroud head assembly to prevent sliding.

The available friction force in the Upset, Emergency and Faulted conditions - calculated as the (friction coefft, μ) x (shroud head bolt pre-load, **V**) is not adequate to prevent sliding of the shroud head. Hence, the shear resistance of the pins was also considered. Seismic pins by themselves have the capacity to support the entire horizontal load in shear, and the stresses meet the ASME Code allowable limits for all operating levels.

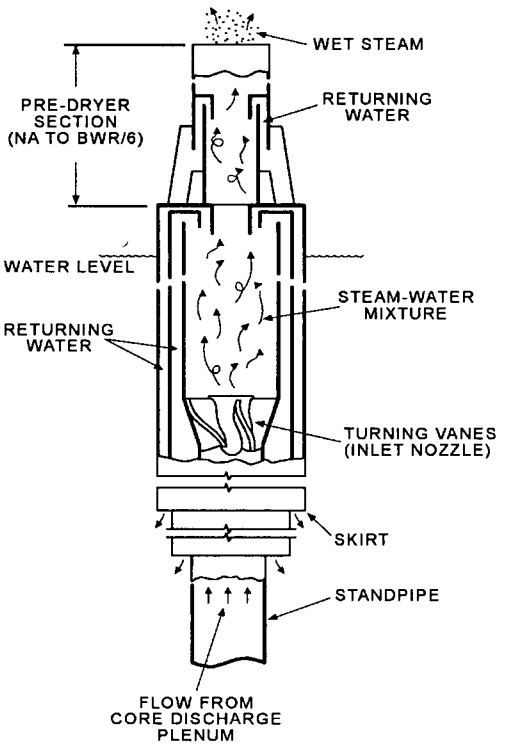
Furthermore, due to the close fitting holes around the shear pins, there is no horizontal displacement of the shroud head with respect to the shroud flange. Consequently, there is no bending stress induced in the shroud head bolts, and hence, the membrane stresses are governing for this component.

NRC Question 21:

Section 3.4.2 of Attachment 4 to PLA-6076 indicates that the steam separator is "significantly affected by CPPU conditions". Provide a summary of the evaluation of the steam separator for CPPU.

PPL Response:

The steam separator is a non-safety related component. The fixed axial flow type steam separators have no moving parts and are made of stainless steel. In each separator, the steam-water mixture rising through the standpipe impinges on the vanes, which give the mixture a spin to establish a vortex where in the centrifugal forces separate the water from the steam in each of three stages. The steam leaves the separator at the top and passes into the wet steam plenum below the dryer. The separated water exits from the lower end of each stage of the separator and enters the pool that surrounds the standpipes to join the downcomer annulus flow. At EPU conditions, the higher steam output from the core results in an increase of approximately 13% in the steam flow velocity through the separator. This notable increase in steam flow velocity may increase the flow induced vibration of the steam separators. A typical steam separator is shown on the next page:



Typical Steam Separator

The Susquehanna shroud head and steam separator assembly uses GE Model 67PL axial flow steam separators. Each steam separator is mounted on a 6-inch Schedule 40 standpipe. The array of standpipes and steam separators are braced laterally. The 67PL separator has an inner barrel (9.00" outside diameter, 0.25" thickness), a middle tube with skirt (11.25" outside diameter, 0.125" thickness) and an outer tube (12.75" outside diameter, 0.125" thickness). At the top of the separator is the pre-dryer tube (6.5" outside diameter, 0.125" thickness). The separator is about 101" in height from the bottom of the skirt to the top of the pre-dryer.

With the introduction of the smaller diameter and more flexible BWR/6 steam separators (Model AS2B), extensive vibration tests were conducted to investigate potential flow induced vibration issues. These tests provide the basis for the Susquehanna EPU evaluation. [[

]] The AS2B separator has an inner barrel (8.75" outside diameter, 0.125" thickness), and an outer tube with skirt (10" outside diameter, 0.125" thickness). The AS2B separator is about 90.125" from the bottom of the skirt to the top of the separator.

[[

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In addition, there are no known structural problems related to temperature or flow effects in steam separators. Thus, EPU operation is not expected to have any detrimental effect on the structural integrity and functionality of the steam separators at Susquehanna.

NRC Question 22:

Section 10.3.3 of Attachment 4 to PLA-6076 indicates that some mechanical equipment such as pumps and heat exchangers were reviewed for increased nozzle loads and component support loads for CPPU. Confirm that these reviews addressed the upset, emergency and faulted design conditions, which incorporate Operating Basis Earthquake (OBE) or Safe Shutdown Earthquake (SSE) loads.

PPL Response:

The effects of increased fluid induced loads on safety-related components are described in Sections 3 and 4.1 of Attachment 4 (Reference 1). Safety-related pumps and heat

exchangers are not affected significantly by CPPU. Safety-related components on, or attached, to the main steam piping are affected by CPPU. Some examples are the reactor pressure vessel and the main steam isolation valves. The analyses performed to include the increased turbine stop valve closure loads, discussed in the response to Question #17 above, addresses the upset, emergency and faulted design conditions, which incorporate Operating Basis Earthquake (OBE) or Safe Shutdown Earthquake (SSE) loads as they are defined in the CLTP cases.

NRC Question 23:

Section 10.5.5 of Attachment 4 to PLA-6076 indicates that SSES performed a seismic margins assessment (SMA) following the guidance of EPRI NP-6041. Briefly discuss the referenced SMA performed and summarize any open seismic items from the SMA.

PPL Response:

The SSES seismic margins assessment (SMA) was performed in 1993 and 1994. The methodology presented in EPRI NP-6041 was followed and SSES was classified as a "focused scope" in GL 88-20, Supplement 4. The following provides an overview of the SSES SMA.

SSES was evaluated for a seismic margins earthquake (SME) level of 0.30g, which is 3 times greater than the maximum ground acceleration level of 0.10g associated with the design basis safe shutdown earthquake (SSE). The SMA approach for SSES was to assess the appropriate structures, systems, and equipment to demonstrate a high confidence of low probability of failure to least meet the 0.30g SME level.

To determine the scope of the SMA, a primary and an alternate safe shutdown path for achieving hot shutdown were established. From the paths identified to achieve hot shutdown, a list of equipment, the safe shutdown equipment list (SSEL), was developed. This equipment was a subset of all "Q" equipment, which had been seismically qualified in accordance with IEEE-344 (IEEE Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations) prior to start up. The vast majority of the SMA involved the assessment of the equipment on the SSEL, and included a detailed review of low ruggedness relays. Distribution systems (piping, electrical raceways, and HVAC systems), and safety-related structures were also addressed.

The equipment on the SSEL was evaluated for functional capability and anchorage adequacy at the SME level (0.30g). In addition, accessible equipment was walked-down to: 1) review equipment configuration for vulnerabilities associated with actual failure modes from an earthquake experience data bank; 2) identify installed anchorage

arrangement; and, 3) note any seismic interaction issues that could be detrimental to the performance of the equipment during an earthquake.

The structures, systems, equipment (with a few exceptions), and installed low ruggedness relays were found to be acceptable for the SME. The exceptions noted involved seismic interaction concerns identified during the equipment walk-downs. Examples of these included unrestrained breaker hoists mounted on top of load centers, adjacent panels in close proximity that were not fastened together, and unrestrained items in close proximity to safety-related equipment that could have rolled or toppled into vital equipment during a seismic event. Furthermore, some equipment was noted to have missing and/or broken hardware. All of the identified deficiencies were corrected shortly thereafter, as part of the SSES modification or corrective action programs. There are no open seismic issues associated with the SMA performed in 1993 and 1994.

BOUNDING METHODOLOGY TO PREDICT FULL SCALE STEAM DRYER LOADS FROM IN-PLANT MEASUREMENTS

NRC QUESTION 11 APPENDIX

BOUNDING METHODOLOGY TO PREDICT FULL SCALE STEAM DRYER LOADS FROM IN-PLANT MEASUREMENTS

[[

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TABLES 1 – 8

PIPING LOAD & STRESS DATA TO SUPPORT

NRC QUESTIONS 13, 16, 17, and 19 APPENDIX

TABLE 1

Update to Table 3-11[1] (Attachment 4, Reference 1)
Units 1 & 2 Main Steam and HP Steam to RFPT
Maximum ANSI B31.1 Pipe Stresses For ANSI Equation 9B, Normal/Upset Condition

Unit	Line	CLTP (PSI)	CPPU (PSI)	ANSI Allowable (PSI)	CPPU/ANSI Allowable Ratio
1	HP Steam to RFPT	(1)	(1) (2)	18,000	(1) (2)
2	Steam Seal to Evaporator	17,180	17,150	18,000	0.95 (3)
2	HP Steam to RFPT	16,687	11,163	18,000	0.62 (3)

Notes:

1) Original Table 3-11 (Attachment 4, Reference 1) showed the CPPU Stress for these pipes exceeded allowable.
2) The Unit 1 CPPU stresses are planned to be reduced below allowable by adding Lisega hydraulic snubbers to the High Pressure Steam Piping to the RFPT. The snubbers are planned to be installed in the upcoming Unit 1 15th Refueling outage scheduled for Spring 2008.
3) The Unit 2 CPPU stresses were reduced below allowable by adding 4 Lisega hydraulic snubbers to the HP Steam Piping to the RFPT. The snubbers were installed in the Unit 2 13th Refueling outage completed in Spring 2007.

TABLE 2
Update to Table 3-12[1] (Attachment 4, Reference 1)
Unit 1 Main Steam and Steam Seal Pipe Supports

Pipe Support	Type (2)	Pipe Size	Oper. Cond. (3)	CLTP (4)	CPPU (4)	Allowable (4)	CPPU/ Allowable Ratio
DBB-101-H08	SNB	24	N/U	36,008	58,100	58,100	1.00
DBB-102-H07	SNB	24	N/U	38,842	58,100	58,100	1.00
DBB-102-H17	SNB	24	N/U	118,641	174,400	120,000	1.45 (5)
DBB-103-H07	SNB	24	N/U	40,861	58,100	58,100	1.00
DBB-104-H07	SNB	24	N/U	43,032	58,100	58,100	1.00
DBB-104-H18	SNB	24	N/U	118,414	150,200	120,000	1.25 (5)
DBB-104-H20 (Z)	GUIDE	24	F	102,513	102,017	102,513	0.99
EBD-113-H04	SNB	8	F	4,049	4,214	5,862	0.72
MSL-100-H01	SNB	28	E/F	25,873	27,503	30,626	0.90
MSL-100-H02	SNB	28	E/F	47,449	47,919	55,268	0.87
MSL-100-H03	SNB	28	E/F	19,024	18,242	19,565	0.93
MSL-100-H10 (DP172)	SNB	28	F	38,068	39,905	40,504	0.99
MSL-100-H11 (DP264)	SNB	28	F	57,881	61,164	67,524	0.91

Notes:

1) Original Table 3-12 (Attachment 4, Reference 1) showed the CPPU Load for these pipe supports exceeded allowable. Except for the 2 pipe supports referenced in Note 5, the remainder of the supports above are shown to be within their allowable and do not require modification.
2) SNB = Snubber
3) N/U = Normal/Upset, E = Emergency, F = Faulted. Only the worst-case is shown.
4) Values are Pounds (lbs).
5) These 2 pipe supports still exceed their allowable load rating. Each is being replaced by a larger capacity Lisega Hydraulic snubber in the upcoming Unit 1 15th Refueling outage.

TABLE 3
Unit 1 Main Steam Pipe Supports That are Being Modified

Pipe Support	Type (2)	Pipe Size	Oper. Cond. (3)	CLTP (4)	CPPU (4)	Allowable (1) (4)	CPPU/ Allowable Ratio
DBB-102-H17 (1)	SNB	24	N/U	118,641	174,400	180,000	0.97
DBB-102-H17 (1)	SNB	24	E/F	164,561	211,321	215,000	0.98
DBB-104-H18 (1)	SNB	24	N/U	118,414	150,200	180,000	0.84
DBB-104-H18 (1)	SNB	24	E/F	157,535	183,108	215,000	0.85

Notes:

1) These pipe supports will be replaced by larger capacity Lisega Hydraulic snubbers in the next Unit 1 15th Refueling outage scheduled for Spring 2008. The allowables shown are for the replacement snubbers.
2) SNB = Snubber
3) N/U = Normal/Upset, E/F = Emergency/Faulted.
4) Values are in Pounds (lbs).

TABLE 4
Update to Table 3-13[1] (Attachment 4, Reference 1)
Unit 2 Main Steam and Steam Seal Pipe Supports

Pipe Support	Type (2)	Pipe Size	Oper. Cond. (4)	CLTP (4)	CPPU (4)	Allowable (4)	CPPU/ Allowable Ratio
DBB-201-H24	SNB	24	N/U	117,520	150,200	120,000	1.25 (5)
DBB-202-H04	SNB	24	E	26,082	25,161	26,082	0.96
DBB-203-H21	SNB	24	E	163,874	211,910	215,000	0.99
DBB-205-H12	ANC	24	N/U	141,664	101,115	156,312	0.65
EBD-213-H05	SNB	8	E	3,427	3,521	3,537	0.99
EBD-213-H10	ANC	8	F	3,786	4,865	5,047	0.96
EBD-213-H10	ANC	8	F	18,144	20,270	24,186	0.84
MSL-200-H01	SNB	28	N/U	19,519	20,051	20,885	0.96
MSL-200-H03	SNB	28	N/U	14,145	13,069	14,286	0.91
MSL-200-H09A	SNB	28	E	52,804	53,166	55,972	0.95
MSL-200-H09B	SNB	28	E	16,297	15,813	17,438	0.91
MSL-200-H11A	SNB	28	N/U	41,185	44,328	47,363	0.94
MSL-200-H11B	SNB	28	N/U	50,990	51,937	55,000	0.94

Notes:

1) Original Table 3-13 (Attachment 4, Reference 1) showed the CPPU Load for these pipe supports exceeding allowable. Except for the 1 pipe support described in Note 5, the remainder of the supports above are shown to be within their allowable and do not require modification.
2) ANC = Anchor [Only the highest of the 3 forces and the highest of the 3 moments are shown.] SNB = Snubber.
3) N/U = Normal/Upset, E = Emergency, F = Faulted. Only the worst-case is shown.
4) Values are Pounds (lbs) except for the moment value at the anchor that is ft-lbs.
5) This pipe support still exceeded the allowable load rating. It was replaced by a larger capacity Lisega Hydraulic snubber in the last Unit 2 13th Refueling outage completed in Spring 2007.

TABLE 5
Unit 2 Main Steam Pipe Support As Modified

Pipe Support	Type (2)	Pipe Size	Oper. Cond. (3)	CLTP (4)	CPPU (4)	Allowable (1) (4)	CPPU/ Allowable Ratio
DBB-201-H24 (1)	SNB	24	N/U	117,520	150,200	164,000	0.92
DBB-201-H24 (1)	SNB	24	E/F	160,786	188,051	199,000	0.95

Notes:

1) This pipe support was replaced by a larger capacity Lisega Hydraulic snubber in the last Unit 2 13th Refueling outage completed in Spring 2007. The allowable is for the replacement snubber.
2) SNB = Snubber
3) N/U = Normal/Upset, E/F = Emergency/Faulted.
4) Values are in Pounds (lbs).

TABLE 6

Update to Table 3-14 (Attachment 4, Reference 1)
Unit 2 High Pressure Steam to Reactor Feed Pump Turbine Nozzles

Unit	Feedpump Turbine HP Steam Nozzles	Location	Pipe Size	Oper. Cond. (1)	CLTP	CPPU	Allowable	CPPU/ Allowable (4)
1	RFPT 1S-105A	Force (2)		N/U				
		Moment (3)		N/U				(5)
		Interaction (4)	4	N/U				
1	RFPT 1S-105B	Force (2)		N/U				
		Moment (3)		N/U				(5)
		Interaction (4)	4	N/U				
1	RFPT 1S-105C	Force (2)	4	N/U				
		Moment (3)		N/U				(5)
		Interaction (4)		N/U				
2	RFPT 2S-105A	Force (2)		N/U	1,362	1,209	3,000	0.403
		Moment (3)		N/U	10,359	5,848	18,000	0.325
		Interaction (4)	4	N/U	N/A	N/A	1.0	0.728
								(6)
2	RFPT 2S-105B	Force (2)		N/U	1,120	1,148	3,000	0.383
		Moment (3)		N/U	11,148	10,325	18,000	0.574
		Interaction (4)	4	N/U	N/A	N/A	1.0	0.956
								(6)

Notes:

1) N/U = normal/Upset is the controlling case; the Emergency and Faulted cases will have the same pipe loads with higher allowables, thus smaller interaction values.
2) Values are Pounds (lbs).
3) Values are ft-lbs.
4) Values are dimensionless. Interaction value is the sum of the force + moment values as follows: (Force/3,000) + (Moment/18,000) < 1.0).
5) These nozzles and the attached piping are in the modification process because the applied forces and moments exceed the nozzle allowable. As with Unit 2, new snubbers are planned to be added and the nozzle limits to be met. The snubbers will be installed during the Unit 1 15th Refueling outage in Spring 2008.
6) Four new snubbers were added to this piping during the Unit 2, 13th Refueling outage and now these nozzles and the attached piping meet the RFPT vendor allowable and the ANSI B31.1 Power Piping Code.

TABLE 7[1]
UNIT 1 Reactor Recirculation ASME Class 1 Piping
Maximum Stress Intensity Summary

ASME Equation (2)	Condition	CLTP (PSI)	CPPU (PSI)	ASME Allowable (PSI)	CPPU/ Allowable Ratio (3)
9A	Design	24,339	(3)	25,010	0.973
9B	Normal/Upset	27,378	(3)	27,750	0.987
9C	Emergency	31,047	(3)	33,300	0.932
9D	Faulted	40,557	(3)	50,025	0.811
10		77,326	(3)	50,025	1.546 (4)
12		36,003	(3)	50,025	0.720
13		48,918	(3)	50,025	0.978
Cumulative Usage Factor (5)	Fatigue Check	0.6402	(3)	1.0	0.6402

Notes:

1) Results are the maximum values for the two loops of the Reactor Recirculation Piping Inside Containment.
2) ASME B&PV Code, Section III, Subsection NB 3650.
3) The CLTP values apply also to CPPU conditions since the CPPU pressures, temperatures, and flow rates are negligibly different from those used in the CLTP analyses.
4) This value is acceptable because equations 12 and 13 are within allowable.
5) These values are dimensionless.

TABLE 8[1]

UNIT 2 Reactor Recirculation ASME Class 1 Piping
Maximum Stress Intensity Summary

ASME Equation (2)	Condition	CLTP (PSI)	CPPU (PSI)	ASME Allowable (PSI)	CPPU/ Allowable Ratio (3)
9A	Design	24,349	(3)	25,010	0.974
9B	Normal/Upset	26,232	(3)	27,750	0.945
9C	Emergency	32,331	(3)	33,300	0.971
9D	Faulted	37,212	(3)	50,025	0.744
10		90,466	(3)	50,025	1.808 (4)
12		49,793	(3)	50,025	0.995
13		47,764	(3)	50,025	0.954
Cumulative Usage Factor (5)	Fatigue Check	0.7502	(3)	1.0	0.7502

Notes:

1) Results are the maximum values for the two loops of the Reactor Recirculation Piping Inside Containment.
2) ASME B&PV Code, Section III, Subsection NB 3650.
3) The CLTP values apply also to CPPU conditions since the CPPU pressures, temperatures, and flow rates are negligibly different from those used in the CLTP analyses.
4) This value is acceptable because equations 12 and 13 are within allowable.
5) These values are dimensionless.

Attachment 3
General Electric Company and Continuum Dynamics Incorporated (CDI) Affidavits

Attachment 3
General Electric Company and Continuum Dynamics Incorporated (CDI) Affidavits

Continuum Dynamics, Inc.
(609) 538-0444 (609) 538-0464 fax 34 Lexington Avenue Ewing, NJ 08618-2302

AFFIDAVIT

Re: Enclosure to PLA-6200 Request for Additional Information Responses

I, Alan J. Bilanin, being duly sworn, depose and state as follows:

1. I hold the position of President and Senior Associate of Continuum Dynamics, Inc. (hereinafter referred to as C.D.I.), and I am authorized to make the request for withholding from Public Record the Information contained in the documents described in Paragraph 2. This Affidavit is submitted to the Nuclear Regulatory Commission (NRC) pursuant to 10 CFR 2.390(a)(4) based on the fact that the attached information consists of trade secret(s) of C.D.I. and that the NRC will receive the information from C.D.I. under privilege and in confidence.

2. The Information sought to be withheld, as transmitted to PPL Susquehanna LLC as attachment to C.D.I. Letter No. 07089 dated 17 May 2007, Enclosure to PLA-6200 Request for Additional Information Responses.

3. The Information summarizes:

   (a) a process or method, including supporting data and analysis, where prevention of its use by C.D.I.'s competitors without license from C.D.I. constitutes a competitive advantage over other companies;
   (b) Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;
   (c) Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

   The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs 3(a), 3(b) and 3(c) above.

4. The Information has been held in confidence by C.D.I., its owner. The Information has consistently been held in confidence by C.D.I. and no public disclosure has been made and it is not available to the public. All disclosures to third parties, which have been limited, have been made pursuant to the terms and conditions contained in C.D.I.'s Nondisclosure Secrecy Agreement which must be fully executed prior to disclosure.

5. The Information is a type customarily held in confidence by C.D.I. and there is a rational basis therefore. The Information is a type, which C.D.I. considers trade secret and is held in confidence by C.D.I. because it constitutes a source of competitive advantage in the competition and performance of such work in the industry. Public disclosure of the Information is likely to cause substantial harm to C.D.I.'s competitive position and foreclose or reduce the availability of profit-making opportunities.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to be the best of my knowledge, information and belief.

Executed on this 18 day of May 2007.

Alan J. Bilavin
Continuum Dynamics, Inc.

Subscribed and sworn before me this day: May 18, 2007

Eileen P. Burmeister, Notary Public

EILEEN P. BURMEISTER
NOTARY PUBLIC OF NEW JERSEY
MY COMM. EXPIRES MAY 6, 2012

General Electric Company

AFFIDAVIT

I, George B. Stramback, state as follows:

(1) I am Manager, Regulatory Services, General Electric Company ("GE") and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in Enclosure 1 to GE letter GE-SSES-AEP-323, Larry King (GE) to Mike Gorski (PPL), *GE Proprietary Review of PPL Letters PLA-6196 and PLA-6200,* dated May 22, 2007. The proprietary information in the Enclosures 1 and 2, which are entitled *GE Proprietary Review of PPL Letter PLA-6196 and GE Proprietary Review of PPL Letter PLA-6200*, is delineated by a [[dotted underline inside double square brackets.{3}]] Figures and large equation objects are identified with double square brackets before and after the object. In each case, the sidebars and the superscript notation{3} refers to Paragraph (3) of this affidavit, which provides the basis for the proprietary determination.

(3) In making this application for withholding of proprietary information of which it is the owner, GE relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.390(a)(4) for "trade secrets" (Exemption 4). The material for which exemption from disclosure is here sought also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by General Electric's competitors without license from General Electric constitutes a competitive economic advantage over other companies;

b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;

c. Information which reveals aspects of past, present, or future General Electric customer-funded development plans and programs, resulting in potential products to General Electric;

d. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a., and (4)b, above.

(5) To address 10 CFR 2.390 (b) (4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GE, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GE, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge. Access to such documents within GE is limited on a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority, by the manager of the cognizant marketing function (or his delegate), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GE are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information identified in paragraph (2), above, is classified as proprietary because it contains detailed information about the results of analytical models, methods and processes, including computer codes, which GE has developed, obtained NRC approval of, and applied to perform evaluations of loss-of-coolant accident events in the GE Boiling Water Reactor ("BWR"). The development and approval of the BWR loss-of-coolant accident analysis computer codes was achieved at a significant cost to GE, on the order of several million dollars.

The development of the evaluation process along with the interpretation and application of the analytical results is derived from the extensive experience database that constitutes a major GE asset.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GE's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GE's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GE.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GE's competitive advantage will be lost if its competitors are able to use the results of the GE experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GE would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GE of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing these very valuable analytical tools.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information, and belief.

Executed on this 22nd day of May 2007.

George B. Stramback

George B. Stramback
General Electric Company

General Electric Company

AFFIDAVIT

I, Bradley J. Erbes, state as follows:

(1) I am Manager Services Engineering, General Electric Company ("GE") and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in Enclosure 1 of the GE-SSES-AEP-322, Larry King (GE) to Mike Gorski (PPL), *GE Responses to BWR Systems RAIs 10, 12, 14, 33 and 40; Mechanical and Civil RAIs 1, 3, 7, 12, 20 and 21; Containment and Venting RAIs 1, 3, 5, 9 and 14*, GE Proprietary Information, dated May 21, 2007. The Enclosure 1 (*GE Responses to BWR Systems RAIs 10, 12, 14, 33 and 40; Mechanical and Civil RAIs 1, 3, 7, 12, 20 and 21; Containment and Venting RAIs 1, 3, 5, 9 and 14*) proprietary information is delineated by a dotted underline inside double square brackets. In each case, the superscript notation{3} refers to Paragraph (3) of this affidavit, which provides the basis for the proprietary determination.

(3) In making this application for withholding of proprietary information of which it is the owner, GE relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.390(a)(4) for "trade secrets" (Exemption 4). The material for which exemption from disclosure is here sought also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by General Electric's competitors without license from General Electric constitutes a competitive economic advantage over other companies;

b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;

c. Information which reveals aspects of past, present, or future General Electric customer-funded development plans and programs, resulting in potential products to General Electric;

d. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a., and (4)b, above.

(5) To address 10 CFR 2.390 (b) (4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GE, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GE, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge. Access to such documents within GE is limited on a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority, by the manager of the cognizant marketing function (or his delegate), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GE are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information identified in paragraph (2), above, is classified as proprietary because it contains detailed results and conclusions from evaluations, utlizing analytical models and methods, including computer codes, which GE has developed, obtained NRC approval of, and applied to perform evaluations of transient and accident events in the GE Boiling Water Reactor ("BWR"). The development and approval of these system, component, and thermal hydraulic modes and computer codes were achieved at a significant cost to GE, on the order of several million dollars.

The development of the evaluation process along with the interpretation and application of the analytical results is derived from the extensive experience database that constitutes a major GE asset.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GE's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GE's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GE.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GE's competitive advantage will be lost if its competitors are able to use the results of the GE experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GE would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GE of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing these very valuable analytical tools.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information, and belief.

Executed on this 18TH day of May 2007

Bradley J. Erbes

Bradley J. Erbes
General Electric Company