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Exelon SM
Nuclear

RS-05-179

December 22, 2005

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Dresden Nuclear Power Station, Units 2 and 3
Renewed Facility Operating License Nos. DPR-19 and DPR-25
NRC Docket Nos. 50-237 and 50-249

Quad Cities Nuclear Power Station, Units 1 and 2
Renewed Facility Operating License Nos. DPR-29 and DPR-30
NRC Docket Nos. 50-254 and 50-265

Subject: Response to Quad Cities Steam Dryer Open Issues

On November 8 and 9, 2005, Exelon Generation Company, LLC, (Exelon) met with the NRC technical staff to discuss the results and conclusions of evaluations performed to demonstrate the acceptability of the Quad Cities Nuclear Power Station (QCNPS) replacement steam dryers for long-term operation at extended power uprate (EPU) conditions. As a result of this meeting, the NRC requested that Exelon provide additional information to support the NRC review of steam dryer related issues and, ultimately, closure of the issues related to operating the QCNPS units at EPU power levels. The attachments to this letter contain the information to support the NRC's review.

Attachment 1 of this letter contains an overall summary of each of the remaining open issues and the associated information that resolves each of them. These responses, in part, refer to technical reports that are enclosed with this letter.

Attachment 1 and the enclosures to this letter contain information considered proprietary to General Electric (GE). Therefore, Exelon requests that this information be withheld from public disclosure in accordance with 10 CFR 2.390, "Public inspections, exemptions, requests for withholding," paragraph (a)(4), and 10 CFR 9.17, "Agency records exempt from public disclosure," paragraph (a)(4). An Affidavit attesting to the proprietary nature of these documents is included in Attachment 1. A non-proprietary version of Enclosure 7 of Attachment 1 will be provided at a later date. Attachment 2 contains a non-proprietary version of Attachment 1 without the enclosures.

A097
A098

Should you have any questions concerning this letter, please contact Mr. Thomas G. Roddey at (630) 657-2811.

Respectfully,

Patrick R. Simpson

Patrick R. Simpson
Manager – Licensing

Attachments

1. Affidavit and Exelon Response to NRC Open Issues Concerning the Quad Cities Units 1 and 2 Replacement Steam Dryers (Proprietary)
2. Exelon Response to NRC Open Issues Concerning the Quad Cities Units 1 and 2 Replacement Steam Dryers (Non-Proprietary)

GE Energy
Nuclear

Richard J. Bodily
Project Manager
Exelon Integrated Steam Dryer

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GE-ENG-DRY-159

December 17, 2005

To: Alan Bontjes (Exelon)

Authors: B. Branlund (GE)

Subject: Review of Failure Modes for Quad Cities Unit 1 Replacement Dryer

Reference: 1. "GE - Quad & Dresden Dryer Performance Program," Exelon Business Services Co., Contract 75766, July 30, 2004.

Dear Alan:

As part of the Exelon Integrated Steam Dryer Project, GE is providing the subject attached engineering documents for review by the NRC. These documents have been verified in accordance with GE's Quality Assurance program.

The Attachment 3 affidavit identifies that the designated information has been handled and classified as proprietary to GE. The designated information is suitable for review by the NRC when accompanied by the attached affidavit. GE hereby requests that the designated information be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390 and 9.17.

GE requests that any transmittal of this proprietary information to the NRC be accompanied by the enclosed affidavit and proprietary notice. In order to maintain the applicability of the affidavit and to meet the requirements of 10CFR2.390, the transmittal to the NRC should:

1) faithfully reproduce the proprietary information,
2) preserve the proprietary annotations, and
3) include the words similar to "GE Proprietary Information" at the top of first page and each page containing the proprietary information.

Based on past discussions with the NRC, GE has been encouraged to request its customers to provide a paragraph similar to the following paragraph for inclusion in their transmittal letters in order to clearly indicate the proprietary nature of the information and to document the source of the proprietary information as indicated in the GE affidavit.

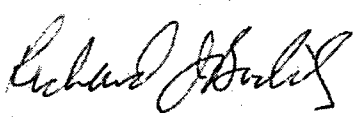
> "The enclosed document contains proprietary information as defined by 10CFR2.390. GE, as the owner of the proprietary information, has executed the enclosed affidavit, which identifies that the enclosed proprietary information has been handled and

classified as proprietary, is customarily held in confidence, and has been withheld from public disclosure. The proprietary information was provided to Entergy in a GE transmittal that identifies the document and the affidavit. GE hereby requests that the enclosed proprietary information be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390 and 9.17. A non-proprietary version of the document is also provided."

Further, 10CFR2.390 requires that the proprietary information be incorporated, as far as possible into a separate paper. Therefore, Attachment 2 hereto contains the non-proprietary and redacted report, and the proprietary information is provided in Attachment 1. GE requests that the non-proprietary version be a hard copy. If an electronic copy of the non-proprietary information is provided to the NRC, GE requests that the non-proprietary information be removed from the file, not simply hidden with white fonts, hidden text or covered with electronic-drawn boxes, which can be readily defeated to reveal the proprietary information.

If you have any questions related to the enclosures, please contact the undersigned at (925) 862-4410.

Very truly yours,



Richard J. Bodily

cc James Meister (Exelon)
Roman Gesior (Exelon)
Guy Deboo (Exelon)
Robert Stachniak (Exelon)
Roy Hunnicutt (Exelon)
Thomsa Roddey (Exelon)

Attachment 1 – GENE-0000-0048-8406-01-P, "Review of Failure Modes for Quad Cities Unit 1 Replacement Dryer" – (Proprietary)

Attachment 2 – GENE-0000-0048-8406-01-NP, "Review of Failure Modes for Quad Cities Unit 1 Replacement Dryer" – (Non-Proprietary)

Attachment 3 – Affidavit, George B. Stramback, dated December 17, 2005

ATTACHMENT 2

GE-ENG-DRY-159

"Review of Failure Modes for Quad Cities Unit 1 Replacement Dryer", GENE-0000-0048-8406-01-NP

NON PROPRIETARY NOTICE

This is a non proprietary version of the document GENE-0000-0048-8406-01-P, which has the proprietary information removed. Portions of the document that have been removed are indicated by an open and closed bracket as shown here [[ ]].

GENE-0000-0048-8406-01-NP
Class I
December 2005

Review of Failure Modes for Quad Cities Unit 1 Replacement Dryer

IMPORTANT NOTICE REGARDING THE CONTENTS OF THIS REPORT

Please Read Carefully

NON PROPRIETARY NOTICE

This is a non proprietary version of the document GENE-0000-0048-8406-01-P, which has the proprietary information removed. Portions of the document that have been removed are indicated by an open and closed bracket as shown here [[ ]].

IMPORTANT NOTICE REGARDING CONTENTS OF THIS REPORT

Please Read Carefully

The only undertakings of the General Electric Company (GENE) with respect to the information in this document are contained in the contract between EXELON and GENE, and nothing contained in this document shall be construed as changing the contract. The use of this information by anyone other than EXELON or for any purpose other than that for which it is intended, is not authorized; and with respect to any unauthorized use, GENE makes no representation or warranty, express or implied, and assumes no liability as to the completeness, accuracy, or usefulness of the information contained in this document, or that its use may not infringe upon privately owned rights.

Process/Product
Failure Modes and Effects Analysis
(FMEA)

Process or Product Name:	Review of Failure Modes for Quad Cities Unit 1 Replacement Dryer						Prepared by: RB, DBD, HSM, DWS, DCP, RMH, LW, VWP				
Responsible:	Brantlund, Horn, Wellstein, Pence	Responsible Verifier: Pappone					FMEA Date (Orig) 11/21/05 Rev. 0				
Process Step/Part Number	**Notes regarding design and modeling**	**Potential Failure Mode**	**Potential Failure Effects**	**SEV**	**Potential Causes**	**OCC**	**Current Controls**	**DET**	**RPN**	**Actions Recommended**	**Resp.**
	Also see Reference 1 Figure 6-3 for full steam dryer model	In what ways can the process step go wrong?	What is the impact of the Failure Mode on the customer?	How severe is the effect on the customer?	What are the causes of the Failure Mode?	How often does the Cause or Failure Mode occur?	What are the existing controls and procedures that prevent the Cause or Failure Mode?	How well can you detect the Cause or Failure Mode?	Calculated	What are the actions for reducing the occurrence, decreasing severity or improving detection?	Who is responsible for the recommended action?
[[ ]] Reference 2 - Table 3-1.	DESIGN and MODELING: [[ ]] Reference 1 - Figure 6-23. STRESS: Refined the model and the stresses were reduced - see "Revised Design Margin" (Reference 2).	High cycle fatigue initiation and fatigue crack growth.	[[ ]] [[ ]]	1	[[ ]]	1	**Assume Detection during Inspection:** Can be inspected with a remote vehicle while in the equipment pool. **Assume Detection during Normal Operation:** [[ ]]	1	1	Inspect with a remote vehicle while in the equipment pool during next outage	Exelon

Process or Product Name:	Review of Failure Modes for Quad Cities Unit 1 Replacement Dryer						Prepared by: RB, DBD, HSM, DWS, DCP, RMH, LW, VWP				
Responsible:	Branlund, Horn, Wellstein, Pence	Responsible Verifier: Pappone					FMEA Date (Orig) 11/21/05 Rev. 0				
Process Step/Part Number	**Notes regarding design and modeling**	**Potential Failure Mode**	**Potential Failure Effects**	**SEV**	**Potential Causes**	**OCC**	**Current Controls**	**DET**	**RPN**	**Actions Recommended**	**Resp.**
	Also see Reference 1 Figure 6-3 for full steam dryer model	In what ways can the process step go wrong?	What is the impact of the Failure Mode on the customer?	How severe is the effect on the customer?	What are the causes of the Failure Mode?	How often does the Cause or Failure Mode occur?	What are the existing controls and procedures that prevent the Cause or Failure Mode?	How well can you detect the Cause or Failure Mode?	Calculated	What are the actions for reducing the occurrence, decreasing severity or improving detection?	Who is responsible for the recommended action?
[[ ]] Reference 2 - Table 3-1	DESIGN and MODELING: [[ ]] Reference 1 - Figure 6-25 STRESS: [[ ]]	High cycle fatigue initiation and fatigue crack growth.	[[ ]]	1	[[ ]]	1	**Assume Detection during Inspection:** External Inspection **Assume Detection during Normal Operation:** [[ ]]	1	1	Inspect while in the equipment pool during next outage. Note: this is recommended to be only an external inspection.	Exelon

Process or Product Name:	Review of Failure Modes for Quad Cities Unit 1 Replacement Dryer						Prepared by: RB, DBD, HSM, DWS, DCP, RMH, LW, VWP				
Responsible:	Brenlund, Horn, Wellstein, Pence	Responsible Verifier: Pappone					FMEA Date (Orig) 11/21/05 Rev. 0				
Process Step/Part Number	**Notes regarding design and modeling**	**Potential Failure Mode**	**Potential Failure Effects**	**SEV**	**Potential Causes**	**OCC**	**Current Controls**	**DET**	**RPN**	**Actions Recommended**	**Resp.**
	Also see Reference 1 Figure 6-3 for full steam dryer model	In what ways can the process step go wrong?	What is the impact of the Failure Mode on the customer?	How severe is the effect on the customer?	What are the causes of the Failure Mode?	How often does the Cause or Failure Mode occur?	What are the existing controls and procedures that prevent the Cause or Failure Mode?	How well can you detect the Cause or Failure Mode?	Calculated	What are the actions for reducing the occurrence, decreasing severity or improving detection?	Who is responsible for the recommended action?
[[ ]] Reference 2 - Table 3-1	DESIGN and MODELING: [[ ]] Reference 1 - Figure 6-26 STRESS: [[ ]]	High cycle fatigue initiation and fatigue crack growth.	[[ ]]	1	[[ ]]	1	**Assume Detection during Inspection:** Can be inspected with a remote vehicle while in the equipment pool. **Assume Detection during Normal Operation:** [[ ]].	1	1	Inspect with a remote vehicle while in the equipment pool during next outage	Exelon

Process or Product Name:	Review of Failure Modes for Quad Cities Unit 1 Replacement Dryer						Prepared by: RB, DBD, HSM, DWS, DCP, RMH, LW, VWP				
Responsible:	Branlund, Horn, Wellstein, Pence	Responsible Verifier: Pappone					FMEA Date (Orig) 11/21/05 Rev. 0				
Process Step/Part Number	**Notes regarding design and modeling**	**Potential Failure Mode**	**Potential Failure Effects**	**SEV**	**Potential Causes**	**OCC**	**Current Controls**	**DET**	**RPN**	**Actions Recommended**	**Resp.**
	Also see Reference 1 Figure 6-3 for full steam dryer model	In what ways can the process step go wrong?	What is the impact of the Failure Mode on the customer?	How severe is the effect on the customer?	What are the causes of the Failure Mode?	How often does the Cause or Failure Mode occur?	What are the existing controls and procedures that prevent the Cause or Failure Mode?	How well can you detect the Cause or Failure Mode?	Calculated	What are the actions for reducing the occurrence, decreasing severity or improving detection?	Who is responsible for the recommended action?
[[ ]] Reference 2 - Table 3-1 [[ ]]]]	DESIGN and MODELING: [[ ]] Reference 1 - Figure 6-29. STRESS: [[ ]]	High cycle fatigue initiation and fatigue crack growth.	[[ ]]	9	[[ ]]	1	**Assume Detection during Inspection:** Can be inspected with a remote vehicle while in the equipment pool. **Assume Detection during Normal Operation:** [[ ]]	1	9	Inspect with a remote vehicle while in the equipment pool during next outage	Exelon

Process or Product Name:	Review of Failure Modes for Quad Cities Unit 1 Replacement Dryer						Prepared by: RB, DBD, HSM, DWS, DCP, RMH, LW, VWP				
Responsible:	Branlund, Horn, Wellstein, Pence	Responsible Verifier: Pappone					FMEA Date (Orig) 11/21/05 Rev. 0				
Process Step/Part Number	**Notes regarding design and modeling**	**Potential Failure Mode**	**Potential Failure Effects**	**SEV**	**Potential Causes**	**OCC**	**Current Controls**	**DET**	**RPN**	**Actions Recommended**	**Resp.**
	Also see Reference 1 Figure 6-3 for full steam dryer model	In what ways can the process step go wrong?	What is the impact of the Failure Mode on the customer?	How severe is the effect on the customer?	What are the causes of the Failure Mode?	How often does the Cause or Failure Mode occur?	What are the existing controls and procedures that prevent the Cause or Failure Mode?	How well can you detect the Cause or Failure Mode?	Calculated	What are the actions for reducing the occurrence, decreasing severity or improving detection?	Who is responsible for the recommended action?
[[ ]] Reference 2 - Table 3-1	DESIGN and MODELING: [[ ]] Reference 1 - Figure 6-32 and solid model from Reference 3 - Figure 6-72. STRESS: [[ ]]	High cycle fatigue initiation and fatigue crack growth.	[[ ]] [[ ]]	1	[[ ]]	5	**Assume Detection during Inspection:** Can be inspected with a remote vehicle while in the equipment pool. **Assume Detection during Normal Operation:** [[ ]]	1	5	Inspect with a remote vehicle while in the equipment pool during next outage	Exelon

Process or Product Name:	Review of Failure Modes for Quad Cities Unit 1 Replacement Dryer						Prepared by: RB, DBD, HSM, DWS, DCP, RMH, LW, VWP				
Responsible:	Branlund, Horn, Wellstein, Pence	Responsible Verifier: Pappone					FMEA Date (Orig) 11/21/05 Rev. 0				
Process Step/Part Number	**Notes regarding design and modeling**	**Potential Failure Mode**	**Potential Failure Effects**	**SEV**	**Potential Causes**	**OCC**	**Current Controls**	**DET**	**RPN**	**Actions Recommended**	**Resp.**
	Also see Reference 1 Figure 6-3 for full steam dryer model	In what ways can the process step go wrong?	What is the impact of the Failure Mode on the customer?	How severe is the effect on the customer?	What are the causes of the Failure Mode?	How often does the Cause or Failure Mode occur?	What are the existing controls and procedures that prevent the Cause or Failure Mode?	How well can you detect the Cause or Failure Mode?	Calculated	What are the actions for reducing the occurrence, decreasing severity or improving detection?	Who is responsible for the recommended action?
[[ ]] Reference 2 - Table 3-1	DESIGN and MODELING: [[ ]] Reference 1 - Figure 6-35 STRESS: [[ ]]	High cycle fatigue initiation and fatigue crack growth.	[[ ]]	1	[[ ]]	1	**Assume Detection during Inspection:** Can be inspected with a remote vehicle while in the equipment pool. **Assume Detection during Normal Operation:** [[ ]].	1	1	Inspect with a remote vehicle while in the equipment pool during next outage	Exelon

Nomenclature:

SEV	How severe is the effect on the customer?
OCC	How often does the Cause or Failure Mode occur?
DET	How well can you detect the Cause or Failure Mode?
Value	1 = Low, 5 = Medium, 9 = High - either severity (SEV), likelihood of occurrence (OCC), or ability to detect (DET) - (a lower value is better)
RPN	=SEV*OCC*DET
Failure	For the purposes of this FMEA failure is defined as crack initiation and propagation with the potential for generating a loose part.

References:

1. L. Wellstein, et. al., "Quad Cities Unit 1 Replacement Steam Dryer Stress and Fatigue Analysis at EPU Power Level of 2957 MWt Based on Measured EPU Conditions," GE-NE, Sunol, CA, August 2005, (GENE-0000-0043-5391-01P, Revision 1). GE Proprietary Information
2. L. Wellstein and J. Waal, "Quad Cities Units 1 and 2 Replacement Steam Dryer Analysis Stress, Dynamic, and Fatigue Supplementary Analysis for EPU Conditions," GE-NE Sunol, CA, December 2005, (GENE-0000-0046-5358-01 Rev 1-P) GE Proprietary Information
3. "Quad Cities Units 1 and 2 Replacement Steam Dryer Analysis Stress, Dynamic, and Fatigue Analyses for EPU Conditions," DRF GE-NE-0000-0034-3781, DRF Section GE-NE-0000-0039-4902, Revision 0, Class III, April 2005

ATTACHMENT 3

GE-ENG-DRY-159

Affidavit

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 GE Proprietary report, GENE-0000-0048-8406-01-P, *Review of Failure Modes* for *Quad Cities Unit 1 Replacement Dryer*, Class III (GE Proprietary Information), dated December 2005. The proprietary information is delineated by a double underline inside double square brackets. Figures and large equation objects are identified with double square brackets before and after the object. 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 details of steam dryer stress, dynamic and fatigue analyses of the design of the BWR Steam Dryer. Development of this information and its application for the design, procurement and analyses methodologies and processes for the Steam Dryer Program was achieved at a significant cost to GE, on the order of approximately two 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 17th day of December 2005.

George B. Stramback

George B. Stramback
General Electric Company

Response to NRC Concern on Quad Cities Steam Dryer Startup Criteria

NON PROPRIETARY NOTICE

This is a non proprietary version of the document GE-NE-0000-0045-5505-01-P, which has the proprietary information removed. Portions of the document that have been removed are indicated by an open and closed bracket as shown here [[ ]].

Response to NRC Concern on Quad Cities Steam Dryer Startup Criteria

NRC RAI: The NRC wants to see if Exelon met startup criteria on QC2 for strain gage locations S-5, S-7, and S-9 using calculated stresses (Using the modified action levels generated during the QC2 startup testing and the final stresses calculated for various components, determine whether any criteria were exceeded for strain gages).

Response (prepared by Richard Wu, eDRF Section 0000-0045-5505):

References:

1. "Quad Cities Replacement Steam Dryer Instrumentation Acceptance Criteria" GENE, DRF 0000-0032-1827, Section 0000-0036-2077, Revision 0, April 2005.

2. "Quad Cities Units 1 and 2 Replacement Steam Dryer Analysis Stress, Dynamic, and Fatigue Analyses for EPU Conditions" DRF GE-NE- 0000-0034-3781, Section GE-NE-0000-0039-4902, Revision 0, April 2005.

3. "Quad Cities Replacement Steam Dryer Improved Acceptance Criteria for Strain Gages S-5 and S-7" GENE, DRF 0000-0040-7752-01, Section 0000-0040-7755, Revision 0, May 2005.

4. "Quad Cities Replacement Steam Dryer Revised Acceptance Criteria for Strain Gage S-7" GENE, DRF 0000-0040-7752-03 R1, Section 0000-0040-7755 Revision 2, June 2005.

5. "Quad Cities Unit 2 Replacement Steam Dryer Vibration Instrumentation Program Plant Startup Test Report" GE-NE- 0000-0044-2240-01, Section 0000-0030-1241 Revision 0, August 2005.

6. "Quad Cities Unit 2 Replacement Steam Dryer Stress and Fatigue Analysis Based on Measured EPU Conditions" DRF GENE- 0000-0043-3105-01, July 2005.

7. "QC1 & 2 Replacement Steam Dryer Stress, Dynamic, and Fatigue Supplementary Analysis for EPU Conditions" DRF GENE- 0000-0046-5358, Section 0000-0046-5359, October 2005.

8. "Fatigue Stress Threshold Criteria for use in the Exelon Replacement Steam Dryer", GENE-0000-0034-8374, October 2004.

A startup test was performed on the QC2 new steam dryer. The new steam dryer was instrumented with strain gages (Reference 1) that are located on components where finite element analysis (FEA, Reference 2) predicted high stresses (as listed in Table 1). Of the strain gages installed, only 5 strain gages were operable throughout the startup program.

Two levels of strain measurement acceptance criteria were established (Reference 1): Level A and Level B.

Level A [[

]]

Level B [[

]]

Table 1 High Stress Locations Monitored Directly by Strain Gages

Strain Gage	Gage Location	Components Monitored
[[		
		]]

These allowable stress limits were used to calculate the strain gage acceptance criteria based on two sets of pre-test predicted fluid dynamic loads from Continuum Dynamics Inc (CDI): Scaled Model Test (SMT) load and In-plant load. The calculated strains at each gage location, with the maximum stress normalized to the acceptance stress limit for the appropriate level, are the strain gage acceptance criteria. For each of the two pre-test predicted loads, three time history stress responses were calculated with [[

]] scaled time intervals (Reference 2). Thus, for each strain gage, there are six criteria. The minimum of the six was conservatively selected as the acceptance criterion (Table 2). Also presented in Table 2 are startup test measured strains at [[

]]

Table 2 QC2 Startup Test Strain Gage Acceptance Criteria using Pre-test Predicted SMT and In-Plant Loads

[[			
			]]

During QC2 startup testing, the new steam dryer was also instrumented with pressure sensors, and the steam lines were instrumented with strain gages. Incorporating the measured steam line strain gage data with the benchmarked acoustic circuit model, a modified set of steam dryer loads (post –test predicted loads) was also developed.

Using these modified post-test predicted dryer loads, three time history stress responses were again calculated with [[ ]] (References 6 and 7). Based on these stresses, a modified set of strain gage acceptance criteria was established as shown in Table 3. The procedures used to determine the modified strain gage acceptance criteria were identical to those used for the strain gage acceptance criteria based on the stresses calculated using pre-test predicted In-plant and SMT loads.

Example calculations are given in the following for Strain Gage S-9 (outer hood gage). The governing case for this gage is the stress and strain responses with the nominal time interval:

[[

]]

The data in Table 3 demonstrates that all measured strains are considerably below the modified allowable limits for both Level A and Level B. Therefore, using the modified action levels generated during the QC2 startup testing and the final stresses calculated for various components, no criteria was exceeded for all strain gages.

Table 3 QC2 Startup Test Strain Gage Acceptance Criteria using Post-test Acoustic Circuit Model Load

[[			
			]]

Figure 1 Time History Peak Stress Intensity, Outer Hood

[[

]]