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March 11, 2008

Via Electronic and U.S. Mail

Public Utility Commission
Attn: Filing Center
550 Capitol St. NE #215
P.O. Box 2148
Salem OR 97308-2148

Re: In the Matter of PORTLAND GENERAL ELECTRIC COMPANY
Application to Amortize the Boardman Deferral.
Docket No. UE 196

Dear Filing Center:

Enclosed please find an original and five copies of the CORRECTED Confidential Response Testimony and Exhibits of John R. Martin on behalf of the Industrial Customers of Northwest Utilities ("ICNU") in the above-referenced docket. Please disregard the testimony filed on March 6, 2009, in this docket. The confidential pages and exhibits are inserted in separate envelopes and sealed pursuant to the protective order in this proceeding. Also enclosed, is a complete Redacted Version of the testimony.

Thank you for your assistance.

Sincerely yours,

/s/ Brendan E. Levenick
Brendan E. Levenick

Enclosures
cc: Service List

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that I have this day served the foregoing CORRECTED Confidential Response Testimony and Exhibits of John R. Martin on behalf of the Industrial Customers of Northwest Utilities upon the parties, on the official service list shown below for UE 196, via U.S. Mail. All parties in this proceeding are authorized, pursuant to the protective order. A Redacted Version of the testimony and exhibits was served via electronic mail.

Dated at Portland, Oregon, this 11th day of March, 2009.

/s/ Brendan E. Levenick
Brendan E. Levenick

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BEFORE THE PUBLIC UTILITY COMMISSION

OF OREGON

UE 196

In the Matter of	)
PORTLAND GENERAL ELECTRIC COMPANY	)
Application to Amortize the Boardman Deferral.	)

RESPONSE TESTIMONY OF

JOHN R. MARTIN, P.E.

ON BEHALF OF

THE INDUSTRIAL CUSTOMERS OF NORTHWEST UTILITIES

REDACTED VERSION

March 6, 2009

I. INTRODUCTION

Q. WHO ARE YOU REPRESENTING IN THIS PROCEEDING?

A. I have been retained by the Industrial Customers of Northwest Utilities ("ICNU") to address the causes and circumstances surrounding the failure of the low-pressure steam turbine No. 1 ("LP1") rotor at the Boardman Power Plant ("Boardman") in 2005. In connection with my review, I have evaluated the prudence of Portland General Electric Company's ("PGE") actions related to the engineering, design, procurement, installation, operation, and maintenance of the LP 1 turbine.

Q. HAVE YOU PREVIOUSLY PROVIDED TESTIMONY IN THIS CASE?

A. Yes, I provided direct testimony on February 20, 2008, and surrebuttal testimony on June 5, 2008.

Q. THE COMMISSION HAS SUBSEQUENTLY REOPENED THE RECORD IN THIS DOCKET TO ALLOW THE SUBMISSION OF ADDITIONAL TESTIMONY AND INFORMATION. WHAT NEW INFORMATION FROM PGE HAVE YOU REVIEWED IN PREPARING YOUR TESTIMONY?

A. I have reviewed: 1) the testimony of Stephen Quennoz (PGE/500) and Janet Kahl (PGE/600); 2) PGE's response to the Administrative Law Judge's December 8, 2008 Bench Request (the "Bench Request"); and 3) PGE's responses to the data requests of ICNU, CUB, and Staff.

Q. BASED ON YOUR REVIEW OF PGE'S ADDITIONAL TESTIMONY AND DATA SUBMITTALS, DO YOU HAVE ANY CHANGES OR ADDITIONS TO YOUR PRIOR TESTIMONY?

A. I have no changes to my prior testimony. However, I do want to supplement my prior testimony based on the new information provided in PGE's testimony and data responses. I will address the following areas:

1. PGE's answers to the Bench Requests;
2. PGE's Quality Assurance/Quality Control (QA/QC) practices;
3. PGE's project management approach for the LP1 turbine installation;
4. The type of rotor damage found in 2005 and the cause;
5. The visibility of the loose and missing LP1 soleplate fasteners; and
6. The risk and consequences of an operational failure of the LP1 rotor.

II. SUMMARY

Q. PLEASE SUMMARIZE YOUR PRINCIPAL FINDINGS.

A. Based on my review of the information provided, I have reached the following conclusions:

1. Because of the complexities of this project and the inexperience of its staff, PGE should have retained the services of an Engineer/Constructor that was experienced with the design and installation of replacement turbine generators in large power plants.
2. The Engineer/Constructor acts as the agent for the utility and normally provides all of the services required for a complex turbine retrofit, including detailed engineering, procurement, construction, quality control, inspection, startup, and testing.

3. Siemens is an Original Equipment Manufacturer ("OEM"), not an Engineer/Constructor.
4. PGE's use of Siemens to take total engineering and construction responsibility for the replacement of the Boardman turbines does not conform to prudent industry standards. Because of the complexities involved, most utilities would have retained an experienced Engineer/Constructor to provide the project engineering and management.
5. It is standard industry practice for Engineer/Constructors to retain the OEM (Siemens in this case) to provide technical services during the installation of a new turbine.
6. To justify it's use of Siemens as the Engineer/Constructor, PGE submitted a list of Siemens turbine retrofit projects and suggested that Siemens took total project responsibility for the installation of these new turbines. PGE/502C, Quennoz/1. The list is simply a summary of facilities that have retrofit Siemens turbines. The list does not represent projects in which Siemens was totally responsible as the Engineer/Constructor for the installations.
7. Using the OEM for major maintenance is a common and desirable practice in the industry, but it is not an industry standard. Using the OEM for routine annual maintenance is unusual and clearly not an industry standard.
8. PGE's Quality Control practices can best be described as an informal and passive program that directed responsibility to Siemens, an entity that has

no liability or responsibility. Given the circumstances, PGE's quality control practices were inadequate.

9. The operational failure of the Boardman LP1 turbine in 2006 could have destroyed much of the Boardman plant and would surely have killed plant staff. It appears that such a failure nearly happened, which illustrates why well developed project management and quality control programs are essential.

III. DISCUSSION

Q. PLEASE PROVIDE YOUR COMMENTS ON PGE'S ANSWERS TO THE QUESTIONS IN THE BENCH REQUEST.

A. The first question raised by the Judge was:

"What is standard industry practice for turbine installation and maintenance?

The question really should be divided into three parts:

1. Turbine installation;
2. Major maintenance; and,
3. Minor maintenance.

Taking the first question about standard practice for turbine installation, Mr. Quennoz states that it is standard industry practice to hire the OEM to install large turbines like those at Boardman. PGE/500, Quennoz/3. Mr. Quennoz's response is simple and clear, but it does not describe standard industry practice.

The installation of a large steam turbine generator is a major construction project. In new power plants, standard utility practice would be to employ an experienced Engineer/Constructor who would act as the utility's agent and be

responsible for the design, construction, inspection, startup, and testing of turbine generators. The Engineer/Constructor would normally retain the OEM for technical support during the installation, startup and testing of the turbine generator. The Engineer/Constructor would be responsible for specifying the QA/QC requirements on behalf of its utility client. The Engineer/Constructor would also have its own engineers and technicians on site to inspect and approve the installation, startup and testing. It would also be normal for the utility owner to have its technical and operating staff on site to review the installation, startup and testing and to accept the unit when startup and testing was satisfactorily completed. During this period, the utility staff would be trained on the operation and maintenance of the turbine generator and would also prepare operation and maintenance procedures for the plant. PGE has stated that this is essentially how its Port Westward Plant was built. ICNU/402, Martin/1-2.

Q. YOUR STATEMENT ABOVE IS FOR NEW PLANTS, WHILE THE BOARDMAN INSTALLATION IS A TURBINE REPLACEMENT. HOW WOULD THE BOARDMAN TURBINE INSTALLATION BE DIFFERENT?

A. Replacing a large steam turbine in an existing power plant is more complex than installing a turbine in a new plant. This is because of the complex structural, mechanical, electrical, and control interfaces between the new turbine and the existing plant.

One of the important design considerations is the **weight** of the new turbines. The turbine is mounted on a pedestal, which is a large elevated reinforced concrete "table." The structural design of the turbine installation normally is based on the dynamic (vibration) interaction between the relatively

heavy rotating turbine, its supporting pedestal, and the foundation soils that the pedestal is built on. This type of structural design analysis is important to be sure the supporting structure is able to support the static and dynamic loads imposed by the new turbine. If the structure is not suitable, then the turbine installation can move excessively. [redacted]. ICNU/306, Martin/2-3.

PGE was asked to describe the static and dynamic structural analysis that was performed to support the design and installation of the new LP turbines in 2000 and the HP/IP turbine in 2004. PGE was also asked whether the analysis considered the dynamic interaction between the turbine, its supporting structures (bearing pedestals), turbine pedestal, and the subsurface geotechnical conditions, and whether the analysis was performed by a structural engineer licensed in the state of Oregon. PGE's answer to the question was that [redacted]. ICNU/402, Martin/3-5. One would gather from PGE's answer, that they do not know if the analysis was performed. The structural integrity of the turbine generator supporting structure required a design review to confirm it is suitable for the new turbine. Not performing a complete structural analysis of the new turbine on the existing structure is extremely imprudent. PGE simply relied on a guarantee from Siemens, which unfortunately has no liability.

Q. WHAT IS YOUR OPINION OF PGE'S PROJECT MANAGEMENT APPROACH TO THE BOARDMAN TURBINE RETROFIT?

A. It is my opinion that a prudent utility would have employed an experienced Engineer/Constructor to design and manage the installation of a replacement turbine because of the many complexities involved.

ICNU/403, Martin/1 shows a simplified organizational structure that is an industry standard for complex design and construction projects. In this arrangement, the Engineer/Constructor would be responsible for the interface design and would specify the project QA/QC requirements for the installation. In addition, the Engineer/Constructor would have its own engineers and technicians on site to inspect and approve the installation, including insuring the turbine is properly supported.

ICNU/403, Martin/2 shows the organizational structure used by PGE for the Boardman installation. The installation of the new turbine at Boardman was missing the involvement of an independent Engineer/Constructor with significant direct experience in the turbine installations.

Based on my review of the experience of PGE staff, I do not believe its staff had ever been engaged in the complex replacement of a large steam-turbine. As such, it is my opinion that PGE was imprudent because it did not retain an experienced Engineer/Constructor to manage the design and the installation of the replacement steam turbine on its behalf. The Engineer/Constructor would have been responsible for the QA/QC program and independent inspection of the installation on PGE's behalf. This is the way PGE has said it managed the construction of its Port Westward Plant. ICNU/402, Martin/1-2. Siemens should

have been retained to provide technical support for the installation, startup and testing of the turbine under the direction of the Engineer/Constructor. PGE technical and operating staff would still have a responsibility to inspect the work and accept the final installation. I believe PGE's approach to this project eliminated the critical oversight of the experienced Engineer/Constructor working on its behalf. The turbine OEM (Siemens) would be responsible for technical support and installation verification.

Q. PLEASE DESCRIBE BENCH REQUEST 1B.

A. Bench Request 1B asks PGE to provide examples of other utilities that have relied on an original equipment manufacturer to provide installation and maintenance services. PGE conducted a survey of other utilities in order to answer the question. ICNU/402, Martin/6-62.

Q. PLEASE COMMENT ON YOUR REVIEW OF THE SURVEY.

A. The survey was sent to 77 utilities and 13 utilities provided 14 responses, so the response (17%) was fairly limited. [redacted]. ICNU/401, Martin/1-8.

Q. DO YOU SEE ANY OTHER PROBLEMS WITH THE SURVEY?

A. Yes. The PGE survey includes the following very unclear question:

"Did you have the original equipment manufacturer (OEM) install or verify proper installation of the steam turbine during original installation?"

This question is really about two separate activities (install versus verify). As discussed above, it is standard industry practice for an Engineer/Constructor to

handle the overall design and installation of turbine generators. The OEM normally provides technical support during installation and "verifies" that the installation is correct. A respondent could answer PGE's question "yes," meaning the OEM supervises or verifies the installation. However, PGE interpreted the answers to mean that the OEM provided the complete Engineer/Constructor installation services. PGE concludes from the answer to this question that 12 out of 13 respondents had the OEM install their turbines. PGE/500, Quennoz/4-5. However, this is highly unlikely. The ambiguity of the question makes the answers useless in determining the frequency with which the OEM installs turbines.

Q. WHAT IS YOUR OPINION CONCERNING STANDARD INDUSTRY PRACTICE FOR TURBINE MAINTENANCE?

A. With regards to the maintenance of the turbine, it is very common (but not an industry standard) to utilize the OEM to provide major maintenance for a large steam turbine.

Some utilities utilize independent maintenance contractors to provide major maintenance of steam turbines and these arrangements can be very satisfactory. So it is not necessary to always have the OEM provide major maintenance for steam turbines. Either way, the utility is responsible for having or retaining experienced staff to act on its behalf to protect its facilities.

It is very uncommon for the OEM to provide normal scheduled maintenance. Most utilities have experienced maintenance personnel who have been properly trained to provide normal scheduled maintenance. In fact, most

utility operating staff members are more competent and experienced than the OEM in providing normal scheduled maintenance.

The PGE survey asked other utilities whether they use OEM's, contractors, or the utility staff to provide normal maintenance. The answers received indicate that other utilities use all of the above options (OEM's, contractors, or the utility staff), which agrees with my experience.

Q. BENCH REQUEST 1C ASKED PGE TO PROVIDE OTHER INSTANCES WHERE SIEMENS PROVIDED INSTALLATION SERVICES TO PGE AND OTHER UTILITIES. PLEASE PROVIDE YOUR COMMENTS ON PGE'S RESPONSE.

A. To answer this question, PGE provided Exhibit PGE/502C, [redacted]. The list does not specify that Siemens installed the upgrades by providing engineering, design and construction services. It is simply a list of plants that have been upgraded. It would be common for Siemens to provide technical support and advisory services for these upgrades, but it is doubtful that Siemens provided the complete plant design and construction services normally provided by an Engineer/Constructor.

The Siemens Upgrade list in Exhibit PGE/502C contains the following important additional information:

[redacted]

[redacted]

Q. PLEASE DESCRIBE THE TYPE OF ROTOR DAMAGE DISCOVERED IN NOVEMBER 2005 AND YOUR OPINION OF THE CAUSE.

A. All of the reviewers, including Alstom, Siemens, PGE, and me, agree the rotor was damaged by high cycle fatigue. High cycle fatigue is a classical and well-understood failure mode of misaligned rotating shafts.

Based on the circumstances, shaft misalignment is the only thing that could cause a high cycle fatigue in a new turbine rotor. The real question is "why was the shaft misaligned?"

In my prior testimony, I stated that a complete root cause analysis would not stop with the fact that the shaft was misaligned, but should evaluate the reasons why the shaft was misaligned. This would include additional factors related to the management and quality control of the design, installation, and maintenance of the new turbine. In my prior testimony, I have addressed these factors; however, I would like to discuss PGE's quality control practices.

Q. BASED ON YOU REVIEW OF THE DOCUMENTS PROVIDED, PLEASE DESCRIBE PGE'S QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) PRACTICES DURING THE INSTALLATION OF THE LOW-PRESSURE TURBINES IN 2000, THE TURBINE MAINTENANCE IN 2002, AND THE INSTALLATION OF THE HP/IP TURBINES IN 2004.

A. First of all, I think it is important to understand that a formal corporate QA/QC program is something that applies to a specific company, its staff, and the work and the products produced by that company. For example, Siemens has a quality control program that applies to its staff and to the work performed and the

products produced by Siemens. Most of the Siemens quality program is focused on manufacturing, because that is the primary focus of their business. Their program does not seem to be focused on construction.

PGE has stated that it does not have a formal corporate QA/QC program which means that PGE does not have a program **that applies to PGE staff and its activities**. ICNU/402, Martin/63-64; ICNU/402, Martin/1-2. I believe this is true. However, PGE does have informal QA/QC practices. For example, requiring Siemens to have an ISO 9001 certified QA/QC program is a PGE QA/QC measure. Other PGE QA/QC measures include witnessing factory inspections and observing the installation and maintenance of the turbine. I would characterize PGE's QA/QC program as an unofficial, passive and hands off program. All of the terms PGE uses to describe its activities are passive, such as, "reviewing," "monitor," and "oversee." PGE/500, Quennoz/10. I believe this philosophy is based on the idea that by depending on Siemens, PGE can absolve itself of responsibility if something goes wrong. Unfortunately, Siemens has no liability (or responsibility), and PGE is ultimately responsible for its facilities. I believe PGE's QA/QC practices place it at great risk. It is my opinion that PGE needs to actively protect its facilities. It is my experience that other utilities do.

A reasonable quality management program would include (but not be limited to) the following elements:

1. Quality objectives;
2. Quality policy and procedures;
3. Staff training;

4. Defined responsibilities;
5. Requirements for written reporting, review, and records;
6. Requirements for review and approval of work performed by designers, equipment suppliers (e.g. Siemens) and construction contractors;
7. Weekly and monthly management reports on the work performed;
8. Requirements for independent inspections; and
9. A complete set of project records.

Based on the information I have reviewed, it is clear that PGE did not have a formal, well-developed quality management program that effectively addressed these areas.

Q. DID THE CONTRACT FOR THE INSTALLATION OF THE NEW LP TURBINE IN 2000 PROVIDE ANY QA/QC PROGRAM?

A. [redacted]. PGE/510C, Quennoz/76-77. The Pre-construction Conference was held on April 17, 2000. However, PGE's meeting minutes contain no reference to the preparation of a QA/QC program for the **installation** of the new LP turbines. ICNU/402, Martin/65-69. PGE has stated that the contract did not require preparation of a QA/QC program. ICNU/402, Martin/70-71. However, [redacted] and it appears no such program was ever prepared.

Q. DID THE CONTRACT FOR THE INSTALLATION OF THE NEW HP/IP TURBINE IN 2004 PROVIDE ANY QA/QC REQUIREMENT?

A. Yes, the contract required Siemens to have a QA/QC program. ICNU/402, Martin/72. However, in reviewing the documents produced by PGE, I see no

evidence of any QA/QC program developed jointly by Siemens and PGE during the Pre-construction Conference.

Q. ARE THERE SPECIFIC DEFICIENCIES THAT YOU SEE IN THE PGE INFORMAL QA/QC PROGRAMS?

A. Yes. The main deficiencies I see are a lack of proactive management and adequate record keeping.

First, in the area of proactive management, there appears to be a lack of proactive participation by PGE in the review and approval of Siemens' work. For example, PGE employees had the right to directly question and challenge Siemens' design and installation of the LP turbines in 2000 and the HP/IP turbines in 2004. ICNU/402, Martin/76. However, there is little if any indication that PGE staff did. PGE was asked if PGE employees ever questioned or challenged Siemens' shaft alignment during turbine installation in 2000 and in 2004, and they were unable to provide any example where this was done. ICNU/402, Martin/77.

Second, there appears to be a lack of record keeping on the part of PGE concerning their QA/QC activities. For example, PGE was requested to provide records to document which PGE staff was assigned to inspect the installation of the LP turbine in 2000 and the HP/IP turbine in 2004; including assigned staff, a definition of the assigned duties, inspection reports, and hours spent. However, PGE was unable to produce this information. ICNU/402, Martin/78-87. PGE was also requested to provide copies of the reports prepared and submitted by PGE employees to the Boardman Plant management during the installation of the LP turbines, the 2002 maintenance outage, the installation of the HP/IP turbine,

and the maintenance outage in 2007. PGE indicated that all reports were oral and written records were not kept. ICNU/402, Martin/73. A copy of hand written job notes, diaries, and other references from the 2000 and 2004 turbine installations were requested, but were not "located." ICNU/402, Martin/74-75. Copies were requested of all PGE review comments of Siemens' work during installation, including the review of the rotor alignment and field measurements and the communication with the Siemens engineers in Florida to confirm the correct alignment for both the LP turbines and the HP/IP turbines. However, there are no written records. ICNU/402, Martin/88. PGE and Siemens did not keep an inventory of "parts-out and parts-in," or a record of the torque applied to critical fasteners during the installation of the turbine. ICNU/402, Martin/89-90.

Q. DOES PGE'S FAILURE TO KEEP ADEQUATE RECORDS OR PROVIDE ADEQUATE MANAGEMENT OVERSIGHT CONSTITUTE IMPRUDENCE.

A. In my opinion, yes.

Q. IS IT STANDARD INDUSTRY PRACTICE FOR A UTILITY TO RELY EXCLUSIVELY ON AN OUTSIDE ENTITY'S (INCLUDING AN OEM'S) QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) PROGRAM FOR THE INSTALLATION AND MAINTENANCE OF A TURBINE ROTOR INSTEAD OF HAVING ITS OWN QA/QC PROGRAM?

A. No, it is not normal practice. Normal practice is for the Owner or its Engineer/Constructor to specify the project QA/QC requirements. This can be done either directly through the utility's QA/QC program or through its Engineer/Constructor QA/QC program. For example, PGE has stated that its Engineer/Constructor provided the QA/QC program for the construction of its

Port Westward Plant. ICNU/402, Martin/1-2. A similar QA/QC program by an Engineer/Constructor was missing from the Boardman turbine installations.

Q. HAVE YOU HAD THE OPPORTUNITY TO VISIT THE BOARDMAN PLANT?

A. Yes. I visited the Boardman Plant on February 20, 2009.

Q. DURING YOUR PRIOR TESTIMONY, YOU EXPRESSED CONCERN ABOUT THE LOOSE AND MISSING FASTENERS THAT WERE DISCOVERED IN JULY 2006. DO YOU HAVE ANYTHING TO ADD TO YOUR PRIOR TESTIMONY?

A. Yes, I do. First, the sole plates and fasteners should have been thoroughly inspected at the time the new turbine components were installed in 2000 and 2004. The plant had been in operation for over 20 years, and the sole plate supports and grout can be damaged and the attachment can become loose over time. A thorough inspection of the support structures and fasteners was especially important in this case since the new turbines significantly increased the weight that the support structures had to carry. [redacted]. ICNU/203, Martin/1-7; ICNU/208, Martin/1-5. The lack of inspection of the sole plate fasteners is a significant QA/QC failure.

I visited the Boardman Plant on February 20, 2009, for the purpose of observing the location of the loose and missing fasteners. In its testimony, PGE has stated that these fasteners could not be seen. Transcript at 44. This was not

true at the time of my visit. The two nuts that were reported to be missing are somewhat difficult to see when the turbine is assembled, but they are visible.

ICNU/404, Martin/1 is a photograph of Nut No. 25 that was reported missing by PGE. ICNU/405 Martin/1 shows the photograph taken by the PGE technician in June 2006 of the same nut. Clearly, the PGE technician who observed the missing nuts in June 2006 was able to also see that they were missing without disassembling the turbine. ICNU/406, Martin/1 is a photograph of Nut No. 2 that was reported loose by PGE. ICNU/407, Martin/1 shows the photograph taken by the PGE technician in June 2006 of the same nut.

When the turbine was disassembled and reassembled in 2000 and 2004, the missing nuts would have been clearly observable. PGE has stated that plywood decking was placed over the area during the installation (PGE/400, Quennoz/11), but the nuts would be visible when the decking was not in place. The fasteners that were reported to be loose were clearly visible to me from the operating deck at the time of my visit.

Q. PLEASE DESCRIBE YOUR OPINION REGARDING THE RISK AND CONSEQUENCES ASSOCIATED WITH A POSSIBLE OPERATIONAL FAILURE OF THE LOW-PRESSURE (LP) TURBINE.

A. I feel it is important to be clear about the catastrophic damage that would result from an operating failure of the Boardman LP turbines. During testimony on July 23, 2008, Judge Wallace asked for Mr. Quennoz's opinion concerning the possible damage that would result from an operational failure of the low-pressure turbine. Mr. Quennoz responded, "I guess you could postulate almost anything". Transcript at 98, line 23, through 99, lines 1-3. Mr. Quennoz's response did not

answer Judge Wallace's question. The question is important, and I would like to explain the consequences of an operating failure of the LP turbines.

The operational failure of the Boardman low-pressure turbine in 2006 would have destroyed much of the Boardman plant and would surely have killed plant staff. It appears to me that such a failure nearly happened. It is important to acknowledge the magnitude of that risk and take steps so that such a failure never occurs.

The following example illustrates the energy contained in the operating turbine rotor. The two LP turbine rotors together weigh almost 200,000 pounds and rotate 60 times every second. At full load, the turbine is generating over 600,000 kW and the rotors possess a very significant amount of kinetic energy. For comparison, the weight of the LP turbines (200,000 pounds) is more than a fully loaded Boeing 737 aircraft (154,500 pounds). The kinetic energy of the rotating LP turbine rotor shaft is about the same as a fully loaded Boeing 737 traveling at 500 miles per hour. If the LP turbine rotor failed while operating, the turbine rotor (200,000 pounds, rotating 60 times a second) would instantly impact the stationary part of the turbine and would result in a mechanical and thermal explosion. The mechanical explosion would include all rotating and stationary parts of the entire turbine generator, including the HP/IP turbine, the LP turbines, and the generator. The debris from the mechanical explosion would cause catastrophic damage to the entire turbine building and the equipment and piping inside the building. Most, if not all, of the steam piping would be destroyed, including the high pressure (2400 psig) and high temperature (1000^{o}F) main

steam lines and the reheat piping steam (1000°F) lines. The release of the high temperature and pressure steam would effectively explode the turbine building and would have undoubtedly killed plant staff. The results would be devastating.

Q. WHAT IS THE SIGNIFICANCE OF THIS RISK?

A. Large steam turbines are carefully designed and maintained, due to the risk of catastrophic damage from a turbine failure.

[redacted] ICNU/402, Martin/91-106.

The stresses in the rotor and its load carrying capacity are an exponential function of the rotor diameter. As the effective diameter of the rotor is reduced by cracking, the stresses increase exponentially. [redacted]

[redacted]. PGE/105C-B, Quennoz/28-41. .

I believe that the rotor could have failed if the turbine was exposed to the maximum potential operating loads. The steam turbine shaft does not experience the maximum stresses during normal operation. Much higher shock loads are experienced when the turbine is tripped off line by a system disturbance or when the over-speed protective system is tested. These types of trips could have occurred when the rotor was badly damaged. Because the rotor was significantly weakened by the fatigue cracking that existed in October and November 2005, I believe the LP1 turbine rotor could have operationally failed if the turbine experienced a full trip. For example, if the unit experienced a full load trip in say October 2005, I believe a complete shaft failure could have occurred. I believe the plant was lucky. The Boardman turbine was very close to a catastrophic failure when it was finally opened for inspection in November 2005.

Q. PLEASE SUMMARIZE YOUR POSITION IN THIS CASE.

A. This case primarily focuses on recovery of money spent by PGE as a result of the failure of the LP 1 turbine. However, it is important to understand that the results of this failure could have been much worse if a catastrophic failure of the plant had occurred. The potential for catastrophic loss demonstrates the importance of PGE

having a high quality project management and quality assurance program in place to oversee the design, installation and maintenance of a major turbine replacement. I believe these protections were lacking in this case.

I believe PGE management was imprudent in a number of specific areas including the following:

1. PGE should have retained the services of an experienced engineer contractor to manage this highly complex project.
2. Siemens is an equipment manufacturer, not an engineer constructor and should never have been given total project responsibility.
3. PGE's staff did not have the experience with the execution of similar projects and were not well equipped to manage through prior experience.
4. PGE did not have adequate management and quality assurance programs in place to manage this project in the absence of an engineer contractor.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

BEFORE THE PUBLIC UTILITY COMMISSION

OF OREGON

UE 196

In the Matter of	)
PORTLAND GENERAL ELECTRIC COMPANY	)
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ICNU/402

REDACTED VERSION

March 6, 2009

February 18, 2009

TO: Brad Van Cleve
Industrial Customers of NW Utilities

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 196
PGE Response to ICNU Data Request 12.2
Dated February 3, 2009
Question No. 089

Request:

Please provide a copy of PGE's Corporate QA/QC program and policy that applied to new facilities construction that existed at the time the new HP/IP turbine was installed in 2004. Please identify the personnel responsible for PGE's Corporate QA/QC policy at that time? Please provide a summary of their QA/QC experience and training.

Response:

PGE did not have a QA/QC program that applied to new plant construction in 2004. PGE did not have a need for such a program because it did not design, manufacture, or install large power plants or upgrades to such plants. PGE's policy was to require that entities performing design, manufacture, or installation work for its plants have an industry standard QA/QC program and that PGE be allowed to monitor an entity's compliance with its own industry standard QA/QC program.

PGE implemented this policy in the case of the HP/IP upgrade by hiring Siemens, who had an ISO 9001 certified QA/QC program (see Page 15 of Tab 15 of Attachment A to PGE's Response to ICNU Request No. 096) and by contractually ensuring the right to monitor Siemens' compliance with Siemens' ISO 9001 certified QA/QC program. PGE's Response to ICNU Request No. 099 provides several examples of contractual provision of PGE's right to monitor.

At the time of the HP/IP upgrade, PGE also applied its policy to the construction of its Port Westward (combined-cycle combustion turbine) facility. Black & Veatch, the

engineering, procurement, and construction contractor, and Mitsubishi, the turbine manufacturer, both had ISO 9001 certified QA/QC programs. PGE then monitored these entities' compliance with their own QA/QC programs.

Page 6 of PGE Exhibit 600 and PGE Exhibit 610 provide the names, experience, and training for the PGE people who monitored Siemens' compliance with Siemens' QA/QC program for the LP upgrade. Many of these PGE people did the same for the HP/IP upgrade. Other PGE people who monitored Siemens' compliance with Siemens' QA/QC program for the HP/IP upgrade had similar experience and qualifications.

February 19, 2009

TO: Melinda Davison
Industrial Customers of NW Utilities

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 196
PGE Response to ICNU Data Request 13.12
Dated February 5, 2009
Question No. 108

Request:

Please describe the static and dynamic structural analysis that was performed to support the design and installation of the new LP turbines in 2000 and the HP/IP turbine in 2004. Did the analysis consider the dynamic interaction between the turbine, its supporting structures (bearing pedestals), turbine pedestal, and the subsurface geotechnical conditions? Did a structural engineer licensed in the state of Oregon perform the analysis? Who was the structural engineer? Please provide all documents that refer or relate to such analysis.

Response:

Siemens performed the structural analysis to support design and installation for the LP upgrade in 2000 and the HP/IP upgrade in 2004. The upgrades utilized existing components where possible, including the turbine outer cylinders and supporting structures. For the LP upgrade, there was a contractual clause concerning load increases. Attachment 108-A repeats the relevant contract clause from PGE Exhibit 510C (Quennoz/66). Attachment A is confidential and subject to the protective order in this docket (Order No. 07-433).

PGE has requested supporting documentation from Siemens for both upgrades. We will supplement this response if and when we receive the documents from Siemens.

UE 196
Attachment 108-A

Confidential and Subject to Protective Order No. 07-433

LP Update Contract Clause

February 17, 2009

TO: Melinda Davison
Industrial Customers of NW Utilities

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 196
PGE Response to ICNU Data Request 13.1
Dated February 5, 2009
Question No. 097

Request:

Please provide copies of the E-mail responses from utilities that operate steam turbines that were received by PGE as a result of the FOMIS described in UE 196/PGE/500/Quennoz/4/lines 9-10.

Response:

See Attachment 097-A for E-mail responses from various utilities. Attachment 097-A is confidential and subject to Protective Order No. 07-433.

UE 196
Attachment 097-A

Confidential and Subject to the Protective Order No. 07-433

Provided in Electronic Format (CD) Only

Email Responses

February 18, 2009

TO: Brad Van Cleve
Industrial Customers of NW Utilities

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 196
PGE Response to ICNU Data Request 12.1
Dated February 3, 2009
Question No. 088

Request:

Please provide a copy of all PGE Corporate Quality Assurance/Quality Control (QA/QC) programs and policies that applied to new facilities construction at the time the new LP turbine was installed in 2000. Please identify the personnel responsible for PGE's Corporate QA/QC policy at that time? Please provide a summary of their QA/QC experience and training.

Response:

PGE did not have a QA/QC program that applied to new plant construction in 2000. PGE did not have a need for such a program because it did not design, manufacture, or install large power plants or upgrades to such plants for many years. PGE's policy was to require that entities performing design, manufacture, or installation work for its plants have an industry standard QA/QC program and that PGE be allowed to monitor an entity's compliance with its own industry standard QA/QC program. PGE's Response to Bench Request No. 4(a) provides detail on how PGE's policy was implemented for the LP upgrade through contractual requirements that Siemens have an ISO 9001 certified QA/QC program and that PGE be allowed to monitor compliance. Siemens met these contractual requirements.

There were no personnel responsible for a PGE corporate QA/QC program that applied to new facilities construction in 2000 because no such program existed. Instead, as explained above, PGE's policy was to require an industry standard QA/QC program and the ability to monitor program compliance. Page 6 of PGE Exhibit 600 provides a list of PGE personnel responsible for monitoring Siemens' compliance with its own ISO 9001 certified QA/QC program for the LP upgrade. PGE Exhibit 610 provides a summary of their experience and training.

February 17, 2009

TO: Brad Van Cleve
Industrial Customers of NW Utilities

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 196
PGE Response to ICNU Data Request 12.4
Dated February 3, 2009
Question No. 091

Request:

Please provide a copy of the minutes from the Pre-Construction Conference that was scheduled to be held 20 days prior to Siemens mobilization for the installation of the LP turbine in 2000 (see, page 71 of the Contract for the LP Turbine Installation).

Response:

Attachment 091-A is a copy of the minutes.

UE 196
Attachment 091-A

Copy of Pre-Construction Meeting Minutes

UE 196
PGE's Response to ICNU Data Request No. 091
Attachment 091-A

Boardman Outage Planning Meeting
April 17, 2000

PGE
Tom Kingston – Plant Manger
Janet Gulley – Project Manager
Bryan Timms – Turbine Coordinator
Tom Meyers – Operations Manager
Larry Smythe – Maintenance Manager
Dave Rodgers – Engineering Supervisor
Wayne Oren – Electrical and Controls Engineer
Randy Curtis – Valve and Welding Engineer
Bob Conner – Safety Coordinator
Dick Cole - Scheduler
Jaisen Mody – Mechanical Manager
Cheryl Bryant – Mechanical Engineer, outage coverage
Jim Chartrey - Mechanical Engineer, outage coverage
John Linn – Generator Engineer
Dick Foidel – I&C Electrical Manager
Gary Tingley – Electrical Engineer
Marc Andreasen – Electrical Engineer
Steve Anderson – Emissions and Hazardous Waste Coordinator
Harvey Fleck – Hartford Insurance Inspector

SWPC
Larry Beal – Program Manager, Orlando
Tom Kuchera – Site Project Manager
Julie Doherty – Portland Sales
Mike Sitko – Construction Manager, Salt Lake
Steve Hall – Performance Test Engineer
Carlos Diaz – Performance Test Engineer

Agenda

Job Update – LP1 rotor is in the spin balance pit and expected to final balance on Thursday April 20th. LP2 goes in on Friday. PGE will be witnessing the LP1 spin in Charlotte. The inner cylinders are 98% complete and will ship the first week of May.

Action Item: Larry Beal will get information to PGE regarding the external wrapping of the rotors. PGE requested that SWPC use the best practices to guard the rotors from damage by the elements. PGE has had rotors arrive that were damaged due to poor shipping practices.

Safety Training – SWPC construction management will receive Affected Worker Training. SWPC will bring out a safety person from the Orlando office during the first part of the job to provide safety oversight.

Action Item: A representative from SWPC will be designated to train the SWPC craft labor. Tom Kuchera and Bob Conner will arrange for safety training.

Crane - The turbine deck crane has been fully inspected, upgraded and tested. New motors were installed which behave differently than the old motors.

Action Item: A "Crane Operator Training Session" will be administered by Bryan Timms to all crane operators prior to SWPC operating the crane.

Tagging and Clearances – It is not possible to remove all of the hazardous energy sources from the turbine. Workers will need to sign onto a clearance before working on the turbine. The Foreman will hold clearances

Action Item: Tom Kuchera, Dave Rodgers and Bob Conner will coordinate the tagging program for the Turbine Job.

Construction Schedule – A copy of the construction schedule was handed out and reviewed. The Performance Test is tentatively scheduled for July 9 – 11th. The plant will be brought off line on May 9th at 2400 hours. PGE will pull an electrical clearance on for the turbine on Saturday May 13th at 0700.

Action Item: SWPC will update the construction schedule to include all of the work. The missing scope items are the installation of the flow nozzle and items on Supplement 3.

Work Schedule – The daily work schedule is 7:00 to 5:30 PM, 5:30 to 4:00 AM, Monday – Saturday. There will be Daily Turnover Meetings at 6:30 AM and at 5:00 PM. SWPC will give PGE a copy of the Daily Status Report. It is anticipated that SWPC will require I&C night shift coverage for the last 2 weeks of the outage

Action Item: Dick Foidel will work with Tom Kuchera to schedule the I&C technician support for the Turbine Upgrade Job. Dick is also the PGE contact for supplying construction power. Bryan Timms will locate a second power transformer for the heater bolts.

Generator Test – SWPC has agreed to the Generator Test. The ramp down portion of the Test will be a few days before shut down. SWPC has elected not to witness this portion of the test. The ramp up portion of the test will be a few days after startup.

Action Item: Janet Gulley will submit the final version of the test for SWPC signature.

Mobilization – SWPC will officially mobilize on May 1, 2000. They will initially run one shift with a few people. They will staff up and employ about 18 millwrights per shift. It is not yet decided if Pipe Fitters will be used. SWPC plans on using a ½ traveling crew. They will bring in portable toilets and wash stations for the use of the labor. SWCP will put office trailers on turbine deck. The deck adjacent to the control room will be the designated smoking area. PGE will install some soda machines by the elevator on the turbine deck.

Action Items: SWPC will put up a sign at the entrance of the Contractor Parking Lot showing the craft labor where to park. PGE will provide tables as needed by SWPC. PGE has a refrigerator available for use. PGE will wire in 5 phone lines from the switchboard to the turbine deck. Tom Kuchera will coordinate this with Dick Foidel.

Insulation Removal – This work will start on May 11th and SWPC plans on contracting directly with AC&S.

Scaffolding – SWPC will build all of the scaffolding. PGE will supply the scaffold material and cribbing. SWPC will deck off the top of the condenser with plywood. SWPC will supply the plywood. PGE will remove the condenser hatch. Condenser integrity and cleanliness is very important to PGE.

Action Item: Tom Kuchera will let Larry Smythe know the scaffold and cribbing needs of the job.

NDE Contractor – SWPC will hire an NDE contractor. Randy Curtis is available for small NDE jobs. Jim Chartrey is also qualified fir NDE work and is available. All nuclear NDE work will be done during the non-working hours of 4 am to 7 am.

Waste Management – PGE will accept all of the SWPC hazardous waste provided that it does not put PGE into the "large waste producer" category. SWPC must use work practices to ensure that no large volumes of hazardous waste are generated. Hazardous waste generated by an onsite contractor is counted against PGE. SWPC expects to generate rags, spray cans and about 10 gallons of hazardous waste. SWPC will dispose of their non-hazardous waste. SWPC will put any scrap metal into the bins located by the intake structure.

Action Item: SWPC will submit their Hazardous Waste Management Plan to PGE by May 5, 2000. Tom Kuchera will work with Steve Anderson on the generation and disposal of any hazardous waste.

Hydrogen Cooler Cleaning – This will be done in the Rail Car Maintenance Facility. The coolers will be transported by truck and should not interfere with the ongoing rail car work. The waste wash water generated is not hazardous.

PGE Concurrent Work – The following is a list of work that will be done in the general location of the Turbine Job.

- Flow Meters on the Hydrogen Coolers
- Wiring to the Oil Lift Pumps
- Subsynchronous Signal Wheel
- Generator Breakers – done on a monorail below the deck
- Generator / Exciter Inspection – exciter housing will be removed by PGE
- Preparation for the Installation of Performance Test Instruments
- Installation of orifice in gland seal drain system

The long last stage blades can cause the grounding system to fail if the grounding system is not properly maintained.

Action Item: Julie Doherty will submit a proposal for the Active Shaft Monitoring Grounding System.

Schedule of Deliveries - SWPC has been staging items in the FAST warehouse. These items have been released for shipping. All parts are on schedule to be on site by May 15th.

OEM Tool Control – All originally supplied OEM tools are available for use by SWPC. These tools will be checked out to SWPC by PGE for the duration of the job and returned to PGE during demobilization.

Miscellaneous – SWPC will wash the LP rotors in the crane bay with the light oil wash water going to the oily drain system. SWPC will perform the slow speed balance of the HP/IP rotor in the crane bay. Bearings 4, 5, and 6 will receive a "figure 8" cut to support the oil lift system.

February 18, 2009

TO: Brad Van Cleve
Industrial Customers of NW Utilities

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 196
PGE Response to ICNU Data Request 12.5
Dated February 3, 2009
Question No. 092

Request:

Please provide a copy of the QA/QC program developed at the Pre-Construction Conference for the LP turbine installation.

Response:

PGE objects to this request because it is vague and misstates the record. Without waiving its objections, PGE responds as follows:

There was no contractual requirement for Siemens to develop a new QA/QC program at the Pre-Construction Conference for the LP turbine installation. The LP turbine upgrade contract required that Siemens have an ISO 9001 certified QA/QC program and that PGE be allowed to monitor compliance with that certified QA/QC program. As discussed in PGE's Response to Bench Request No. 4(a) (see PGE Exhibit 500/Quennoz 13-15), Siemens met these contractual requirements by using its existing ISO 9001 certified QA/QC program and allowing PGE to monitor Siemens' compliance with that program.

Prior to the start of installation, PGE representatives, including Janet Kahl, the sponsor of PGE Exhibit 600, reviewed Siemens' QA/QC program documentation. Aspects of the QA/QC program were discussed during the LP Pre-Construction Conference, as reflected in the meeting minutes, provided as Attachment 091-A to PGE's Response to ICNU Data Request No. 091. During the LP turbine installation, Siemens kept a copy of its QA/QC manual in its office at the Boardman site. During installation, Janet Kahl looked at the QA/QC manual in Siemens' on-site office as needed. Siemens did not leave PGE a copy of this manual after completion of the installation and they were not contractually

required to do so. In response to Bench Request No. 4(a), PGE requested copies of Siemens' QA/QC documentation. Siemens provided the Quality Management Manual which is included in PGE Exhibit 513C (see Quennoz 47-59). This manual is dated 2006, but it is consistent with the QA/QC program Siemens had in place in 2000.

February 18, 2009

TO: Melinda Davison
Industrial Customers of NW Utilities

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 196
PGE Response to ICNU Data Request 12.8
Dated February 3, 2009
Question No. 095

Request:

Please provide a copy of the QA/QC program developed for the HP/IP turbine installation in 2004.

Response:

PGE objects to this request because it is vague and misstates the record. Without waiving its objections, PGE responds as follows:

There was no contractual requirement for Siemens to develop a QA/QC program specifically for the HP/IP turbine installation in 2004. However, Attachment 096-A to PGE's Response to ICNU Data Request No. 096, which includes the HP/IP upgrade contract and related documentation, states:

> "Siemens is an ISO 9001 registered company. The Siemens Westinghouse Quality Assurance program for all Turbine Generator service at the Plant(s) will be governed by PRHB-9, Global Service Process Procedures Manual."

(See Tab 15, Page 15, of Attachment 096-A.) For both the LP and HP/IP upgrades, the QA/QC structure was the following:

- Siemens had an ISO 9001 certified QA/QC program that it used for the upgrade.
- PGE monitored Siemens work to ensure that Siemens followed Siemens' ISO 9001 certified program.

February 19, 2009

TO: Melinda Davison
Industrial Customers of NW Utilities

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 196
PGE Response to ICNU Data Request 13.7
Dated February 5, 2009
Question No. 103

Request:

Please provide copies of the reports prepared and submitted by PGE employees to the Boardman Plant management during the installation of the LP turbines in 2000, the 2002 maintenance outage, the installation of the HP/IP turbine in 2004, and the maintenance outage in 2007. See UE 196/PGE/500/Quennoz/19/lines 21-22, UE 196/PGE/500/Quennoz/20/lines 1-4 and Exhibit 514.

Response:

The testimony cited did not state that PGE employees prepared and submitted written reports. Rather, the testimony stated that "PGE employees verify completion of the maintenance tasks, and report the tasks as complete to plant management." PGE employees' task completion reports were provided verbally to plant management. Pages 1 through 23 of PGE Exhibit 607 are job notes that provide a summary of PGE's monitoring activities during the LP upgrade. These job notes were also viewed by Boardman plant management.

For the LP and HP upgrades, Siemens held both daily and weekly status meetings to manage task completion. Janet Kahl attended these meetings and received written reports prepared by Siemens. Ms. Kahl used these written Siemens reports to verbally discuss task completion and overall progress with Boardman plant management. PGE did not retain copies of the Siemens meeting reports for the LP turbine upgrade. For the HP/IP upgrade, we retained reports from only the May 2, 2004, and May 5, 2004, daily meetings. Attachments 103-A and 103-B are copies of these two Siemens reports. These attachments are confidential and subject to the protective order in this docket (Order No. 07-433).

February 19, 2009

TO: Melinda Davison
Industrial Customers of NW Utilities

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 196
PGE Response to ICNU Data Request 13.14
Dated February 5, 2009
Question No. 110

Request:

Please refer to UE 196/PGE/600/Kahl /4, which are the "Job Notes" from the installation of the LP turbines in 2000. Please provide a copy of all hand written Job Notes, diaries, and other references related to the LP turbine installation in 2000. Also, please identify references in the notes to the "witness points" that PGE inspected during the installation of the LP turbines in 2000.

Response:

PGE objects to this request because it is overly broad and unduly burdensome. Without waiving its objections, PGE responds as follows:

As discussed on Page 2 of PGE Exhibit 600, PGE negotiated the contractual right to establish "witness points" during the LP manufacturing process. (See Pages 73 and 83 of the contract; PGE Exhibit 510C.) Siemens performed the manufacturing for the LP upgrade at its facilities in Mexico and the eastern United States. These "witness points" required advance notification and gave PGE the ability to observe and accept important steps in the manufacturing process.

It was not necessary for PGE to negotiate a specific list of "witness points" for the installation phase of the LP upgrade because installation took place at the Boardman facility and PGE's Quality Control Representative (PQCR), Janet Kahl (Gulley), and other PGE personnel were present at the Boardman site to monitor the entire installation. Their monitoring was not limited to a specific list of "witness points."

PGE has already provided Janet Kahl's Job Notes from the LP installation, which describe in detail the monitoring that PGE performed during this installation. (See PGE Exhibit 607, Pages 1-23.) We did not locate any hand-written notes, diaries, or other references from this 9-year old project.

February 19, 2009

TO: Melinda Davison
Industrial Customers of NW Utilities

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 196
PGE Response to ICNU Data Request 13.3
Dated February 5, 2009
Question No. 099

Request:

Did PGE employees have the right to directly question and challenge Siemens design and installation of the LP turbines in 2000 and the HP/IP turbines in 2004? If so, please provide examples.

Response:

Yes. PGE had the right to directly question and challenge any work that we found unacceptable including Siemens design and installation of the LP turbines in 2000 and the HP/IP turbine in 2004. Some examples from the LP upgrade contract (provided as PGE Exhibit 510C) include (but are not limited to):

- PGE Exhibit 510C/Quennoz 32: Part III, General Conditions, Section GC-7: "Inspection and Rejection of Work"
- PGE Exhibit 510C/Quennoz 52: Part IV, Special Conditions, Section SC 14: "Rejected Work and Materials"
- PGE Exhibit 510C/Quennoz 56: Part IV, Special Conditions, Section SC 25: "Final Payment"
- PGE Exhibit 510C/Quennoz 89: Part VI, Section 6, Quality Assurance, Item 5.0: "Deviations and Nonconformances"

February 17, 2009

TO: Melinda Davison
Industrial Customers of NW Utilities

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 196
PGE Response to ICNU Data Request 13.4
Dated February 5, 2009
Question No. 100

Request:

Did PGE employees ever question or challenge the turbine shaft alignment that was set by Siemens in 2000 and in 2004? If so, please provide details of all such challenges.

Response:

PGE objects to this request because it is overly broad. Without waiving objection, PGE responds as follows:

Yes. When bearing temperature anomalies occurred in 2000 and 2004, PGE requested that Siemens investigate the cause. In response, Siemens adjusted bearing elevations, as previously discussed in PGE's Responses to ICNU Data Request Nos. 043 and 044.

February 19, 2009

TO: Melinda Davison
Industrial Customers of NW Utilities

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 196
PGE Response to ICNU Data Request 13.2
Dated February 5, 2009
Question No. 098

Request:

Please provide records to document the PGE staff that was assigned to inspect the installation of the LP turbine in 2000 and the HP/IP turbine in 2004. The records should include a management organization chart of the assigned staff and a definition of the assigned duties, inspection reports, and hours spent. See UE 196/PGE/500/Quennoz/11/lines 5-8.

Response:

The reference cited states that "PGE personnel were assigned day and night to monitor Siemens' activities, including installation, interface problems, QA program compliance, and any material or program nonconformance." PGE has already provided materials supporting this statement. Pages 44-77 of PGE Exhibit 607 provide examples from the hundreds of LP and HP/IP installation photographs taken by PGE. The full set of photographs is in PGE Exhibit 608. Pages 1-23 of PGE Exhibit 607 are job notes from the LP installation. Many of these notes concern inspections made of various installation tasks.

Page 6 of PGE Exhibit 600 and PGE Exhibit 610 provide the names, experience, and training of PGE employees assigned to monitor and inspect the LP installation in 2000. Many of these employees also performed the same or similar roles in the HP/IP installation in 2004. Other PGE people who monitored Siemens' compliance with Siemens' QA/QC program for the HP/IP upgrade had similar experience and qualifications. Attachment 98-A is a copy of the Pre-Construction Meeting Notes related to the HP/IP upgrade. It lists several of the PGE employees assigned to monitoring and inspection roles for the HP/IP upgrade.

The PGE employees discussed above worked either in PGE's Power Supply Engineering Services (PSES) group or at the Boardman plant. Attachment 98-B contains organization charts for PSES and the Boardman plant in 2000 and in 2004. PGE's practice is to retain timesheets for only three years. Timesheets for the LP and HP/IP installations are not available.

UE 196
Attachment 098-A

HP/IP Pre-Construction Meeting Minutes

UE 196
PGE's Response to ICNU Data Request No. 098
Attachment 098-A

Portland General Electric - Boardman Power Plant
Tuesday November 18, 2003
Pre Construction Meeting
8:30 am
AGENDA

GENERAL SESSION:

This meeting is the first of three pre-construction planning meetings, second in January and last one in March.

Second meeting to be scheduled January 27, 2004 starting at 10 AM at the Boardman Plant.

1. Team Players - Group Introductions, Review the roles of PGE team players and Contractor team players.

2. PGE Assistance:

Janet Gulley - HP/IP and Boiler Project Manager
John Linn - Generator Project Manager
John Wacker - Static Exciter, Iso Phase Bus, and Step Up Transformer Project Manager
Roger Lewis - HP/IP Turbine
Randy Curtis - Boiler
Jim Chartrey - Nights
Rick Neimann, Randy Curtis, Jim Chartrey - NDE
Bob Ball - Crane Scheduler

SWPC Team

Shane Patton - Commercial Project Manager (Orlando, FL)
Tom Kucera - Site Project Manager (Installation - Boardman Site)
Bill Howarth - Babcock Project Manager (Worcester, MA)

3. Commercial Terms and Technical Assistance - Go to the Project Manager

	Office	Cell	email
• Janet Gulley	503 464 8167	503 789 4230	janet_gulley@pgn.com
• John Wacker	503 464 8152	503 703 2618	john_wacker@pgn.com
• John Linn	503 464 8453	503 703 2619	john_linn@pgn.com

4. Potable Water - Drinking water on the turbine deck will be provided daily in large orange coolers by PGE onsite maintenance contractor.

5. Plant Facilities - Bathrooms for ladies in the control room, vending machines by PGE will be on near the elevator. No access to PGE locker rooms.

6. Scope of Work - Review in summary:

   a. HP/IP upgrade
   b. Generator
   c. Stub Shaft

UE 196
PGE's Response to ICNU Data Request No. 098
Attachment 098-A

d. Static Exciter Electronics
e. Iso Phase Bus
f. Transformer
g. Boiler

The Scope of Work was covered in generalities by the PGE, SWPC, and Alsthom team representatives.

7. Schedule - Review the project schedule as required. Coordinate other Contractor activities in the areas of work.

- Boiler Monday May 3 7am to Friday July 2 7am
- Turbine Wednesday May 5 7am to Friday July 2 7 am
- Generator Monday May 3 7 am to Tuesday July 6 7am (Preliminary)
- Boiler Feed Pump (three weeks of work during the outage)

Plant shutdown will be midnight April 30. The schedules from SWPC and Alstom were discussed in generalities, particularly at the beginning and end of the outages when crane is most in need. Bob Ball, PGE, will be the coordinator of crane activity during the outage. Some discussion occurred as to possibility of SWPC entertaining the BFPT scope to help stay load-leveled in regards to staffing during the outage period for contingency (additional unplanned work in regards to steam inlets, for example) concerns.
Action: The January meeting will continue discussion regarding crane usage. Further discussion, if warranted, regarding SWPC participation in BFPT scope of work.

8. Lay Down Areas - Location for new material, equipment, work areas, tool cribs, toilets, dumpsters, trailers, and break areas. Mark up drawing and give to PGE.

A general turbine/generator deck area drawing was given to each Contractor and spatial requirements were requested by PGE.
Action: Each Contractor is to prepare a markup of space requested for laydown area (Babcock is exempted as this should not be a concern in the boiler area) for the January meeting for continued discussion on this topic.

9. Crane Coordination - Bob Ball PGE Crane Scheduler. Review Contractors crane usage schedules. Develop a preliminary crane usage schedule.

CONTRACTOR BREAK OUT SESSION:

10. Correspondence - Written correspondence addressed to whom, verbal direction will be followed with written.

SWPC Commercial Issues - Shane Patton, Orlando, 407-736-5501, shane.patton@siemens.com
4400 Alafaya Trail, MC 208
Orlando, FL 32826
SWPC Site Issues (During Installation)
Tom Kucera (Boardman Site)

11. Contingency Scope(s) of Work - OMM 13 inspection by PGE, Steam inlet replacement, straightening steam inlets.

Discussion was held regarding possible steam inlet replacement if severe cracking is found upon disassembly/inspection. Forgings are relatively long lead items and could be disastrous to the outage schedule if not procured early. A level III magnetic particle test to be provided by PGE.
Action: Shane Patton to determine lead time and price for each forging (8 inlets). Contingency initial thoughts are to have two or three inlet forgings on hand.

12. Contract Change Notices (CCN) - Review the form, procedure and commercial terms.

13. Time Sheets for extra work - Review the process of signature, etc. Required for all Time and Material (T & M) work.

14. Getting Material out of the Warehouse - Review procedure for Contractor to get material from warehouse. Set up account for Contractors.

15. Portable Toilets - Contractor is responsible for providing their own portable toilets.

Discussion was held relative to the portable toilets and it was agreed that it made more sense for PGE to supply the portable toilets to SWPC turbine and boiler teams. Portable toilets and a lunch area are to be provided by PGE for boiler and turbine teams close to the respective work areas.

16. 480V & 120 V Power - Where located for Contractor's use.

17. Hazardous Waste - Discuss handling, storage, and disposal.

18. Material Disposal - Review procedure and location of debris and waste material disposal.

19. Phone Numbers - # outside lines required by Contractor. Plant personnel extension lists, Contractor plant extensions and motel numbers.

Request was made by SWPC for three phone lines. SWPC wishes to revisit this item during the January meeting.

20. LAN Connection - Discuss Contractor access to PGE LAN system with VPN hardware.

Discussion was held regarding LAN requirements for SWPC at site - three bandwidths were requested by SWPC. Action was taken by PGE and SWPC to provide experts to communicate needs. PGE has provided their expert contact.

21. Lead Paint - Discuss lead paint here at the Plant

Discussion was held and PGE agreed to do some sampling prior to the outage, particularly in the boiler scope areas.

22. Working hours per each shift

The boiler preliminary plans are for a 2 x 10 x 5 schedule. The turbine plans are for a 2 x 10 x 6 schedule once the unit is ready to be assembled and a one shift schedule during the first part of the outage (prior to arrival of new HP turbine).

23. Contractor pre-outage onsite representatives

24. PGE Crafts Labor Requirements

25. Division of Responsibilities

26. Lay down areas for the Boiler

27. Bearing work - #3 elevation adjustment

Discussion was held concerning the fact that the #2 bearing has been running hot - approximately 20 degrees hotter than #3 bearing. With the slightly heavier HP rotor, the post-upgrade concern may be greater. Data was given to SWPC regarding current operational conditions.
Action: SWPC Engineering to analyze data and determine course of action during the outage in terms of bearing elevation and coupling alignment.

28. Air In-leakage in Gland Steam

SWPC, Tom Kucera, made some recommendations for checks to be made during current operation of the turbine to Mr. Bryan Timms, PGE.
Action: PGE to implement SWPC suggestions and to report if any improvements have been made at the January meeting.

29. Oil Leak on #4 Bearing

This will be addressed and corrected during the outage by Tom Kucera, SWPC Site Manager.

SAFETY & SECURITY:

1. Safety - Review the emergency response procedure here at the Plant. Company and Contractor responsibilities.

PGE to train SWPC Site Manager Tom Kucera and Tom has the responsibility to train the contractors of SWPC/Babcock team.

2. Contract Personnel - Explain security's role and requirements.

Regarding truck delivery, the front desk is to be notified prior to any truck deliveries. Phone number 481-9356. No deliveries are possible on Friday unless prior agreement is reached within PGE.

3. Contractor Parking - Identify contractor parking area(s).

4. Contractor Vehicle Access - Contractor parking lot

5. Housekeeping -

PGE to provide dumpsters.

6. Paging System - Explain the procedure here at the plant for paging.

7. Personnel Protective Equipment (PPE)

Following items are required: hardhat, glasses (no sideshields required), cotton shirt with sleeves, leather shoes (steel toes not required), earplugs.

8. Clearance Procedure - Review the tag-out procedure and requirements.

9. Material Safety Data Sheets (MSDS) -

10. Smoking Policy - Outside only, no smoking in the boiler.

11. Confined Space - Operations will sniff the area, post a clearance.

12. Weld Permit -

13. Contractor Safety Orientation - Schedule

14. HERP - Hazardous Energy Removal Procedure

Dave Rogers, PGE, should be contacted for any material that would be included under "Hazardous Energy" for disposal and consultation.

QUALITY CONTROL:

1. Q.C. Documentation - Q.C. procedure and documentation. Quality Control documentation shall be completed per contract specification.

PGE will x-ray X% of welds. X-rays are done while Contractors are not welcome (night, weekends, etc.).

2. Inspection - Contractor that the Company Inspection Points

Hydro-test will occur approximately early April 2004 for the boiler scope of supply in Erie, PA. Customer notification is requested two weeks prior to test. PGE would like to attend.
Turbine Rotor Overspeed test and Final Assembly Clearance Check to occur in Germany approximately early March and April 2004, respectively.

3. Welding inspections for the boiler by PGE

MEETINGS & REPORTS:

1. Progress / Outage Meetings - Review time and location, purpose, and requirements of Contractor for these meetings.

Roger Lewis, HP/IP Turbine Lead, will attend turbine/boiler shift meetings periodically for status.

2. Crane Scheduling meetings -

Will be held daily during the outage, particularly during critical beginning and end of outage time periods, and led by Bob Ball, PGE.

3. Contractor Daily Force Report - Requested weekly.

4. Other Reports - Review other reports that may be require submittal by the Contractor per contract specification.

Accident reports are necessary to be completed when an unfortunate accident occurs. Progress reports will also be required and as quantitative as possible in terms of progress to date.

OPEN DISCUSSION:

Question and Answer - Open discussion.

A discussion was held regarding PGE placing screens in the throttle valves.
Action: PGE to determine whether or not it wishes to place temporary screens for the intercept valves.

Boiler Cleaning Logistics - Randy Curtis is contact and was unavailable for November 2003 meeting. It is suggested that this topic be included in the January 2004 meeting as a continuance of a discussion that occurred at the Project Kickoff Meeting in August 2003.

New Items for January Meeting

SWPC/Babcock - Status of Installation Contract for Boiler Scope.

Update of Progress for Turbine/Boiler Scope of Work including Witness Points ahead

February 19, 2009

TO: Melinda Davison
Industrial Customers of NW Utilities

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 196
PGE Response to ICNU Data Request 13.18
Dated February 5, 2009
Question No. 114

Request:

Please refer to UE 196/PGE/600/Kahl /7, line 1 and 15. Please provide copies of all PGE review comments of Siemens work during installation of the LP turbines including the review of the rotor alignment and field measurements and the communication with the Siemens engineers in Florida to confirm the correct alignment for both the LP turbines and the HP/IP turbines.

Response:

In her role as project manager, Ms. Kahl ensured that the actual field measurements were reviewed and accepted by Siemens design engineering in Florida. Ms. Kahl did this by witnessing verbal communications between Siemens field personnel and Siemens design engineering in Florida. PGE did not submit written comments. PGE's monitoring of Siemens' alignment activities is documented in her job notes, previously provided as PGE Exhibit 607 (see Pages 1-21). The relevant job note entries are:

- June 20, 2000: "SWPC is working on bearing moves today. Our machine was naturally very close to being in alignment so this work is small." (See Page 17 of PGE Exhibit 607.)

- June 21, 2000: "Coupling alignment is done. Luckily we only had to make a few moves." (See Page 18 of PGE Exhibit 607.)

February 19, 2009

TO: Melinda Davison
Industrial Customers of NW Utilities

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 196
PGE Response to ICNU Data Request 13.16
Dated February 5, 2009
Question No. 112

Request:

During the installation of the turbines, did PGE or Siemens keep an inventory of "parts-out and parts-in" and a record of the torque applied to critical fasteners?

Response:

To the extent that the term "critical fasteners" refers to the two missing sole plate nuts on the #2 bearing pedestal, PGE objects to this request because it is based on a false premise and misstates the record. Page 11 of PGE Exhibit 400 and PGE Exhibit 401 have already explained how the sole plate fasteners on the bearing pedestal were not disturbed during the LP installation process. Areas not being worked on were covered with protective decking, preventing any view of the sole plate fasteners. The sole plate fasteners were also inaccessible. Thus, no sole plate nuts were removed, replaced, or tightened during the LP installation. This is also true for the HP/IP installation. Accordingly, there would have been no inventory of "parts-out and parts-in" for or record of torque applied to the pedestal sole plate nuts during either the LP or HP/IP installations. Without waiving its objection, PGE responds as follows:

PGE did not keep an inventory of "parts-out and parts-in," nor did PGE keep a record of the torque applied to critical fasteners. Siemens did not keep a parts-out and parts-in inventory. However, parts that were removed were kept on pallets and in labeled bins for accountability. Page 57 of PGE Exhibit 607 shows some of the parts that were removed and placed on pallets during the LP upgrade. Fasteners that were placed in bins were cleaned and inspected for suitability for reuse and returned to the bins awaiting reinstallation. This ensured that all parts were reinstalled. Additionally, PGE

contractually held SWPC responsible for ensuring that foreign objects did not remain in the turbine, and required them to use practices to eliminate them from the system (see SC 36, "Foreign Objects in Steam Piping Turbine Components", in contract provided as PGE Exhibit 510C / Quennoz 59).

PGE has requested documentation from Siemens concerning the torque applied to critical fasteners. We will supplement this response if and when we receive this documentation.

BEFORE THE PUBLIC UTILITY COMMISSION

OF OREGON

UE 196

In the Matter of	)
PORTLAND GENERAL ELECTRIC COMPANY	)
Application to Amortize the Boardman Deferral.	)

ICNU/403

March 6, 2009

EXHIBIT 1A

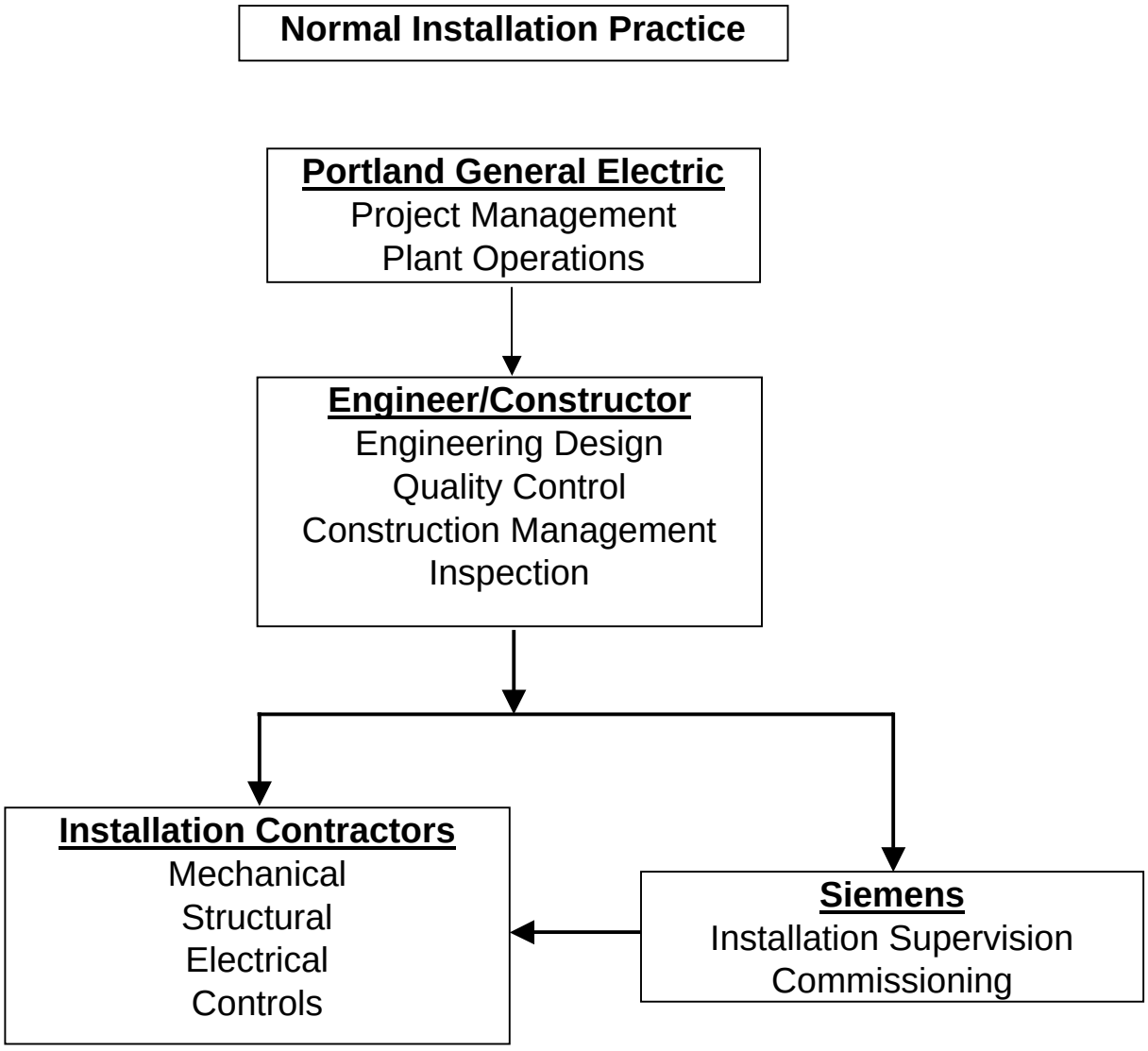
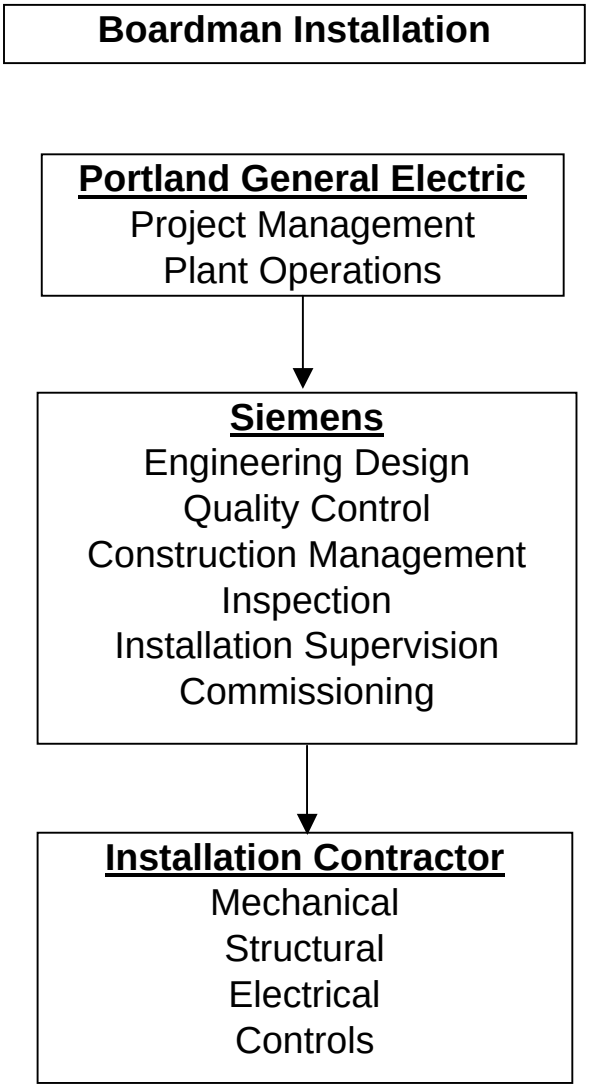

Normal Installation Practice
Portland General Electric
Project Management
Plant Operations
Engineer/Constructor
Engineering Design
Quality Control
Construction Management
Inspection
Installation Contractors
Mechanical
Structural
Electrical
Controls
Siemens
Installation Supervision
Commissioning

EXHIBIT 1B


Boardman Installation
Portland General Electric
Project Management
Plant Operations
Siemens
Engineering Design
Quality Control
Construction Management
Inspection
Installation Supervision
Commissioning
Installation Contractor
Mechanical
Structural
Electrical
Controls

BEFORE THE PUBLIC UTILITY COMMISSION

OF OREGON

UE 196

In the Matter of	)
PORTLAND GENERAL ELECTRIC COMPANY	)
Application to Amortize the Boardman Deferral.	)

ICNU/404

March 6, 2009

Exhibit 2

BEFORE THE PUBLIC UTILITY COMMISSION

OF OREGON

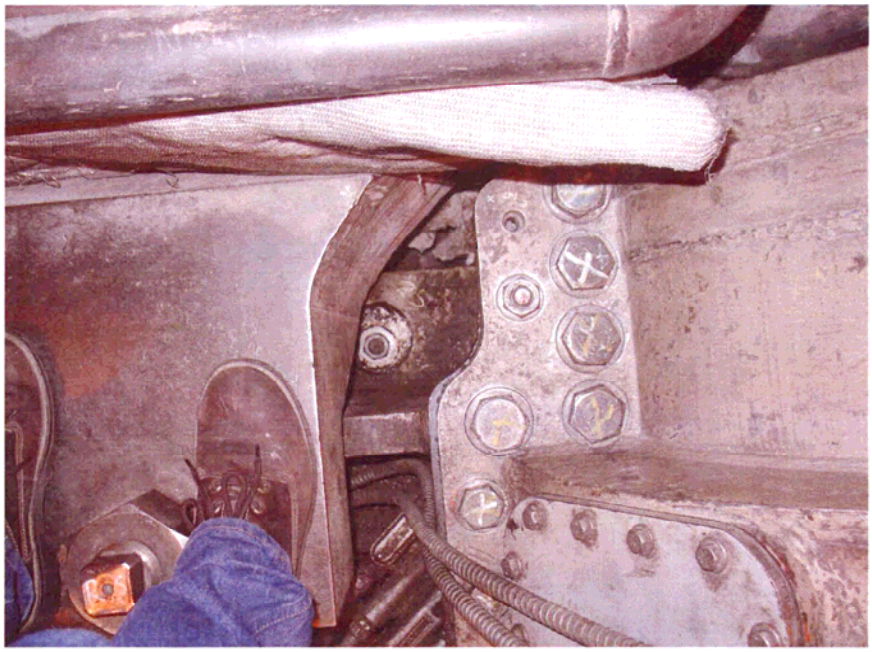
UE 196

In the Matter of	)
PORTLAND GENERAL ELECTRIC COMPANY	)
Application to Amortize the Boardman Deferral.	)

ICNU/405

March 6, 2009

EXHIBIT 3



Sole plate under bearing #2, bolt #25.

BEFORE THE PUBLIC UTILITY COMMISSION

OF OREGON

UE 196

In the Matter of	)
PORTLAND GENERAL ELECTRIC COMPANY	)
Application to Amortize the Boardman Deferral.	)

ICNU/406

March 6, 2009

Exhibit 4

BEFORE THE PUBLIC UTILITY COMMISSION

OF OREGON

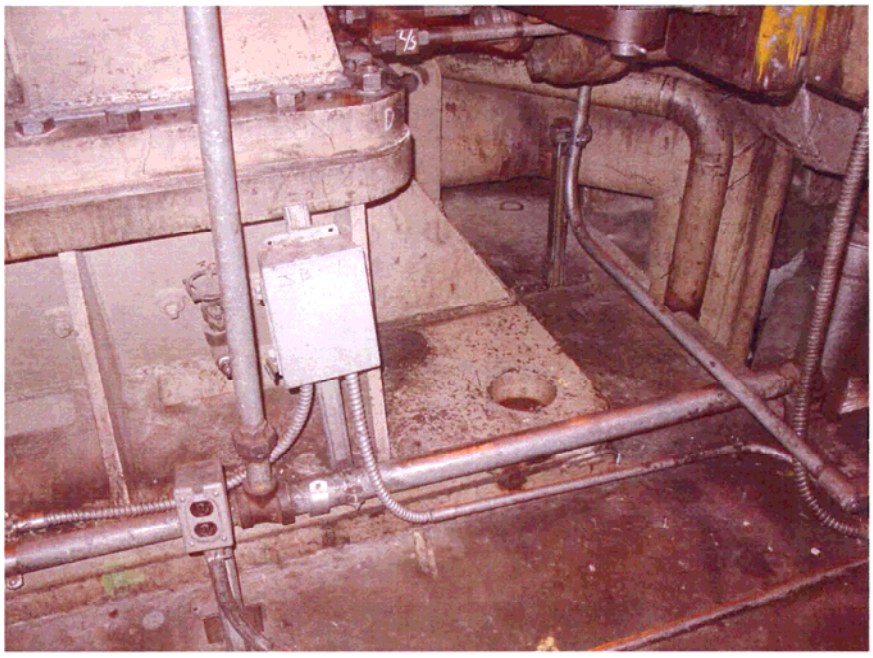
UE 196

In the Matter of	)
PORTLAND GENERAL ELECTRIC COMPANY	)
Application to Amortize the Boardman Deferral.	)

ICNU/407

March 6, 2009

EXHIBIT 5



South West corner of LP-1, bolt # 2.