Oregon

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February 20, 2008

Via Electronic Filing and U.S. Mail

OREGON PUBLIC UTILITY COMMISSION
ATTENTION: FILING CENTER
PO BOX 2148
SALEM OR 97308-2148

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

Enclosed for filing in the above-captioned docket is the Public Utility Commission Staff's Reply Testimony. This document is being filed by electronic mail with the PUC Filing Center.

/s/ Kay Barnes

Kay Barnes
Regulatory Operations Division
Filing on Behalf of Public Utility Commission Staff
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cc: UE 196 Service List - parties

PUBLIC UTILITY COMMISSION
OF OREGON

UE 196

STAFF REPLY TESTIMONY OF

Ed Durrenberger

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

February 20, 2008

CASE: UE 196
WITNESS: Ed Durrenberger

PUBLIC UTILITY COMMISSION
OF
OREGON

STAFF EXHIBIT 100

Reply Testimony

February 20, 2008

Q. PLEASE STATE YOUR NAME, OCCUPATION, AND BUSINESS ADDRESS.

A. My name is Ed Durrenberger. I am a Senior Utility Analyst with the Public Utility Commission of Oregon (OPUC). My business address is 550 Capitol Street NE Suite 215, Salem, Oregon 97301-2551.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND WORK EXPERIENCE.

A. My Witness Qualification Statement is found in Exhibit Staff/101.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. My testimony addresses the prudence of Portland General Electric's (PGE) actions with regard to the breakdown of the Boardman Oregon coal fired generation plant, which resulted in excess power costs that the company is seeking to recover from customers. I also discuss staff's position on PGE's proposed ratemaking treatment of those deferred costs.

Q. DID YOU PREPARE AN EXHIBIT FOR THIS DOCKET?

A. Yes, I have included supporting documents as Exhibit Staff/102 consisting of 11 pages.

Q. HOW IS YOUR TESTIMONY ORGANIZED?

A. First, I look at what the Commission concluded in Order No. 07-049, which concerned PGE's request to defer excess net variable power costs resulting from the Boardman outage. Next I will look at the company's earnings position and assess whether PGE could absorb all or part of the deferred excess power costs and earn a reasonable rate of return. Third, I confirm that PGE is eligible to amortize the excess net variable power costs associated with the Boardman under ORS 757.259, which caps the amount of deferred amounts a utility may amortize within one year and specifies that the Commission must review a utility's earnings before authorizing amortization of deferred amounts. Fourth, I confirm that the deferred amounts are in fact correctly deferred under Order No. 07-049.

Once these preliminaries are out of the way, I will discuss the prudence of the company's actions leading up to, during and after the turbine shaft breakdown. Included in this discussion is my review of the related equipment warranty and consequential damage insurance. This is followed by an examination of the steps that the company has and will take to prevent recurrence of the breakdown.

Q. WHAT DID THE COMMISSION CONCLUDE IN THE BOARDMAN DEFERRAL DOCKET UM 1234?

A. The OPUC rendered a decision on the Boardman deferral request and issued Order No. 07-049 in Docket UM 1234. In this order, the Commission decided that the outage constituted a scenario risk and, by definition, was not predictable as part of the normal course of events. The Commission further found the cost of the outage to be material and therefore satisfied deferral criteria. The Commission concluded that the amount of excess power costs eligible for deferral was $42.8 million; however, the Commission also determined that the company should bear a certain level of power cost risk and applied a deadband and cost sharing to the amount, reducing the deferral to $26.4 million.

Q. IS THE AMOUNT PGE DEFERRED AND IS NOW SEEKING TO AMORTIZE THE AMOUNT AUTHORIZED FOR DEFERRAL?

A. Yes. The company has complied with Order No. 07-049 and deferred $26.4 million. With the application of interest at the authorized rate of return this sum has grown to $31.4 million as of December 2007.

Q. IF PGE WERE TO AMORTIZE THIS AMOUNT OVER A ONE-YEAR PERIOD WHAT WOULD IT DO TO THE COMPANY'S EARNINGS?

A. The company provided an earnings test report for the 12 months ending March 31, 2006, with its application (*See* UE 196/PGE/204, Tooman- Hager/1). This period is consistent with OAR 860-027-0300(9), which requires that "The period selected for the earnings review will encompass all or part of the period during which the deferral took place or must be reasonably representative of the deferral period." Staff has reviewed this report and agrees with the company's finding: that even if the Commission allowed recovery of the entire $26.4 million, the company's earnings would still be significantly below its authorized ROE for the period encompassing this outage. Staff concludes that PGE's earnings do not preclude PGE's recovery of the deferred amounts.

Q. DOES AMORTIZATION OF THE ENTIRE AMOUNT IN ONE YEAR PASS THE 3% TEST IN ORS 757.259?

A. With some exceptions specified in ORS 757.259, the total rate impact of the amortization of deferred balances, in any one year, cannot exceed 3% of the company's revenue for the previous year. The pertinent portion of ORS 757.259 is as follows, "…the overall average rate impact of the amortizations authorized under [ORS 757.259] in any one year may not exceed three percent of the utility's gross revenues for the preceding calendar year." PGE's revenue in 2007 was $1.6 billion. Three percent of this amount is $48 million. However, PGE proposes to offset the rate impact of the Boardman deferral amortization with rate credits owed for previously authorized deferrals so that the net rate effect is zero, even though it does not appear necessary to offset the Boardman deferral in order to satisfy the three percent test in ORS 757.259. The main offsets the company proposes to use are surplus funds in the Trojan Decommissioning Trust and a deferral associated with the Independent Spent Fuel Storage Installation (ISFSI).

I have not yet been able to verify that there are sufficient surplus funds in the Trojan Decommissioning Trust to complete the necessary decommissioning and to provide the offset that would be necessary. If the Commission decides to authorize the amortization of the Boardman excess power cost deferral as requested, I support the company's proposal to use offsets to reduce the rate effect or to make the net effect rate neutral if there are sufficient credits available and further support using the rate credits proposed, subject to verification of sufficiency. Any amortization of the excess Boardman power cost deferral should be applied to rates on an equal cents per kilowatt hour basis like other power costs.

Q. HAVE YOU REVIEWED THE EXCESS POWER COSTS AND IF SO WHAT ARE YOUR FINDINGS?

I have not personally reviewed the individual contracts that comprise the power purchases leading up to the excess power costs. When the Boardman event initially unfolded, PGE applied for deferred accounting to account for the excess power supply expenses. The filing was docketed as UM 1234. At that time, the company invited the OPUC Staff and other interested parties to review the company's action plan for covering the power lost due to the outage. Although the question of who would be paying for the excess power costs was not on the table at that time, Staff did not voice any opposition to the company's approach to backfilling the lost generation. Through the course of the deferred accounting application docket (UM 1234), Staff questioned whether the excess power costs are within the power cost variability range that represents normal risks. Staff also recommended that the Commission decrease the amount eligible for amortization to better reflect Boardman's average output, recalculate the daily on- and off-peak average price or quantity of pre-scheduled power purchases for seven days of the outage, remove costs associated with 1,200 MWh of prescheduled energy, and recalculate the savings associated with avoided maintenance. The Commission adopted all Staff's recommendations.

I have reviewed Staff's work in UM 1234 and discussed the company's actions regarding the Boardman outage with PGE power trading and scheduling manager Tom Ward and have no further questions about the excess power costs.

Q. WHAT STRATEGY DID PGE USE TO SECURE THE REPLACEMENT ENERGY FOR THE BOARDMAN OUTAGE?

A. Initially, before the extent of the outage had been fully realized, the company purchased replacement energy in the real time market. Once the full extent of the outage became known and the duration appeared to be months rather than days, PGE implemented a different replacement energy purchasing strategy. The company compared the cost of making the replacement energy at the Beaver Generating Plant, the only plant in their fleet with sufficient capacity at that time of the year, with purchasing power on a forward basis on the market. Based on the forward price curves for energy and the operating costs of the Beaver Generating Plant based on forward gas costs, the least-cost alternative was to purchase replacement power on a forward basis in the power market. That was what PGE did.

Q. HOW MUCH ELECTRICITY DID PGE BUY AND WHAT WAS THE COST?

A. The amount of power purchased was consistent with PGE's share of the typical output of the Boardman facility, about 376 aMW over the course of the outage. PGE purchased about $46 million in replacement power. The company defrayed some other costs by taking the annual maintenance outage during the breakdown rather than when it was scheduled in May, reducing costs by approximately $3.2 million. In addition, the company did not take any coal during the outage, thus saving the fuel costs. Overall, PGE's total excess power costs were $42.8 million.

Q. WHY IS THIS AMOUNT DIFFERENT THAN THE AMOUNT THAT WAS DEFERRED AND THAT PGE IS SEEKING TO AMORTIZE?

A. The Commission decided in Order No. 07-049 that not all of the excess power costs were subject to deferral. First, PGE shareholders bear a certain level of the power cost risks (and benefits) as part of the cost of doing business. In this case, the Commission decided that PGE's power cost risk represented a deadband reduction of 80 basis points of return on equity. This calculates to a reduction of $13.4 million. The Commission further determined that the remaining excess power costs would be subject to a 90/10 sharing between customers and shareholders, customers being responsible for a 90% share of the remaining excess costs and the company the remaining 10%. This sharing further reduced the deferral amount by $2.9 million leaving the amount deferred at $26.4 million.

Q. WHAT IS THE NEXT STEP? SINCE THE COMMISSION APPROVED THE DEFERRAL, DOES IT FOLLOW THAT THE COMPANY GETS TO RECOVER THIS AMOUNT FROM CUSTOMERS?

A. The next step is the one the company is currently engaged in. The Commission has allowed excess power costs to be deferred but reserved any determination of ratemaking treatment of the costs until a ratemaking proceeding. PGE has now asked that the Commission allow PGE to recover the deferred excess power costs from customers. In order for this request to proceed, the company must show that their actions were prudent. This means the incident was not the result of a negligent act or omission by the company and that PGE did everything they could have reasonably done to minimize the costs resulting from the incident that they are asking customers to pay for.

Q. WHAT WAS THE CAUSE OF THE BREAKDOWN?

A. The event leading up to the excess power costs was that one section of a three piece turbine shaft, with a combined length of about 100 feet, developed some undetected fatigue cracks over time. The section of turbine shaft that cracked had a normal service life of 30 years and at the time it cracked had been in service for 5 ½ years. Prior to the start of this event, the company had no indication that there was a cracking problem with this turbine shaft. PGE's direct testimony of Mr. Quennoz (*See* UE 195/ PGE/ 100, Quennoz/ 3) provides a chronology of the events beginning from when the company first noticed the vibration levels trending up indicating a problem. As the cracks grew larger they allowed for shaft deflection, which was detected by the shaft vibration monitoring. The company states that they first noticed an increase in vibration in July 2005 and by late October of that year it became sufficiently alarming that the unit was shut down. After several attempts to restart it failed, because of excessive shaft vibration, technicians were called in to disassemble the turbine. On November 18, 2005, PGE learned that the shaft was cracked and the turbine inoperable.

Q. WHAT DID THE COMPANY DO AFTER DISCOVERING THE CRACKING?

A. There was not a lot the company could do other than repair the cracked rotor as quickly as possible. PGE did not have a spare rotor, nor did the manufacturer. PGE also reviewed whether there was any viable operating alternative that could allow the plant to continue to operate in some fashion and reduce excess power costs, but it could identify none (*See* Exhibit Staff/102/Durrenberger/1).

Q. HOW DID THE COMPANY REPAIR THE CRACKED ROTOR?

A. PGE does not have the expertise or facilities to repair a shaft of this size. It obtained competitive bids from the original equipment manufacturer and from one other competent turbine maintenance and manufacturing concern that could perform this type of work. PGE picked the contractor with the shortest repair schedule and sent the rotor for repair. The contractor cut the rotor in two at the cracked area, removed the cracked material, replaced missing material with weld buildup, and then welded the two pieces back together.

Q. WHAT DID PGE DO TO MINIMIZE THE OUTAGE TIME?

A. The company arranged to transport the broken rotor to and from the machine shop on the east coast by air. Although expensive, excess power costs were even more costly, and the move saved 10 to 12 days in the overall outage time. Also, as stated previously, PGE selected the contractor with the quickest turnaround time to perform the work, saving approximately 30 days over the other contractor's repair time.

Q. WHAT DO YOU CONCLUDE ABOUT PGE'S RESPONSE TO THE INCIDENT?

A. I find that PGE did all that it could have reasonably done to respond to this unanticipated event.

Q. WHAT ABOUT THE UNDERLYING EVENTS THAT LED TO THE ROTOR CRACK? WAS THERE A PROBLEM WITH HOW PGE OPERATED THE TURBINE THAT CAUSED THE CRACK?

A. There is no evidence that PGE's operation of the unit was responsible for the crack. Part of the investigation into this breakdown includes three separate Root Cause Analysis (RCA) evaluations. The point of an RCA is to determine the underlying reason an incident occurred. In this case the root cause analyses were performed by PGE, Siemens, the original equipment manufacturer (OEM), and by Alstom, another large power generation equipment manufacturer and the company that performed the repair to the shaft. PGE, Siemens, and Alstom are competent entities with specific knowledge about the type of equipment being evaluated. Each of these companies sought to come up with a definitive answer to what went wrong. Yet each was unable to identify a specific action, event or omission that they could state was the underlying cause.

Despite this, there are a number of things that the three RCAs did agree on. One is that there is no evidence that an operating event caused this failure. The turbine's operation is continuously monitored and recorded, and the company furnished operating records going back to when the turbine first started up after the rebuild in 2000. Based on these records, the unit was started, stopped and operated according to the manufacturer's operating procedures designed to minimize undue wear and tear and maximize equipment operating life. Another point of agreement in the RCAs is that there were no lapses in the performance of routine and major maintenance on this turbine. The maintenance had been routinely performed with no evidence that necessary procedures were irresponsibly neglected or deferred. In fact, the OEM performed the major maintenance from day one. A third common finding is that the unit operated with sensitive shaft monitoring equipment at all times. In addition, all the RCAs concluded there was no evidence that PGE operated the unit when any bearing temperatures or shaft vibration levels were above what the manufacturer considered safe for sustained operation.

Q. IS THERE A POSSIBILITY THAT THE BREAKDOWN COULD HAVE BEEN CAUSED BY FACTORS OTHER THAN THE OPERATION AND MAINTENANCE?

A. Yes, although the RCAs do not specifically point to a particular defect that could have caused the cracking. This is where, in my opinion, the three RCAs fall short. Both Siemens, which is the original equipment manufacturer and Alstom, the repair company, performed metallurgical tests to the shaft material, examined the cracks under a microscope and performed engineering studies of the shaft design. The shafting metallurgy was consistent with what was originally specified and typical of what similar turbine shafting would be made from. At the site of the cracks no serious material flaws or faults were found, although one report notes observing some microscopic inclusions, the effects of which were uncertain. The engineering design studies indicated that the design should have been capable of handling the operating stresses without breaking. All this and yet the shaft failed from high cycle fatigue cracking from bending stress due to an alignment issue. This is the point where the RCAs leave out any further conclusion.

Q. WHAT CONCLUSION CAN YOU DRAW FROM THE TESTIMONY AND EVIDENCE?

A. The evidence seems to point to the fact that that the rotor could not have been properly aligned, and that PGE unknowingly operated the turbine with the rotor in this misaligned state, and that the ensuing bending stresses caused high cycle fatigue cracking. The RCAs note that cyclic bending stresses occurred causing the fatigue cracking. Shaft alignment is the process used by machine maintenance personnel to prevent bending from occurring in properly designed (and balanced) rotating machines. It follows that the unit was not properly aligned during operation, leading to a cyclical bending of the shaft with each revolution that eventually caused the shaft to crack.

Q. IF YOUR CONCLUSION IS CORRECT WHAT DOES THAT MEAN FOR THE RECOVERY OF EXCESS POWER COSTS THAT RESULTED FROM THE BREAKDOWN?

A. PGE did not receive any insurance coverage from another party to defray either the repair costs or the excess power costs of the outage (*See* Exhibit/Staff/102/Durrenberger/2). The company also stated that it had not taken legal action against the OEM and that a finding of negligence on the part of the Commission would have little or no impact on its actions in this regard (*See* Exhibit/Staff/102/Durrenberger/3). PGE did not specifically state that it had no plans to take Siemens to court, only that it had not yet done so. Due to the uncertainty about any legal action by PGE, I suggest that, should the Commission render a decision allowing for the amortization of the excess power costs, the Commission require that any subsequent financial settlement with a third party on this matter would first be used to make the company whole for actual repair costs and then shared with customers in proportion to the cost they are being asked to bear.

Q. WOULD AN ALIGNMENT PROBLEM THAT WAS BAD ENOUGH TO CAUSE A CRACK BE OBVIOUS TO THE BOARDMAN TURBINE OPERATORS?

A. Evidently not. It is curious that the misalignment was not detected by the vibration monitors. In fact, considering the progressive nature of a fatigue crack, the shaft was, in all probability, operated for some time with fatigue cracks that only became obvious when their size caused the shaft deflection to create unacceptable vibration. No mention was made of whether the high vibration alarm threshold was appropriate or if the vibration monitoring was properly placed to be able to detect the misalignment. Both were designed by the manufacturer and operated according to manufacturer-approved procedures.

Q. COULD PGE HAVE EXERCISED BETTER OVERSIGHT OVER THE TURBINE MAINTENANCE AND KNOWN IF AN ISSUE SUCH AS ALIGNMENT WAS A PROBLEM?

A. PGE's oversight of the maintenance on the turbine is consistent with what I would have expected considering who they contracted with to perform the maintenance. PGE had a contract with Siemens to perform all of its turbine maintenance. As a practical matter the OEM should not need a great deal of supervision in maintaining equipment of its own manufacture; that, presumably, is why you use the equipment manufacturer for the maintenance. Siemens routinely checked the alignment of the turbine shafts and made adjustments when necessary, according to their alignment procedures. As noted above, the shaft monitoring gave no indication of an alignment problem. I am hard pressed to see how PGE would have known this was a problem when the OEM didn't know it was an issue. Since the breakdown, however, the company has taken the additional step of retaining an independent consultant to monitor shaft alignment and component movement as well as train PGE personnel on the subject (*See* Exhibit Staff/ 102/ Durrenberger/4-5). Perhaps the independent consultant can suggest some way that the shaft monitoring can be improved to where it will pick up a misalignment or other issue well ahead of a failure.

Q. THE BOARDMAN TURBINE WAS UPGRADED TO A NEW, HIGH EFFICIENCY DESIGN IN 2000. DID THE UPGRADE TO A NEW AND RELATIVELY UNTESTED DESIGN CREATE RISKS THAT WERE NOT ADEQUATELY EVALUATED AT THE TIME?

A. PGE upgraded the turbine in 2000 to increase its efficiency. In the upgrade the low pressure rotor that later experienced the cracking was replaced along with an inner cylinder and the bearings near the crack area. The new design used unique turbine blades not readily available and in stock at the blade manufacturer. The risk that some of these unique blade pieces would break and replacements would not be available was one that PGE identified at the time. PGE made arrangements with the manufacturer to have spares on hand because of this. The upgraded unit used newly designed shafts that were of a "ruggedized" design; each was a solid steel forging.

There is no indication that the durability of the shafts was in question at that time. Siemens' records indicate that other than the Boardman turbine shaft, there have not been any other failures of this shaft design to date (*See* Exhibit Staff/102/Durrenberger/6). According to the company (*See* Exhibit Staff/102/Durrenberger/7-8), the upgrade performed in 2000 resulted in about a 4% overall efficiency increase, specifically an increase in output of 23 MW with the same steam energy input. PGE states that customers have benefited by more than $28 million from 2001 through 2007 as a result of the upgrade and customers continue to save approximately $6.8 million annually on power costs. There were maintenance cost savings, too. With the new rotor design PGE experienced lower maintenance costs too, the result of extending major inspection cycle times from once every 5 years to once every 10 years with the new shafts as recommended by the OEM.

Q. WHEN PGE UPGRADED THE TURBINE IN 2000 DID IT RECEIVE ANY SPECIAL WARRANTY FROM THE EQUIPMENT MANUFACTURER SINCE THIS WAS A NEW AND RELATIVELY UNTESTED DESIGN?

A. The terms of the warranty offered by Siemens at the time of the upgrade covered defects of workmanship and materials for a period of 10 years and included a consequential damages penalty clause should the unit not perform up to the guaranteed output increase. This warranty did not cover excess power costs that could occur from an extended outage due to a breakdown such as what happened in this case several years after the initial startup.

Q. HAS THE COMPANY INSTITUTED ANY CHANGES TO ITS OPERATIONS OR MAINTENANCE PROCEDURES AS A RESULT OF HAVING THE ROTOR CRACK UNEXPECTEDLY?

A. The company has not changed its operating procedures since its operation was not found to be at fault for the cracking. Insofar as the turbine maintenance, PGE will now require the area that cracked to undergo a more extensive annual inspection. PGE assumes that, if a crack is found by this increased vigilance, it will be sufficiently small that the rotor shaft will not have to be parted and welded back together to fix, resulting in a 105 day outage. In addition, as mentioned earlier, the company will increase its oversight of the alignment and movement by retaining an independent consultant to watch over the maintenance.

Q. DO YOU BELIEVE THE ROTOR WAS REPAIRED TO “GOOD AS NEW” CONDITION?

A. Alstom, who performed the repair, gives the rotor a clean bill of health and guaranteed their workmanship for three years. Although the shaft design, by all indications, was sufficiently robust to take the stresses of the operation and the alignment was maintained within the manufacturer's specifications, and the monitoring of the shaft gave no indication of an alignment or cracking problem until it was too late, I still have some reservations. Even if the shaft is as good as new, I do not see enough difference from the previous status quo and find it possible, if not probable, that further problems will occur.

Q. DOES PGE PLAN TO GET A SPARE ROTOR IN CASE THE REPAIR CRACKS AGAIN?

A. No, the company hired a consultant to evaluate the need for a spare rotor. The analysis assumes that the rotor doesn't break again and cause an extended 105 day outage to repair and concludes that a replacement rotor is not justified by savings in electricity costs from the routine maintenance outages. I am not sure I agree with the analysis. If PGE were to add the excess power costs that would occur if the shaft cracked and required a prolonged repair outage once again in its 31 year life, the spare rotor evaluation would turn out differently.

Q. IS THERE ANY OTHER ALTERNATIVE THAT COULD PROTECT CUSTOMERS IN THE EVENT OF ANOTHER EXTENDED OUTAGE SUCH AS HAPPENED HERE?

A. This incident is a scenario risk, an unanticipated event not susceptible to prediction or quantification. The company has stated that there is no insurance that they are aware of that would cover the excess power cost resulting from an equipment breakdown such as this, or if it were available it would not be affordable (*See* Exhibit Staff/ 102/Durrenberger/ 10). Furthermore, PGE's Reliability Centered Maintenance evaluation indicates that a spare rotor is not justified. However, the definition of affordable changes as the price differential gets large and larger between coal-fired base load generation, such as Boardman, and peak season backup power consisting of wholesale power purchased from natural gas-fired generation. This incident costs approximately $500,000 per day in excess power costs alone, roughly half of which the customers are being asked to pay. If the company had the appropriate spare part on the shelf, ready to go, it could have been back up on line in as quickly as 14 days (*See* Exhibit Staff/102/Durrenberger/11). There may be some other lower cost hedge available that would defray some or all of the excess power costs should this or a similar event happen again. I would hope the company has given sufficient thought to analyzing alternatives. If a similar outage were to happen again, it might well be viewed as a predictable stochastic risk event, with the entire excess costs appropriately borne by the utility shareholders.

Q. WHAT DO YOU CONCLUDE?

A. I conclude that the company did not behave imprudently and that the Boardman excess power cost deferral amortization should be allowed with the condition noted above. I further believe that the company's proposal to use offsets to defray the rate impact has merit provided the details can be worked out by Parties.

Q. DOES THAT CONCLUDE YOUR TESTIMONY?

A. Yes.

CASE: UE 196
WITNESS: Ed Durrenberger

PUBLIC UTILITY COMMISSION
OF
OREGON

STAFF EXHIBIT 101

Witness Qualification Statement

February 20, 2008

WITNESS QUALIFICATION STATEMENT

NAME:	Ed Durrenberger
EMPLOYER:	Public Utility Commission of Oregon
TITLE:	Senior Utility Analyst
ADDRESS:	550 Capitol St. NE, Ste. 215, Salem, Oregon 97301
EDUCATION:	B.S. Mechanical Engineering Oregon State University, Corvallis, Oregon
EXPERIENCE:	I have been employed at the Public Utility Commission of Oregon since February of 2004. My current responsibilities include staff research, analysis and technical support on electric power cost issues.
OTHER EXPERIENCE:	I have over twenty years of experience managing boiler plant engineering, operations and maintenance in a heavy industrial manufacturing environment. I have also managed manufacturing and production in high tech equipment manufacturing.

CASE: UE 196
WITNESS: Ed Durrenberger

PUBLIC UTILITY COMMISSION OF OREGON

STAFF EXHIBIT 102

Exhibits in Support of Reply Testimony

February 20, 2008

January 22, 2008

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Randy Dahlgren
Director, Regulatory Policy & Affairs

PORTLAND GENERAL ELECTRIC
UE 196
PGE Response to OPUC Data Request
Dated January 7, 2008
Question No. 019

Request:

Is there any operating scenario that the company looked at that would have allowed for some level of operation of the Boardman facility, even if it were at a reduced capacity or lower efficiency, that could have mitigated some of the excess power costs?

Response:

We considered a "lower operation" scenario, but quickly concluded that this approach was not feasible. Possible solutions to the problems introduced by the "lower operation" scenario would have been too complex for implementation within the period in which LP 1 was out. In other words, implementing and then taking out any temporary solution would have required so much time that the process would not have been completed by the time the repaired LP 1 was ready for installation. Also, any possible solution would have introduced serious operational issues.

November 5, 2007

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 196
PGE Response to OPUC Data Request
Dated October 22, 2007
Question No. 002

Request:

Did PGE receive reimbursement from an insurance carrier? If not, is PGE seeking cost recovery from an insurer or other party for the repair and transport costs for the incident? If so, from whom and how much? Please provide a detailed reporting of all costs submitted for recovery and/ or any insurance or liability coverage (reimbursement) provided to PGE related to the Boardman outage.

Response:

PGE did not receive reimbursement from an insurance carrier, nor is PGE seeking cost recovery from an insurer or other party for the repair and transport of the turbine rotor. See also PGE's Response to OPUC Staff Data Request No. 003.

November 5, 2007

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 196
PGE Response to OPUC Data Request
Dated October 22, 2007
Question No. 010

Request:

If the Commission were to determine that the OEM was negligent in either design or maintenance leading to this failure and was to deny all or part of the amortization of the excess power cost deferral, would the company take legal action against the OEM to redress its losses?

Response:

PGE objects to this request to the extent it seeks a legal conclusion. Subject to and without waiving its objection, PGE responds as follows:

No. PGE's ability or inability to assert a claim against the OEM is dependent on a number of factors including the facts surrounding the outage, contracts between PGE and the OEM, and applicable laws. A finding by the Commission of negligence of the OEM would have little or no relevance to such a claim or impact on PGE's actions.

February 7, 2008

TO: Brad Van Cleve
Industrial Customers of NW Utilities

FROM: Randy Dahlgren
Director, Regulatory Policy & Affairs

PORTLAND GENERAL ELECTRIC
UE 196
PGE's *First Supplemental* Response to OPUC Data Request
Dated October 22, 2007
Question No. 008

Request:

Did PGE start, stop, and operate the turbine according to operating procedures prescribed or approved by the OEM? Have any of the operating procedures or processes for startup, operation, or shutdown of this turbine been changed as a result of the shaft failure? Please explain.

Response (November 5, 2007):

PGE started, stopped, and operated the turbine according to operating procedures prescribed or approved by the OEM, Siemens. PGE submitted to Siemens all operating data from initial start-up in 2000 through the rotor failure in 2005, a period of more than five years, and Siemens found no operating errors. Attachment 008-A gives Siemens' precise statement regarding this finding. This attachment is confidential and subject to Protective Order No. 07-433. Procedures and processes for startup, operation, and shutdown of the turbine have not been changed as a result of this failure.

First Supplemental Response (February 7, 2008):

OPUC Staff has indicated in conversations that it is interested in changes other than in operation of the turbine made subsequent to the rotor cracking. PGE objects to this request on the basis of relevance. Without waiving objection, PGE responds as follows:

PGE has taken or plans to take steps including the following to maintain proper alignment of the turbine train and lower the risk of future rotor cracking:

- We retained independent consultants to conduct alignment checks, measure turbine component movement, and train PGE personnel on rotating equipment alignment theory and application.

- We rechecked the sole plate nuts on both LP 1 and LP 2 for tightness. No problems were found.

- We plan to uncouple each segment of the turbine generator train to make alignment measurements. This will be done in either or both of the 2008 and 2009 planned maintenance outages. We are gathering information to optimize alignment during the 2009 maintenance outage if needed. Based on this same information gathering, we will correct any significant alignment issues during the 2008 maintenance outage.

- We inspected the crack location area on the other low-pressure turbine (LP 2).

- We shot-peened the crack location area on both LP 1 and LP 2 to reduce the potential for crack initiation. Shot-peening increases resistance to cracking at the surface.

- We examined the governor ends of LP 1 and LP 2 visually and using liquid dye penetrant testing after one year of operation. The area was free of linear indications. We will continue these examinations on a routine basis.

- We are continuing our discussions with Siemens Westinghouse regarding ways to increase resistance to failure due to high cycle fatigue.

November 5, 2007

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 196
PGE Response to OPUC Data Request
Dated October 22, 2007
Question No. 009

Request:

Has the turbine manufacturer experienced this type of failure on any other similar machines at other installations? If so, where did this occur and what was the resolution?

Response:

The turbine manufacturer, Siemens, analyzed other Siemens units for comparison purposes. Although there were some instances of rotor cracking in other units, there were none among units having ruggedized (or solid) rotor design, which is also Boardman's rotor design. See Page 19 of PGE Exhibit 105C-C in this docket.

February 7, 2008

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Randy Dahlgren
Director, Regulatory Policy & Affairs

PORTLAND GENERAL ELECTRIC
UE 196
PGE Response to OPUC Data Request
Dated January 24, 2008
Question No. 026

Request:

At the time PGE decided to perform the turbine upgrade in 2000 what were the stated, expected or guaranteed benefits to making the changes? How has the unit performed compared to the expectations? If there were benefits that the company can quantify, for instance increased output, better efficiency or lower costs, what was the approximate value of the benefits in the ensuing time period since the upgrade went into operation? If the unit did not meet performance expectations were there any consequences?

Response:

Siemens Westinghouse guaranteed that output for the entire Boardman plant would increase by 23 MW, to 580 MW. This performance standard was met, resulting in 4 percent of output going forward being attributable to the upgrade (23 / 580 = 4%). For PGE's 65 percent share, 4 percent of the new capacity was approximately 15 MW. This higher capacity for PGE's share has resulted in approximately $28.6 million in customer benefits in Dockets UE 115, UE 139, UE 149, UE 161, UE 172, and UE 180, which covered the period October 2001 through December 2007. This calculation excludes the November 18, 2005 through June 6, 2006 period. 2008 customer benefits through UE 192 are approximately $6.8 million. Given our current modeling for a 2009 test year general rate case, we project 2009 customer benefits of approximately $6.8 million. We expect customer benefits for future years to be in the same range as those for 2008 and 2009.

For the period July 2000 through September 2001, power cost savings associated with the higher capacity were approximately $23.8 million. These benefits helped customers indirectly by providing earnings that allowed PGE to delay filing the UE 115 rate case and were reflected in the January 2001 through September 2001 power cost deferral..

Attachment 026-A is an Excel file which provides the power cost savings estimates. This attachment is confidential and subject to the protective order in this docket (Order No. 07-433).

November 5, 2007

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 196
PGE Response to OPUC Data Request
Dated October 22, 2007
Question No. 007

Request:

Since the rotor was installed in 2000 has the maintenance followed the OEM requirements for frequency and type? Other than small routine operating maintenance has PGE or another contractor besides the OEM performed any of the major maintenance or alignment of the machine before the cracked rotor was found?

Response:

Maintenance has followed the OEM requirements for frequency and type. Neither PGE nor any other contractor other than the OEM had performed any maintenance or alignment of the rotating parts before the crack was found in the rotor. See also the question and answer beginning on Page 8, Line 18 of PGE Exhibit 100 in this docket.

At the time of installation in 2000, the OEM, Siemens, recommended inspection and maintenance at 10-year intervals. This 10-year cycle has become the standard of OEMs since the 1990's.

November 5, 2007

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Patrick G. Hager
Manager, Regulatory Affairs

PORTLAND GENERAL ELECTRIC
UE 196
PGE Response to OPUC Data Request
Dated October 22, 2007
Question No. 003

Request:

Does PGE have business interruption or consequential damage insurance for any of the thermal plants such as Boardman? If no, has PGE ever had such insurance? Please explain.

Response:

PGE does not have, nor has it ever had, business interruption or consequential damage insurance for any of the thermal plants such as Boardman. As stated in PGE's Response to OPUC Staff Data Request 014 in Docket UM 1234, "To PGE's knowledge, there are no equipment manufacturers that will enter into a contract that contains penalties for consequential damages. Discussions with suppliers have indicated that the selling prices would rise to prohibitive levels, if a sale could be negotiated, with coverage of consequential damages."

January 22, 2008

TO: Vikie Bailey-Goggins
Oregon Public Utility Commission

FROM: Randy Dahlgren
Director, Regulatory Policy & Affairs

PORTLAND GENERAL ELECTRIC
UE 196
PGE Response to OPUC Data Request
Dated January 7, 2008
Question No. 017

Request:

If the company were to have a spare LP1 turbine rotor shaft and the present shaft were to develop a defect requiring a repair out of the machine, how many days would it take to remove the old rotor, assemble a replacement shaft with all the blades and parts and re-assemble the machine ready to operate?

Response:

If PGE only had an unbladed shaft, it would have to be shipped out for the production and installation of blades. This would result in a delay of several months. (See PGE's response to OPUC Request No. 016.) If we had a spare bladed shaft, it would take at least two weeks from the time of shut-down to the time at which the plant would be ready to resume operation.

CERTIFICATE OF SERVICE

UE 196

I certify that I have this day served the foregoing document upon all parties of record in this proceeding by delivering a copy in person or by mailing a copy properly addressed with first class postage prepaid, or by electronic mail pursuant to OAR 860-13-0070, to the following parties or attorneys of parties.

Dated at Salem, Oregon, this 20th day of February, 2008.

Stephanie S. Andrus
Assistant Attorney General
Of Attorneys for Public Utility Commission's Staff
1162 Court Street NE
Salem, Oregon 97301-4096
Telephone: (503) 378-6322

UE 196
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