EXHIBIT NO. ___(KCG-1T)
DOCKET NO. PG-041624
WITNESS: KEVIN C. GARRITY

BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION, **Complainant,** **v.** **PUGET SOUND ENERGY, INC.,** **Respondent.**	**Docket No. PG-041624**

PREFILED DIRECT TESTIMONY OF KEVIN C. GARRITY ON BEHALF OF PUGET SOUND ENERGY, INC.

AUGUST 15, 2005

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PUGET SOUND ENERGY, INC.

PREFILED DIRECT TESTIMONY OF KEVIN C. GARRITY

I. INTRODUCTION

Q. Please state your name, business and address.

A. Kevin C. Garrity, CC Technologies Services, Inc., 5777 Frantz Road, Dublin, OH 43017-1386.

Q. What is CC Technologies?

A. CC Technologies Services, Inc. ("CCT") is an engineering and research organization specializing in the evaluation of materials properties, materials selection, corrosion, corrosion control, and design and development of instrumentation and engineering software. Our staff consists of Ph.D. researchers, engineers and technicians in metallurgical engineering, materials science, and corrosion science, and our areas of study include general and localized corrosion, coating degradation, stress-corrosion cracking, corrosion fatigue and thermal fatigue.

Q. What is your position with CC Technologies?

A. I am the Chief Operating Officer of CCT, and I direct the activities of CC Technologies Laboratories, Inc., CC Technologies Services, Inc., CC Technologies Canada, CC Technologies International, Inc., and CC Technologies Systems, Inc.

Q. What is your educational and professional experience?

A. I have a B.S. in Electrical Engineering from the Polytechnic Institute of Brooklyn. I am a Registered Professional Engineer in Ohio, New York, Georgia, Louisiana, Tennessee, Kansas and Alabama. I am a member of the National Association of Corrosion Engineers (NACE), and was a member of the Executive Committee of the NACE Board from 1992-1996.

I worked as a corrosion engineer and manager from 1974 until 1985, until I became a Vice President of Engineering with Harco Technologies Corporation in Ohio. In 1989, I became a Vice President with CC Technologies ("CCT") and was later promoted to Executive Vice President and then COO in 2001. I have thirty years of experience in corrosion engineering and the application of cathodic protection to buried pipelines and tanks, concrete structures, and marine structures. I have managed programs in all aspects of cathodic protection design, monitoring, and installation for a wide variety of cathodic protection applications including pre-stressed concrete pipe, transmission and distribution pipelines, reinforced concrete nuclear waste tanks, water lines and tanks, power plant condensers, buried tanks, bridge decks, and parking garages. I also have extensive experience in evaluating and mitigating stray current effects.

During the course of my career, I have been responsible for project management of multiple pipeline integrity projects, including TransCanada PipeLines Ltd. (30,000 km) and Alyeska Pipeline Service, Co. (800 miles). I have also authored numerous publications on the subject of cathodic protection. Those publications and additional details on my qualifications are listed on my curriculum vitae, which is attached as Exhibit No. ___ (KCG-2).

II. SCOPE OF TESTIMONY

Q. What have you been asked to do in this case?

A. I have been asked to: (1) review Puget Sound Energy, Inc.'s ("PSE") data and conduct my own investigation regarding the September 2, 2004, house explosion in Bellevue; (2) offer opinions about the circumstances leading to the explosion and the cause of it; and (3) respond to certain conclusions and opinions reached by Washington Utilities and Transportation Commission ("WUTC") Staff as well as their corrosion expert, Dr. Graham Bell.

III. SUMMARY OF TESTIMONY

Q. Please summarize your conclusions.

A. After reviewing all of the evidence, I conclude that the leak in Mrs. Schmitz's gas service line was caused by corrosion that pre-existed the brief reversal of the Vasa Park Rectifier. Specifically, the leak was caused by external corrosion at the site of a coating holiday in the service line. The explosion was a result of anomalous factors unique to Mrs. Schmitz's residence, including the presence of a drainage system above the gas service line that allowed gas to migrate into the home. I also conclude that PSE's gas distribution system is safely operated and well-maintained, and that there is nothing to indicate that PSE is suffering from system-wide corrosion. Accordingly, PSE should be allowed to resume operations under existing federal and state gas distribution system regulations.

IV. PRIMARY DOCUMENTS AND INFORMATION REVIEWED BY MR. GARRITY

Q. Please list the primary documents that you reviewed in this matter to reach your conclusions.

A. I have reviewed the following documents:

- PSE SAP records of rectifier inspections
- PSE historical leak records
- PSE Operations maps
- PSE Rectifier design and installation records for the Vasa Park and Cross Roads Rectifiers
- PSE historical and recent Exposed Pipe Condition Reports (EPCR's) for the Spiritridge area
- PSE Annual test site readings for the Spiritridge area
- Plat maps of the Spiritridge area
- US Code of Federal Regulations Volume 49 part 192
- Form D-4 for 16645 SE 26th PL
- Historical and recent leak survey results
- City of Bellevue Fire Department News Release 9/4/2004
- Transcriptions of Vasa Park Journal from Greg Schwartz's Journal
- 1994 USGS Soil Survey for the Spiritridge area
- PSE's Response to WUTC Staff Data Request No. 65 (soil samples taken by PSE at the scene of the incident)
- PSE's Pipe Segment Integrity Study

I also interviewed PSE staff, physically inspected the Schmitz residence gas service line, analyzed the soil at the explosion site, and physically inspected a sample of the service risers in the Spiritridge neighborhood. Finally, I have

reviewed all of the testimony and exhibits filed by the WUTC Staff in this matter.

V. THE SPIRITRIDGE NEIGHBORHOOD AND CATHODIC PROTECTION

Q. You have testified that you have reviewed multiple PSE records and interviewed PSE personnel about Spiritridge. Are you therefore familiar with the gas distribution and cathodic protection system for the Spiritridge neighborhood, including the service line servicing Mrs. Schmitz's home at 16445 SE 26th Place, Bellevue, Washington?

A. Yes.

Q. Please tell us what you learned about the gas service line servicing Mrs. Schmitz's residence.

A. In January 1963, a nominal ¾-inch wrapped steel gas service line was installed at 16645 S.E. 26th Place, Bellevue, Washington. The original service installation records indicate that the service extended sixty feet from a 2-inch intermediate pressure wrapped steel gas main located along S.E. 26th Place. Installation of the service was completed on January 10, 1963 and the application for gas service was completed January 14, 1963. A detailed description of the background can be found in my summary report on the failed service line, attached as Exhibit No. ___ (KCG-5).

Q. Please describe what you learned about cathodic protection for the gas distribution lines in the Spiritridge neighborhood.

A. Cathodic protection was applied to the gas main and service lines in the vicinity of Mrs. Schmitz's home during the early 1980s. The coated and wrapped steel service was installed with no dielectric union at the tie-in to the main. The

service therefore was cathodically protected via the cathodic protection sources protecting the main. The predominant cathodic protection current source in the vicinity of the Spiritridge subdivision is located at S.E. 43rd Street and 164th Place S.E. and has been referred to as the Vasa Park Rectifier (the "Rectifier"). The Rectifier is situated approximately 3,240 feet from the incident site. Documents reviewed indicate that this Rectifier and ground bed were installed in March 1982. It is reported that supplemental magnesium sacrificial anodes have been installed at various locations during the normal course of pipe excavations and service installations.

Q. The WUTC Staff and Dr. Bell have given extensive explanations of cathodic protection in their testimony. Do you generally agree with their descriptions?

A. Generally, yes. But a few clarifications are in order. First, cathodic protection does not cause corrosion to be transferred to a higher energy level material (the anode), as described in Dr. Bell's testimony (17:4-7 (Bell)). Second, while Dr. Bell is correct that cathodic protection mitigates corrosion and does not completely prevent it, effective cathodic protection can significantly reduce corrosion to less than 1/1000 of an inch per year.

Q. Are you familiar with PSE's monitoring of its cathodic protection systems with leak surveys and pipe-to-soil potential measurements, as described in testimony of James Hogan?

A. Yes, I am.

Q. Have you reviewed the historical data from cathodic protection monitoring in the Spiritridge neighborhood?

A. Yes.

Q. And what are your conclusions based on this data?

A. The cathodic protection system PSE has in place is effective and appropriate to maintain the safety of the gas distribution system in that area. Indeed, until the summer of 2004, no significant corrosion or corrosion protection-related conditions were noted in the area.

VI. THE INVESTIGATION OF THE SEPTEMBER 2, 2004 EXPLOSION

Q. You were asked by PSE to formulate an opinion regarding the cause of the September 2, 2004 explosion. Based on your investigations, what was the cause of the September 2, 2004 explosion?

A. The explosion was caused by a leak in the gas service line to Mrs. Schmitz's home. That leak resulted from severe corrosion that pre-dated the cross-wiring of the Rectifier. Additionally, the presence of a subsurface drain above the service line, leading from a basement sink inside the house, probably contributed to the explosion because it allowed a direct path for the gas to enter the house through the foundation.

Q. Please outline what you did to investigate the cause of the explosion.

A. In addition to reviewing PSE historical data and interviewing PSE personnel, I: (1) examined and conducted an analysis of the service line; (2) analyzed the soil at the site of the incident; (3) examined and conducted a metallurgical analysis of service risers in the Spiritridge neighborhood; and (4) reviewed PSE's Pipe

Segment Integrity Study.

Q. During the course of your investigation of the September 2 house explosion, did you prepare any reports?

A. Yes, I did.

Q. Can you identify each and explain generally their contents?

A. Yes.

As a result of the analysis of the service line, I prepared a report dated February 18, 2005, entitled "Final Report—Laboratory-Based Evaluation of Failed Service Line." It is attached as Exhibit No. ___ (KCG-3) to my testimony and is focused on objectively analyzing the gas service line for the Schmitz residence. The gas service line was sent to me at our office in Dublin, Ohio, for, among other things, a corrosion assessment and a metallagraphic evaluation. My conclusions, which can be found on page 29 of that report, include my finding that the leak on the gas service line occurred as a result of external corrosion that pre-existed the brief reversal of the Rectifier.

I prepared a report summarizing my opinions regarding the cause of the leak, the role of the cross-wired Rectifier, whether the corrosion of the Schmitz gas service line indicated a systemic problem, and whether PSE's response to the explosion was reasonable. This report is dated February 25, 2005, and is attached to a February 28, 2005, letter from me to PSE attorney Charles Gordon. *See* Exhibit No. ___ (KCG-4). My opinions are reflected on pages 3-6 of that report and include my conclusion that the leak occurred as a result of localized corrosion that began prior to the required application of cathodic protection.

I also prepared a more complete report detailing the factual background leading

up to and following the explosion. It is dated February 28, 2005, and is entitled "Final Report: Summary Report—Failed Service Line Bellevue, Washington." *See* Exhibit No. __ (KCG-5). Much of this report has been repeated in the WUTC Staff testimony, with limited exceptions.

As a result of the soil analysis undertaken by CCT, I prepared a report dated June 15, 2005, and it is attached to a June 15 letter from me to PSE attorney, Steve Secrist, regarding "Puget Sound Energy, Summary of Findings—Soil Survey—Spirit Ridge Subdivision." *See* Exhibit No. __ (KCG-6). In that report, I concluded that there is nothing in our lab analysis that indicates the soil conditions in the Spiritridge neighborhood had unique corrosive characteristics.

As a result of the analysis of the service risers in the Spiritridge neighborhood, I prepared a report dated June 15, 2005, and it is contained within a letter from me to PSE attorney, Steve Secrist, regarding "Puget Sound Energy, Spirit Ridge—Summary of Field Inspection of Seventy-five (75) and Metallurgical Analysis of Six (6) Service Risers—Spirit Ridge Subdivision." *See* Exhibit No. __ (KCG-7). One page 8 of that report, I conclude that the representative sample of the service risers indicated that they were installed in a manner that is consistent with industry practice and that there were no shortcomings in the manner that the risers were installed or wrapped in the field. I also conclude that the risers did not indicate any systemic integrity threat, that the risers are performing in accordance with industry and regulatory standards, and that the Rectifier did not appear to contribute to accelerated risk of the risers for the period that the Rectifier was cross-wired.

Q. Are there any other reports you prepared or are currently working on?

A. No.

Q. Can we walk through the methodology you employed in each report to reach your conclusions and discuss where you and Dr. Bell differ?

A. Yes.

A. METALLURGICAL ANALYSIS OF THE SERVICE LINE

Q. Please describe the analysis you conducted of the service line.

A. The service line was cut into ten segments, wrapped, and shipped. We numbered the segments 1-10, 10 being near the Schmitz house and 1 being nearest the road, where the service line connected to the main.

The analysis of the service line included a visual evaluation and photo documentation of the pipe segments in condition as they were received, a visual evaluation and photo documentation of the pipe segments with the external coating and documentation of the extent of corrosion to the pipe, a cross-sectioning of selected corroded areas with subsequent metallographic evaluation of the transverse surfaces in as-polished and etched conditions using light microscope, scanning electron microscopy of the polished cross-sections, and elemental analysis of the surface products from corrosion sites by means of energy dispersive spectroscopy (EDS).

We also conducted a chemical analysis of the steel segments, took ultrasonic measurements of remaining wall thickness at selected locations, and conducted an analysis of the surface products for the presence of microbiological organisms.

Q. Does Dr. Bell agree that the metallurgical analysis was conducted in accordance with appropriate methods?

A. Yes. He has some criticisms of the use of Linear Polarization Resistance ("LPR"), but LPR is a standard industry method for testing the rate of corrosion

and Dr. Bell admits it is an indicator of the rate of corrosion.

Q. What was the purpose of the metallurgical analysis of the gas service line?

A. To understand the nature of the leak found in the gas service line.

Q. What did the analysis of the service line show?

A. The analysis of the service line showed that the overall condition of the coating was good. There were some scrapes in the coating (coating "holidays"). The leak on segment 10 of the service line, that segment closest to Mrs. Schmitz's home, was a result of external corrosion, probably initiated at one such holiday. For more detail, see Exhibit No. _____ (KCG-3) (Final Report: Failed Service Line).

Q. Are you and Dr. Bell in agreement on that?

A. Partially. Dr. Bell agrees the leak was a result of external corrosion at a coating holiday. Dr. Bell, however, erroneously thinks that the coating was nearing the end of its "useful life." Coating has no known "useful life," and the point when it fails is the point it no longer bonds to the pipe and cathodic protection is not effective, which would be evidenced by an exponential increase of leaks in the area. There is no evidence to support that this is occurring. In fact, the coating was intact on over 98% of the service line.

Q. Dr. Bell states that, given the analysis of the service line to Mrs. Schmitz's residence, more leaks in systems similarly constructed and with a similar vintage can be expected. Do you agree?

A. No. Dr. Bell's statement is purely speculative. First, the condition of the service line was good. Second, there is no evidence to indicate that PSE's gas distribution system is experiencing or will experience an abnormal occurrence of leaks.

B. SOIL SAMPLES

Q. How was the soil analysis conducted?

A. First, two sets of soil samples were collected by GeoEngineers on September 16, 2004, and analyzed by CCT and North Creek Analytical. These results were provided to CCT by PSE and are contained in Exhibit No. ___ (KCG-8). A third set of samples was collected by the WUTC Staff and analyzed by Dr. Bell and the results are contained in his testimony at Exhibit No. ___. (GECB-12). A fourth set of soil samples was collected by PSE and analyzed by CCT and the results are contained in Exhibit No. ___ (KCG-6).

Q. How were the first two sets of soil samples tested?

A. The first two sets of samples were analyzed for inorganic constituents, electrical properties, and pH, consistent with EPA standard methods. Type C1018 carbon steel coupons were placed in the soils to establish corrosion rate through LPR measurements.

Q. Do you agree with Dr. Bell that these first two samples were tested in accordance with EPA standard methods?

A. Yes.

Q. How was the third set of soil samples tested?

A. Dr. Bell's laboratory tested the third set of soil samples, and used standard methods to test for inorganic constituents, electrical properties and pH.

Q. Was the third set tested in accordance with EPA standard methods?

A. We cannot make that determination due to insufficient information.

Q. How was the fourth set of soil samples tested by CCT?

A. The fourth set of soil samples was analyzed to determine water soluble cations and anions, pH, total acidity, total alkalinity, moisture content, and resistivity. Type C1018 carbon steel coupons were placed in the soils to establish corrosion rate through LPR measurements.

Q. Is this a standard industry method for testing soil for corrosive characteristics?

A. Yes.

Q. Does Dr. Bell agree that the fourth set of soil samples were tested in accordance with standard industry practice?

A. Yes. Dr. Bell agrees that CCT used a methodology similar to what Dr. Bell used, and used LPR in addition to such testing. While Dr. Bell states that LPR is a "poor predictor of long term corrosion damage accumulation" (40:17-18 (Bell)), he admits the data is useful as an indication of corrosion.

Q. What was the purpose of the soil analyses?

A. To determine if the soil in the Spiritridge neighborhood had any unique corrosive characteristics.

Q. Overall, what does the analyses of the four sets of soil samples show?

A. That the soil at the house of Mrs. Schmitz did not have any unique corrosive characteristics.

Q. Do you agree with Dr. Bell's conclusion that the soil samples indicate that the soil surrounding Mrs. Schmitz's home had variations of corrosivity, and that such variations can increase the severity of corrosion?

A. No. While it is true that dissimilar soil conditions can produce corrosion cells, the first and second soil samples are consistent with each other and showed no evidence of unique corrosive characteristics. The soil looked as one would expect to find most soil in North America. The third set of soil samples, in which an excessive sulfide level was present, was taken close to the construction site and probably included construction material, such as gypsum board. Because the results of the third set of soil samples were inconsistent with the first and second tests, the fourth set was taken. The results of the analysis of the fourth set of samples were consistent with the first and second. The third set of soil samples is an outlier. Notably, it is clear where the first, second and fourth sets of soil samples came from. But there is no documentation showing precisely where the soil samples from the third set were taken.

Q. Do you agree with Dr. Bell's conclusion that the results from the third set of soil samples show that there was a possibility of microbiologically influenced corrosion ("MIC")?

A. No.

Q. Why not?

A. For three reasons. First, the presence of microbiological organisms does not equate to MIC: microbiological organisms exist in everything. Up to 1000 colonies per milliliter is considered a mid-to-moderate range of microbiological organisms in soil, and none of the soil samples shared a range in excess of 1,000 colonies per milliliter. In fact, all of the soil samples, except for one, were in the 1-10 colonies per milliliter or 10-100 milliliter range. *See* Exhibit No. ___ (KCG-9).

Second, there is no objective indication of MIC. To determine if MIC exists,

more than the presence of microbiological organisms would have to be analyzed. We would look at the morphology of the pipe, that is, the shape and condition of the pipe. The morphology of the Schmitz service line was uncharacteristic of MIC.

Finally, if MIC was present, as suggested by Dr. Bell, I would expect to see corrosion at a rate of 30-100 mils per year, and the line would have leaked shortly after it was put into service.

In summary, Dr. Bell is mistaken about what the soil samples show about the Schmitz residence, he has not identified the morphology of the gas service line that would be consistent with MIC, and he has not explained why such MIC would not have created a leak many years ago.

Q. Is it relevant that microbiological organisms were not tested in the fourth set of soil samples until seven days after the soil was tested?

A. No. All of the soil samples showed a consistent range of order of magnitude of colonies, and none of these ranges was significant. In fact, Dr. Bell's criticism of our reliance on the results of the testing on the service riser months after the service line was removed are unwarranted since the results are nearly identical to tests performed shortly after samples were obtained.

C. SERVICE RISER STUDY

Q. Please describe how the analysis of the service risers was done.

A. Seventy-five service risers were randomly selected from those removed when the pipe was being replaced from February 7, 2005 to April 1, 2004. This number was chosen by CCT because it represented 30% of service risers in this area, a statistically significant sample. The service risers were visually examined for

corrosion; six that showed visible signs of corrosion were selected for metallurgical testing. The protocol for testing the service risers was agreed upon between PSE and WUTC Staff on December 15, 2004, and is further described in Exhibit No. ___ (KCG-7) (June 15, 2005 Field Inspection of Risers) referred to as the Service Riser Study.

Q. Does Dr. Bell agree that CCT used appropriate methodologies in the Service Riser Study?

A. Yes.

Q. Please describe the purpose of the Service Riser Study.

A. The study of service risers in the Spiritridge neighborhood was undertaken to ascertain the condition of the service risers in that neighborhood after the brief polarity-reversal of the Rectifier.

Q. What did the Service Riser Study show?

A. Generally, the Service Riser Study indicated that the service risers in the Spiritridge neighborhood were in good condition. The service risers were installed in a manner that is consistent with industry practice and there were no shortcomings in the manner that the risers were installed or wrapped in the field. The risers were performing in accordance with industry and regulatory standards in effect, and no systemic integrity threats were identified. The inspection indicated only a small number of corrosion features, and no leaks. Additionally, while coating defects along the service length were identified, they were almost entirely void of any measurable corrosion, indicating that the cathodic protection system had been effective prior to the rectifier reversal. The reversal of the Rectifier polarity did not appear to contribute to accelerated attack of the risers

for the period that the rectifier was cross-wired.

Q. Do you agree with Dr. Bell's conclusion that the fact that corrosion damage was found in five of the six risers selected out of the initial 75 risers indicates that corrosion "should be a concern for PSE's systems of similar design, installation and operation?"

A. No. Dr. Bell assumes that because corrosion was found on 5 of 75 risers, PSE should be "concerned" about corrosion in its pipe distribution system of similar type and vintage. However, of all the risers inspected and tested, there was not a single leaking one. Except for one isolated location, those 5 risers that showed signs of corrosion were nowhere near the point of critical condition, with 90 mil to 113 mil of wall thickness remaining. In fact, the condition of the service risers is evidence that the Spiritridge neighborhood had adequate cathodic protection.

Some corrosion is a part of large gas distribution system that includes metal pipe. There is no reason to believe that corrosion and leaks will not be detected and remediated through normal operating procedures, such as cathodic protection monitoring and leak surveys.

D. PIPE SEGMENT INTEGRITY STUDY (COATING STUDY)

Q. Have you reviewed the Pipe Segment Integrity Study ("PSIS"), also known as the Coating Study, conducted by PSE, and attached to Mr. Hogan's testimony as Exhibit __ (JH-4)?

A. Yes.

Q. What is the purpose of the PSIS?

A. The PSIS tested the adequacy of the coating of mains and gas service lines in the Spiritridge neighborhood.

Q. Do you agree with the methodology employed in the PSIS?

A. Yes.

Q. What conclusions have you reached about the state of gas main and service line coatings based on the results of PSIS?

A. That the coating on the PSE's gas and service mains is generally in good condition.

Q. Do you agree with Dr. Bell's conclusions that: (1) "[t]he Study shows that the pipe is backfilled in rocks, which damage the coating and shield cathodic protection current; (2) [t]he Study also shows that soil resistivity variations in orders of magnitude likely contribute to corrosion and failure;" and (3) [t]he Study found two leaks out of only 34 completed excavations; which is 5.8% of the locations excavated."

A. No. First, there was backfill in the soil, and some backfill contained rocks. Not all backfill with rocks is coincident with damage to the coating, and it is not always true that rocks shield cathodic protection. Second, there was nothing unique about the soil characteristics. Third, the fact that the Study found two leaks out of 34 completed excavations does not indicate a system-wide problem; in fact, 5.8% is a small number, and there is no reason to believe that these leaks would not have been found through normal operating procedures.

Q. Do you agree with Dr. Bell's conclusion that the coating survey indicates the integrity of the system in the area studied is compromised, and that there may be a problem with pipeline systems in areas with pipes of similar type and vintage?

A. No. For a number of reasons, Dr. Bell's conclusions from the coating survey

cannot be supported by the evidence.

First, there is no evidence that the coating is failing. As explained earlier, coating fails when it no longer adheres to the pipe and corrosion cannot be controlled through cathodic protection. Evidence of a coating failure includes a chronic increase in leaks so that PSE could not even keep up with locating and repairing them. Not only is there no such evidence, but the number of coating faults found by the study was not inordinate for this type of piping system.

Second, coating faults are part and parcel of a coating; the presence of such coating faults does not mean the coating is bad. Cathodic protection is used precisely to remediate the existence of such coating faults. If coating applied to gas distribution piping was intended to be free of coating faults throughout the useful life of the piping system, there would never be a need for cathodic protection. The applicable Code of Federal Regulations from its inception recognized the inherent shortcomings of coatings and for that very reason, requires coatings to be compatible with supplemental cathodic protection. In fact, brand-new coating is only 99% effective, and cathodic protection is needed for the 1% of pipe's surface that remains exposed. Moreover, coating faults can be caused by a variety of factors, including installation, back filling, excavation, and other utilities. So regardless of how new coating is, it can be subject to damage, which is why cathodic protection is added.

Finally, contrary to Dr. Bell's assertion, there is no industry standard that establishes a "useful life" of coating. Many gas distribution systems that have coating from the 1940s and 1950s are still safely being used today.

VII. CONCLUSIONS

Q. What, in your opinion, cased the leak at 16445 S.E. 26th Place, Bellevue,

Washington?

A. The majority of the external corrosion at 16445 S.E. 26th Place, Bellevue, Washington, was more likely than not caused by unique and long-standing coating defects in the gas service line to the house and subsequent exposure to the local soil conditions for the period of service prior to the application of cathodic protection (approximately 20 years). In fact, the metallurgical examination suggested that the leak may have begun before the Rectifier cross-wiring occurred.

Accordingly, the resultant September 2, 2004 incident appears to be a combination of several unique factors specific to the Schmitz residence and service line, including the plumbing at the residence (sink drainage) diverted through the foundation, the unobstructed path for gas to migrate through the drain into the residence, and the ignition.

Q. Do you agree with Dr. Bell's opinion that the cross-wired Rectifier occurred after the leak in the Schmitz gas service line and that it is unlikely that the Rectifier was a factor in the explosion?

A. Yes.

Q. In your opinion, based on your review of all the data, is there any evidence of a systematic problem with the safety of PSE's pipeline in the Spiritridge neighborhood?

A. No. The metallurgical analysis of the service risers showed that the risers were performing in accordance with industry and regulatory standards, and that nothing, such as the reversal of the Rectifier, contributed to an accelerated attack of the risers. Additionally, the soil testing did not indicate that the soil conditions in the Spiritridge neighborhood had unique corrosive characteristics or that soil

species that would preclude successful mitigation of corrosion through the application of cathodic protection. A review of leak histories prior to the incident and cathodic protection annual survey data indicate that corrosion protection was maintained. The coating study found coating faults, such as would be expected in any pipeline distribution system, but indicated the coating was intact and cathodic protection was effective.

Q. In your opinion, based on your review of all the data, is there any evidence of a systematic problem with the safety of PSE's pipeline in neighborhoods with similar type and vintage of pipe as that that exists in Spiritridge?

A. No. There is no evidence that PSE's pipeline gas distribution system is anything other than safe, efficient, and operating as intended under federal and state guidelines.

Q. Is it your understanding that PSE undertook to replace the service line in the Spiritridge neighborhood with plastic pipe?

A. Yes.

Q. What is your conclusion about PSE's action in this regard?

A. It was timely, conservative, and effective. There was no technical reason to replace the pipe, as post-incident studies confirmed that the Spiritridge piping and services were the only portions of the system that could have been adversely affected by the rectifier cross-wiring. The system leak history and cathodic protection records indicate that corrosion mitigation measures were adequate prior to the inadvertent cross-wiring of the Rectifier. PSE has confirmed that no other rectifiers in the system were cross-wired. There is no evidence to suggest a systemic corrosion problem. Further, the post incident construction activities in

Spiritridge adequately addressed any link between the cross-wired Rectifier and the increased number of leaks following the September 2, 2004 incident.

VIII. RESPONSE TO DR. BELL'S CONCLUSIONS

Q. Dr. Bell draws a number of conclusions from the evidence in this matter, including the analysis of the service line, the soil analyses, the Service Riser Study, and the Pipe Segment Integrity Study. Have you reviewed these conclusions?

A. Yes.

Q. In the beginning of his testimony, Dr. Bell states: "Ultimately, the cause of the explosion was the result of an aging gas distribution system with pre-existing external corrosion and leaks that were not detected through normal operating procedures." (11:6-8 (Bell)). Do you agree with this conclusion?

A. No. PSE does not have an aging natural gas distribution system. "Aging" is an industry term of art that is used to describe a system with chronically escalating gas leaks and cathodic protection failures. If PSE's system was "aging," leaks would have increased at an exponential curve throughout the Puget Sound. There simply is no such evidence that I am aware of. Moreover, PSE would not be able to mitigate those leaks with cathodic protection, or keep up with monitoring and repair.

Q. Dr. Bell also makes a number of conclusions at the end of his testimony. Do you agree with Conclusion Numbers 1 and 2 of his testimony, where he states that: "The leak that resulted in the explosion was the result [of] external corrosion. The leak was associated with coating damage that most likely existed from the time of the original installation" (69:8-10 (Bell)) and "The

external corrosion was most likely not directly related to the cross-wiring of the Vasa Park rectifier. Evidence indicates that the leak preceded the reversal by a significant amount of time"? (69:11-13 (Bell))

A. Yes.

Q. Dr. Bell states in Conclusion No. 3 that: "Microbiologically influenced corrosion may have contributed to the failure." Do you agree with that conclusion? (69:14 (Bell))

A. No. As I explained above, there is no evidence to suggest that MIC was a factor in the corrosion of the service line to Mrs. Schmitz's house. If MIC was a factor, the service line would have corroded a long time ago.

Q. In Dr. Bell's Conclusion No. 4, he states: "The situation within the Spiritridge subdivision is not unique in the PSE system. The results of the Puget Sound Energy, 'Puget Sound Energy Pipe Segment Integrity Study in the Vicinity of the Vasa Park Rectifier,' dated June 21, 2005, indicated that undiscovered leaks are still present in the system and that the condition of the system is typical for construction from this vintage." (69:15-18; 70:1-2 (Bell)) Do you agree with that statement?

A. Yes. Corrosion and leaks are a part of any gas distribution system, and the Spiritridge neighborhood is not unusual in this regard. In fact, the evidence suggested that the coating and service risers in the Spiritridge neighborhood were both in good condition. It should be noted that there is no reason to believe that corrosion and leaks will not be detected and remediated through normal operating procedures, and that corrosion and leaks do not indicate that another catastrophic event is likely.

Q. Finally, Dr. Bell states in Conclusion No. 5: "Replacement of the main and service piping in the Spiritridge subdivision has eliminated the possibility of a similar corrosion related incident because the new piping is non-metallic." (70:3-5 (Bell)) Do you agree with that statement?

A. Yes.

IX. RESPONSE TO WUTC STAFF'S RECOMMENDATIONS

Q. Have you reviewed the recommendations made by Dr. Bell in this matter, under which PSE should inventory its pipeline systems of similar type and vintage, and undertake additional steps to survey them, including conducting a leak survey annually instead of every five years, as required by the applicable regulations?

A. Yes.

Q. In your opinion, are these steps necessary to maintain the safety of PSE's gas distribution system?

A. No. There is no evidence to indicate that PSE should use its resources in this manner, and its resources would be better used complying with the applicable federal and state regulations. As these regulations illustrate, corrosion and leaks are a part of any gas distribution system, and normal operating procedures should detect and remediate them. Simply put, not all corrosion is injurious to the integrity of the piping, and not all leaks mean that a catastrophic event will occur. The explosion at Mrs. Schmitz's house was a tragic but unique circumstance. In light of that fact, there is no evidence to support forcing PSE to undertake tasks and burdens above and beyond what is required of all gas distribution system operators by the federal and state regulations.

Q. Does this conclude your direct testimony?

A. Yes, it does.