EXHIBIT NO. ___(KCG-4)
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

THIRD EXHIBIT TO THE PREFILED DIRECT TESTIMONY OF KEVIN C. GARRITY (NONCONFIDENTIAL) ON BEHALF OF PUGET SOUND ENERGY, INC.

AUGUST 15, 2005

CC Technologies
SOLVING PROBLEMS THROUGH INNOVATION

February 28, 2005

Charles Gordon
Attorney at Law
Gordon Murray Tilden LLP
1001 Fourth Avenue, Suite 4000
Seattle, Washington 98154-1007

Dear Mr. Gordon:

I have been retained through my company CC Technologies Services Inc. by Gordon Murray Tilden LLP, who represents Puget Sound Energy (PSE) to review data, documents, reports, metallurgical analyses and other related information related to a natural gas service line leak at a residence located at 16445 SE 26th Place in Bellevue, Washington. A gas leak and subsequent explosion occurred at the above residence (known as the Schmitz residence) on September 2, 2004. The gas service line was removed from service on September 3, 2004. I have been asked to offer, to the extent possible, opinions in the following areas:

1. The cause of the leak that occurred at the Schmitz residence on the incident date;

2. The role, if any, that the mis-wiring of a rectifier in the affected area had on the cause of the leak;

3. Whether the corrosion of the service line at the Schmitz residence is indicative of a systemic problem relating to other services within PSE's system; and

4. Whether PSE's construction program in response to the incident was reasonable with regard to the findings related to the rectifier and cathodic protection in general.

My findings and opinions are based upon the information reviewed to date and may be supplemented as I learn additional information or perform additional analyses that are relevant to this effort. My report may be modified to reflect additional analyses or opinions.

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1.0 CORPORATE QUALIFICIATIONS AND RESUME OF EXPERIENCE

CC Technologies 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. Areas of study include general and localized corrosion, coating degradation, stress-corrosion cracking, corrosion fatigue and thermal fatigue.

I am Chief Operating Officer of CC Technologies Services, Inc. and have been involved with the pipeline industry since 1974. I have worked in the area of corrosion engineering, corrosion control, cathodic protection, protective coatings and pipeline corrosion since that time. I have a Bachelors of Science in Electrical Engineering and I am a registered professional engineer and NACE certified cathodic protection specialist. I have served on the executive committee and board of NACE International (National Association of Corrosion Engineers) and have chaired several NACE technical committees including the group committee on Underground Corrosion, the unit committee on Cathodic Protection and the task group on Microbially Influenced Corrosion on Buried Pipelines. I currently chair the NACE Task Group TG 285 on Criteria for Cathodic Protection of Pipelines.

2.0 INFORMATION REVIEWED

Documents reviewed that form the basis of my opinions include the following:

- Puget Sound Energy (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 Spirit Ridge area
- PSE Annual test site readings for the Spirit Ridge area
- Plat maps of the Spirit Ridge area
- US Code of Federal Regulations Volume 49 part 192
- Form D-4 for 16645 SE 26th PL
- Historical and recent leak survey results
- Discussions and Interviews with PSE staff
- City of Bellevue Fire Department News Release 9/4/2004

- Transcriptions of Vasa Park Journal from Greg Schwartz's Journal
- Final Report F4434-01G "Laboratory-Based Evaluation of Failed Service Line by CC Technologies Laboratories, Inc.
- 1994 USGS Soil Survey for the Spirit Ridge area
- Physical inspection of risers.

3.0 BACKGROUND

The pipeline that leaked was installed in January of 1963 and was constructed of ¾-inch diameter by 0.130-inch wall thickness carbon steel. The line was wrapped with an external coal tar enamel coating and cathodic protection was applied to the steel mains and services in the vicinity of the incident in the early 1980's. The line was reported to have been buried to a depth of more than 18 inches.

4.0 OPINIONS

Based upon the analysis of the information reviewed and studied to date, I offer the following opinions:

1) Opinion No. 1. Regarding the cause of the leak –

The leak on the service line at the Schmitz residence occurred as a result of localized external corrosion from exposure to corrosive soil conditions prior to the application of cathodic protection. The external corrosion progressed through the pipe wall allowing the gas to escape and migrate into the residence. The leak was accompanied by a series of unique factors that resulted in the tragic explosion (see Opinion #3).

Basis for Opinion No. 1

The majority of the external corrosion was more likely than not caused by unique and long-standing coating defects in the Schmitz service line and subsequent exposure to the local soil conditions for the period of service prior to the application of cathodic protection (approximately 20 years). Laboratory testing of soil samples obtained in the area of the failed service did not identify aggressive 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. Laboratory measured corrosion rates of carbon steel coupons exposed to the soil obtained in the area of the failed service indicated corrosion rates of 6 mils/year (0.006-

inches/year), which when coupled with a 20 year soil exposure prior to the application of cathodic protection could result in 0.120 inch wall loss.

The corrosion morphology at the failure site is consistent with corrosion due to exposure to localized corrosive soil conditions, but not consistent with morphologies typical of stray current corrosion or corrosion associated with rectifier polarity reversals. Therefore the rectifier mis-wiring is not considered to be a primary cause of the corrosion that led to the leak but may be a contributing factor.

The metallurgical examination revealed evidence of internal corrosion on the ID (internal diameter) surface at the breach in the pipe wall, suggesting that the leak may have begun before the rectifier mis-wiring occurred.

2) Opinion No. 2. Regarding the role of the mis-wired rectifier as the predominant cause of the leak

The mis-wired rectifier (Vasa Park Rectifier) was not the predominant cause of the leak, but may have been a contributing factor.

Basis for Opinion No. 2

The corrosion morphology at the failure site is not consistent with corrosion caused by stray current mechanisms or forced current draining from the pipe due to a mis-wired rectifier. The metallurgical examination of the failed service did reveal a localized corrosion site near the tie-in to the main that was consistent with morphologies associated with rectifier reversals; however the leak location was characteristically different, suggesting corrosion due to exposure to local soil conditions.

Although the rectifier mis-wiring is not considered to be the primary cause of the corrosion that lead to the leak, it may have accelerated the dissolution of the final pipe ligament enlarging the leak site and thereby allowing a larger volume of gas to escape.

3) Opinion No. 3. Whether the corrosion of the service line at the Schmitz residence is indicative of a systemic problem relating to other services within PSE's system.

Based on a review of all available information and analyses to date, there is no evidence to suggest a systemic problem.

Basis for Opinion No. 3

The results of the review and studies to date have indicated that a significant number of corrosion related leaks (twenty-three) have been found on the services and piping studied in the Spirit Ridge area following the incident of September 2, 2004. While the root cause of the corrosion contributing to these leaks has not been conclusively determined, it is probable that the inadvertent mis-wiring of the Vasa Park rectifier contributed to them. The portion of PSE's system which was possibly adversely affected by the inadvertent rectifier reversal was limited to the intermediate pressure (IP) piping system in the Spirit Ridge subdivision.

Visual inspection of the entire length of the failed service indicated only a small number of corrosion features. Additionally, a larger number of coating defects along the service length were identified, but were void of any measurable corrosion indicating that the cathodic protection system had been effective prior to the rectifier reversal.

The resultant September 2, 2004 incident appears to be a combination of several unique factors specific to the Schmitz residence and service line, including a) long-standing coating defects and a long-standing corrosion feature in the Schmitz service line, b) the absence of cathodic protection for the first twenty years of service which, although consistent with industry practice at the time, left the service without supplemental corrosion protection, c) a cross-wired rectifier, d) the plumbing at the residence (sink drainage), diverted through the foundation, e) the unobstructed path for gas to migrate through the drain into the residence, and f) the ignition.

Examination of a limited number of service risers removed and visually inspected to date in the Spirit Ridge area has not identified any systemic corrosion related problems. Potentially injurious corrosion defects caused by the rectifier mis-wiring will be removed during the construction program.

4) Opinion No. 4. Regarding whether PSE's construction program in response to the incident was reasonable with regard to the findings related to the rectifier and cathodic protection in general.

While there was no technical reason for the steel service and main replacement project in the Spirit Ridge Neighborhood, the PSE response was timely, conservative, and effective.

Basis for Opinion No. 4

Post incident studies confirmed that the Spirit Ridge IP piping and services were the only portions of the system that could have been adversely affected by the rectifier mis-wiring. The system leak history and cathodic protection records indicate that corrosion mitigation measures were adequate prior to the inadvertent mis-wiring of the Vasa Park rectifier. PSE has confirmed that no other rectifiers in the system were mis-wired. There is no evidence to suggest a systemic corrosion problem. Further, the post incident construction activities in Spirit Ridge adequately addressed any link between the cross-

wired rectifier and the increased number of leaks following the September 2, 2004 incident.

Should you have any questions concerning this letter report, please feel free to contact me at your convenience.

Very truly yours,

CC Technologies Services, Inc.

Kevin C. Garrity, P.E.
COO