Exhibit T- ____ (HCC-T)

BEFORE THE WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

KIMBERLY-CLARK TISSUE COMPANY

Complainant

v. Docket No. UG-990619

PUGET SOUND ENERGY, INC.

Respondent;

DIRECT TESTIMONY OF HEIDEMARIE C. CASWELL

ON BEHALF OF PUGET SOUND ENERGY, INC.

October 4, 1999

DIRECT TESTIMONY OF HEIDEMARIE C. CASWELL

Q. Please state your name, business address and position.

A. My name is Heidemarie C. Caswell. My address is 815 Mercer Street, Seattle, Washington, 98109. I am employed at Puget Sound Energy as Manager-Operations Planning.

Q. Would you describe your education and relevant employment experience?

A. I hold a Bachelor of Science in Civil Engineering from the University of Washington. I am a Professional Engineer, licensed in the State of Washington. From 1979 until the merger between Washington Natural Gas ("WNG") and Puget Sound Power and Light in February 1997, I was employed by WNG. My positions at Washington Natural Gas included Engineering Aide, Staff Engineer, Design Support Engineer, Special Project Engineer, WORMS (Work Order Resource Management System) Project Manager, Manager-Engineering Special Projects, Manager-Corporate Capital Planning, Manager-System Planning & Corporate Capital Planning and Process Lead-System Planning. After the merger I was employed by Puget Sound Energy, Inc. ("PSE") as Manager-Operations Planning. My education and employment experience is described in Exhibit ____ (HCC-1).

Q. What are your responsibilities as Manager-Operations Planning?

A. I am responsible for the development of facility and operational plans for the gas and electric delivery systems. In this capacity, I am directly responsible for the planning department, including 30 engineers and analysts who develop system plans. These plans, including new customer construction work, annually average approximately $220 million. I am also responsible for the system reviews which precede significant events to PSE's distribution facilities. These events can be the result of damage by third-parties (such as contractors),

abnormal operations on Northwest Pipeline's facilities, or any other action which can alter the capability of the gas distribution system. My department and I render our understanding of the system, its operating parameters, and the company's historical actions to ensure that PSE's obligation to provide service to its firm customers is not in jeopardy.

Q. Please summarize your testimony.

A. The following is a summary of the main points of my testimony:

PSE has designed its gas distribution system for a capacity sufficient to provide adequate and reliable service for its firm customer load. PSE's actions with respect to interruptible service customers such as Kimberly-Clark were appropriate and in accordance with its tariff.

PSE reasonably determined that it did not have sufficient distribution capacity to serve all firm and interruptible customers during the December 24 – 28, 1998 curtailment period.

PSE's determination was based on a thorough analysis of relevant, available information at the time and application of sound criteria. The information which PSE considered includes SCADA, Stoner models, customer complaints indicating potential low pressure, weather forecasts, sendout statistics, and pen gauge data.

PSE responded properly in managing the curtailment. Conditions were constantly evaluated, and senior management was involved with respect to key decisions. PSE personnel have extensive experience in managing the natural gas distribution system, and performed their duties in accordance with standard procedures.

Information which became available after the curtailment confirms that PSE's determination was reasonable and correct.

FACTORS WHICH AFFECT DISTRIBUTION CAPACITY

Q. Please explain what distribution capacity is.

A. Distribution system capacity is the ability of the distribution system to deliver energy. One way to illustrate distribution capacity is to analogize the piping system to a bathtub, which has a certain reservoir of buffer capacity, a faucet and a drain. Within PSE's gas distribution system, the reservoir is all of the piping in place which leads to the customer's delivery point. All customers and their equipment act as the drain, while Northwest Pipeline provides the input faucet. If the amount of gas being brought through the faucet, plus the reservoir of buffer capacity is less than the customer drains, there is sufficient distribution system capacity. If, however, the customers' ability to drain the system is greater than the reservoir of buffer capacity within the piping system, plus the amount of gas which is being delivered into the piping system through the faucet, then there is insufficient distribution system capacity.

Q. What are the factors that affect distribution capacity?

A. Fluids, including natural gas, flow from high pressure to low pressure. This basic principle moves gas through the distribution system. The flow, and the distribution capacity is affected by the pipe type, lengths and diameters, system maximum operating pressures, system rebound pressures, system low pressures, the mechanical equipment in the distribution system, the way in which the system is designed to operate, the conditions of the pipes themselves, and customer uses.

Q. What are the factors which affect customers uses?

A. Customer uses depend on many factors. These include the type of customer energy use (heat, industrial processing or others), and its predictability with specific variables, such as

temperature, the time of day, the day of the week, the effect of the weather patterns on customer behaviors related to gas consumption, what time of day the customer performs certain actions, the installed equipment, how simultaneous customers' actions are and others.

Q. Is the system designed to be able to meet a certain level of distribution capacity?

A. Yes. With the knowledge of the factors which effect distribution capacity, including customer uses, PSE designs its system to meet firm customer demand at 55 HDD (heating degree day) or a 10 degree Fahrenheit temperature, normalized to SeaTac.

Q. Is PSE obligated to design the system to meet the distribution capacity requirements of interruptible gas and transportation customers?

A. No. PSE is obligated to design and operate its system to sustain design conditions for its firm customer volumes, only. To the extent that interruptible sales and transportation customers can be served, they are served under the terms and conditions established by PSE's tariff and service agreements.

Q. What tools does PSE have available to manage and demonstrate distribution capacity?

A. PSE operates the largest integrated gas distribution system network model in the United States, using Stoner Associates, Inc. ("Stoner") network modeling software. On a day-to-day basis, this model is used to evaluate both short and long-range operational activities, the most pivotal of which is the evaluation of the distribution system capacity. This modeling system simulates the company's piping system under various conditions. After the simulation using the appropriate base assumptions is complete, results are compared against known datapoints, such

as at SCADA (System Control and Data Acquisition) sites[1] and pressure recording ("pen gauge") locations, both of which record system pressures and flows, to benchmark the model and validate simulation results.

Q. What are the criteria that PSE uses in making curtailment decisions?

A. First and foremost, PSE considers the current state of the distribution system. Then, PSE evaluates forecasted weather conditions, accuracy of weather forecasts (general and recent), effect of different weather conditions on the system (i.e. snow cover, wind, cloud cover), condition of the system both at the time of curtailment and throughout the curtailment, estimated system recovery times, effect of customers' equipment on the gas distribution system, numbers and types of customer service calls, ability to communicate with customers, day of the week, estimated load peaks and profiles, estimated customer usage and expected customer compliance with curtailment. In addition, PSE follows its tariff. This same criteria is considered when making the determination to continue a curtailment. However, parameters such as the condition of the gas distribution system, system recovery, and customer usage based on customer response to weather conditions can become more predominant factors as the curtailment continues.

[1] The SCADA system relies on telemetry at certain points in the gas distribution system to provide real-time temperature and pressure information.

PSE DID NOT HAVE SUFFICIENT DISTRIBUTION CAPACITY TO SERVE ALL FIRM AND INTERRUPTIBLE CUSTOMERS FROM DECEMBER 24 TO DECEMBER 28, 1998

Q. What conclusions can be reached using the Stoner models provided in Exhibit ___ (HCC-2)?

A. These Stoner models were developed using the same distribution system data available to Operations Planning in December 1998. A temperature of 35 degrees Fahrenheit (normalized to SeaTac) or 30 HDD was included in these models based on the weather forecast ranges that PSE had for the time period from December 24 through December 27, 1998. Based on an evaluation of the Stoner models in Exhibit ___ (HCC-2), PSE's gas distribution system had insufficient distribution capacity to serve all firm and interruptible customers (gas and transportation) for the time period from December 24 through December 28, 1998, during peak flow conditions. Thus, there was insufficient distribution system capacity to serve interruptible customers under the modeled conditions.

Q. How do you reach that conclusion?

A. The Exhibit demonstrates areas within the distribution system where inadequate system pressures exist. The first page of Exhibit ___ (HCC-2) provides a key. Referring to the key, red is indicative of pressures of 15 psig or less. Pressures at this level will cause localized outages, in the area where red can be seen. These areas serve firm customers.[2] In certain locations

[2] A portion of PSE's distribution system operates at low pressure, or approximately ¼ psig. These areas appear as red surrounded by blue or green and are differentiated from areas where insufficient distribution system capacity exists.

pressure at -14.73 psig is noted. This indicates pressure equivalent to atmospheric pressure, or no pressure in the distribution system, resulting in a loss of gas flow.

Q. What key assumptions are included in the Stoner models in Exhibit ___ (HCC-2) to establish this result?

A. The assumptions include some which are inherent in the model, such as the pipe diameters, material roughnesses, differential pressures, pipe lengths and pipe connectivity. Then, the customer loads are applied to the piping system. These loads are considered to be linear with temperature, and for PSE's firm customers, have a high correlation to temperature. For certain interruptible customers where the relationship links less closely to temperature they are often individually placed on the model, at equipment maximum flow levels. Lastly, groups of load are placed into the model in order of priority of service, first firm customers, then interruptibles from Schedule 86, to 85, to 87 and 57. Finally, two different peak hour flows are used to predict the range of expected performance, reflecting an understanding that Monday peak flows tend to be extreme.

Q. Why are two different peak hour values used for the simulation?

A. Historically, peak hours vary from approximately 5 to 10% of the daily volume. When evaluating distribution system capacity, the system is at its most stressed when at peak. This consideration was evaluated to ensure appropriate operational actions were taken. As can be seen on Exhibit ___ (HCC-2), page 3, when the peak hour is modeled at 7.5%, adding interruptible customers, excluding two of PSE's largest customers (one of which is Kimberly-Clark) results in insufficient distribution system capacity. As a result, this parameter was of significance in the decision to extend curtailment through Monday morning. Provided in

Exhibit ___ (HCC-3) is a demonstration of peak hour factors observed on PSE's gas distribution system. Reviewing this data indicates using a 7.5% peak hour factor is a reasonable assumption.

Q. Are there factors not included in the modeling process which affect distribution system capacity?

A. Yes. First, the modeling process does not factor in the impact of specific or unusual weather patterns, or their duration. As stated previously, weather throughout the system is normalized to SeaTac temperatures. Additionally, ground conditions, such as snow on the ground, and frozen soil, are not contained within the simulation results. Furthermore, the modeling process does not take into effect the dynamic nature of our customers' behaviors, but rather assumes some predictability of behaviors as a result of past behaviors. It also does not take into account the fact that PSE's residential customers' equipment tends to be oversized. Lastly, the modeling process does not include consideration of customer service calls received, and the impact of frozen mains, regulators, meters and service lines on distribution system capacity.

Q. How does the absence of these factors influence decisions to curtail or extend curtailments of interruptible service?

A. These factors could reasonably be relied on to conclude that there may be less distribution system capacity than demonstrated by a particular Stoner model, because these factors are not included in the modeling system.

Q. Can each red area be treated independently of the surrounding areas where pressures appear to be adequate?

A. No. The company's gas distribution system is highly and tightly integrated. As a matter of fact, it is so integrated that actions taken at South Tacoma can influence the distribution system capacity in Marysville.

Q. Why does PSE design, construct and operate a system which has such a high degree of integration?

A. This type of system results in reliability and economic efficiency.

Q. Based on the criteria PSE used to determine whether there was sufficient distribution system capacity to continue the curtailment from December 24, 1998 through the peak flow on December 28, 1998, was there sufficient distribution capacity to meet the estimated requirements of all firm and interruptible customers during this same time period?

A. No. In reviewing all of the criteria which the Company relied on to make this decision, there was insufficient distribution system capacity to meet the estimated requirements of all interruptible customers from the time period of December 24, 1998 through the peak usage period on December 28, 1998. This is demonstrated in Exhibit ___ (HCC-2); Exhibit ___ (HCC-3); Exhibit ___ (HCC-4); and Mr. Riley's Direct Testimony and Exhibits.

Q. In his testimony, Mr. Owens relies on actual weather data to support his opinion that the continuation of the curtailment after December 24, 1998 was not "well-taken." Please respond.

A. It is critical to understand that curtailment based on insufficient distribution capacity is based on forecasts of weather, customer use and distribution system capacity. Therefore, Mr. Owens' reliance on SeaTac actual temperatures is misplaced. It is not possible to make a forward-looking determination on actual temperatures. The same flaw would exist if one looked with hindsight at actual sendout and then tried to add on to that estimated interruptible load in order to determine whether it was reasonable to call a past curtailment. In addition, Mr. Owens chooses to ignore the relationship between the weather forecasts and the actual SeaTac temperatures throughout the curtailment. As Mr. Riley's Direct Testimony points out, the weather forecasts had been wrong on every day prior to December 24, 1998, i.e. temperatures had been lower than forecasted. See Exhibit ___ (PAR-2); and Exhibit ___ (PAR-6). Average error of those forecasts was significant. At the same time there was snow on the ground on December 24, 1998, with some weather forecasts calling for more snow. It was reasonable for Mr. Riley to take this into account when evaluating the distribution system capacity.

Q. At some point after the curtailment did you use the Stoner model to evaluate the actions that PSE took during the curtailment?

A. Yes.

Q. What did you do?

A. I used the Stoner system to model distribution system capacity constraints for 38 degrees Fahrenheit (the 24-hour forecasted temperature for gas day December 27, 1998), with

interruptibles on in the appropriate priority of service, with a 6% peak hour factor, and with the actual peak load that Kimberly-Clark and another large customer (identified in the confidential Exhibit ___ (HCC- 4)) consumed while they were burning "penalty gas" during the December 1998 curtailment. See Exhibit ___ (HCC-4).

Q. What conclusions can be reached from evaluating the Stoner model in Exhibit ___ (HCC-4)?

A. This exhibit demonstrates that with the forecasted low temperature, a 6% peak hour factor, resumption of all interruptibles and the addition of two of the largest customers at their actual peak curtailment volumes, PSE would have forecasted insufficient distribution system capacity to serve all customers.

Q. Mr. Owens testifies that in your deposition, you identify the system as "stable enough" as of December 22, 1998 and based on this concludes that the PSE operation personnel believed that the distribution system was stable as of December 24, 1998. Is this correct?

A. No. Mr. Owens mischaracterized my statement. I testified in my deposition that a review of this particular benchmark study was only beneficial in determining how the high pressure distribution system was faring. This analysis showed nothing about the intermediate and low pressure distribution system. Additionally, on December 22, 1998, PSE had loss of firm service occur in two areas of the system. This indicates again, that this particular benchmark study can not be interpreted to characterize the condition of the entire gas distribution system as "stable." It is important to note further, that the benchmark study to which I was referring was performed

on December 22, 1998. Kimberly Clark's unauthorized use of interruptible service began subsequent to this study.

Q. Mr. Owens supplies Table 1, from which he rationalizes the distribution system capacity was adequate to serve both firm and interruptible customer loads between December 25 and December 28, 1998. What information can be gleaned from this data?

A. Nothing, without the ability to locate those pressure recording gauges against the pipes to which they are connected. Any individual who would draw such conclusions must be unfamiliar with how a gas distribution system works and therefore does not understand the type of evaluation that is necessary to make a determination about whether there was sufficient distribution system capacity adequate to service interruptible loads over a three-day time period. Distribution system capacity reviews require the understanding of the entire system which is being studied. A review of only 16 data points over a time period of 10 days for a piping system of just under 10,000 miles of mains is not valid to establish distribution system capacity.

Q. To review distribution system capacity, what data should be reviewed?

A. In order to establish distribution system capacity, extensive review of data such as SCADA, Stoner models, customer complaints, weather forecasts, sendout statistics, pen gauge information and others should be performed. Mr. Riley's testimony also describes the type of analysis that must take place to make such a determination.

PARTICIPATION IN THE DECISION TO CURTAIL AND RESUME INTERRUPTIBLE SERVICE

Q. How did you participate in the curtailment process?

A. In the case of the curtailment in December 1998, the weather forecasts triggered the necessity to develop an operational plan to address distribution system capacity constraints. Analysis of the forecasts, when the cold front was expected to hit, the prevailing direction of the cold front, as well as an understanding of customer's consumption was considered and modeled into the evaluation. From that evaluation, PSE deemed it necessary to restrict flows to non-firm customers, due to inadequate distribution system capacity. As the situation developed, Paul Riley and I worked together reviewing system information and preparing plans to mitigate the effect of the constraint on service to firm customers.

Q. How did you participate in the decision-making process?

A. As the cold-front started moving into the area, Operations Planning reviewed Stoner models based on the weather forecasts. The forecast temperature lows, the days of the week, the expected firm usage, and how the system was performing were all evaluated. Early on, there was a expectation that a more limited curtailment would be adequate, however, as we reviewed system operational data, we determined that more significant interruptible reductions were required in order to preserve service to firm customers. I was involved in the initial evaluation and recommendation regarding operational actions to be taken, including the curtailment actions. As the curtailment continued, I continued to participate in the evaluation and recommendation regarding actions which would continue to preserve firm service. I was responsible to report to senior management about the situation, how the system may have been expected to perform and

how it did perform, as well as recommending additional actions needed to mitigate any system performance issues.

Q. Did you provide input to Mr. Riley about continuation of the curtailment on December 24, 1998?

A. Yes.

Q. What information did you provide?

A. Based on my experience and analysis of the data contained in Exhibit – (HCC-2), I confirmed Mr. Riley's conclusion that, given the weather forecasts that stated that there would be continued snow on December 24, 1998 and continued cold weather through the weekend, along with the existing distribution problems and the Monday expected peak flows, continued curtailment of interruptible customers was necessary to ensure that firm service was maintained.

Q. Did any consideration as to the availability of meter readers influence the decision to extend the curtailment?

A. No, not that I am aware of.

Q. Mr. Owen's testimony indicates that since you were not in the office during the afternoon of the 24 through the morning of December 28, no review of the decision regarding curtailment was performed. What was your availability for any actions regarding accelerating resumption of interruptible service or any other emergency events which may have transpired?

A. As always, I am an employee who is pageable 24 hours a day, 7 days a week. If any events had transpired which necessitated my involvement in a decision, I would have been

paged. This is the established protocol with Gas Control, Gas Dispatch and my staff. Additionally, during this time, employees under my direction were on call, 24 hours a day.

CURTAILMENT PROCESS

Q. Was this process consistent with the process formerly used at WNG?

A. This curtailment process, and many of the participants, is highly consistent with that previously performed at WNG.

Q. Is this process consistent with Northwest Pipeline?

A. This process appears to be substantially similar to that effected at Northwest Pipeline.

Q. Mr. Faddis characterized PSE's actions during the curtailment as "mismanagement" and Mr. Owens states this curtailment was "not well taken."

Is this a correct characterization?

A. No. PSE provides service to interruptible customers as required by the applicable terms and conditions of its tariff. Under the tariff, system stability and continuity of service for its firm customers is the most critical test of appropriate management of the system. PSE would have been delinquent in its responsibilities to firm customers had interruptible service been resumed and firm service been jeopardized. PSE attempts to resume service to all interruptible customers as soon as it forecasts that such resumption will not jeopardize service to firm customers.

Q. Mr. Owens further characterizes the resumption under Rate Schedule 57 as "when the distribution system capacity exceeds the capacity needed to meet firm loads, service to curtailed customers should be resumed." Is this a correct view of curtailment resumption practices?

A. No. The resumption of interruptible customers, as defined in Rate Schedule 57 and within Rule 23, should be undertaken when "the distribution system capacity is sufficient to meet the estimated requirements of all firm sales customers, interruptible sales customers and transportation sales customers". PSE must determine that there is sufficient capacity to resume service to the Rate Schedule with the next highest level of service priority before commencing resumption to the customers in that Rate Schedule. Thus, if there is inadequate distribution system capacity to add Rate Schedule 86 customers onto the system and preserve firm service, no resumption of interruptible service should be undertaken.

Q. You were responsible for the activation of EOC-West, at Mercer Street. Why was it considered acceptable to close down operations on December 23, 1998?

A. On December 23, 1998, although the stress to PSE's gas distribution system was still ongoing, Gas Dispatch and Gas Control were able to maintain control of the situation from our Eastside Operations Center.

Q. Is extreme weather the only situation under which PSE curtails customers?

A. No. Any situation which has the ability to influence the piping system's ability to distribute gas or to effect the customers' consumption of gas can effect distribution system capacity, potentially resulting in curtailment. Contrary to David J. Faddis' testimony, PSE's system design and tariff anticipate that conditions other than temperature may necessitate a

curtailment. These conditions could include, but are not limited to any actions on Northwest Pipeline's facilities which would influence delivery pressures or flows at city gate stations, damage or construction on PSE's gas distribution system or operational activities to accommodate specific flow patterns. Furthermore, in 1995, Scott Paper was advised that flow restrictions could be required with a temperature of 45 degrees Fahrenheit, which I would not characterize as "extreme cold". See Exhibit ___ (HCC-5).

Q. Referring to this Exhibit, does this accurately reflect the capacity and firm customer requirements in effect in 1998?

A. No. Since 1995 the firm customer requirements have increased. The Everett/Marysville area has had an average annual customer growth rate of 10%. This customer growth further reduces the ability of the company to meet interruptible customer loads.

Q. How substantial is Kimberly-Clark's load?

A. Kimberly-Clark's meter set equipment has two to three times the capacity of many of the city gate stations PSE installs. It has the ability to use 10% of the volumes through PSE's North Seattle lateral, from which it is served. This lateral is the second highest in volume in PSE's service territory.

Q. What implications does this size have on PSE's distribution system?

A. First, as I indicated previously, the Everett/Marysville area is growing substantially. Next, the location of the service to Kimberly-Clark actually makes it able to deplete the gas system, prior to the service to the firm customers which it is designed to serve. Immediate ramp-up of Kimberly–Clark's demand can severely deplete the distribution system capacity and can negatively affect service to firm customers, even in the absence of extreme cold or curtailment

conditions.

Q. What is Kimberly-Clark's location, such that it can deplete the gas peremptorily from firm customers?

A. As shown on Exhibit ___ (HCC-6), Kimberly-Clark is served from a high pressure system, the Everett Supply, which takes service from the North Seattle Lateral. As I previously discussed in my testimony, gas flows from high pressure to low pressure. Kimberly-Clark's proximity to the high pressure backbone allows it to create a huge drain in the system, and the gas will follow the path of least resistance, which is essentially out that drain. This means customers served from the intermediate pressure systems in Everett and Marysville can be negatively affected by Kimberly-Clark's operation.

Q. Does this conclude your testimony?

A. Yes.

Background of Witness:
Heidemarie C. Caswell

Education & Professional Degree

Bachelor of Science in Civil Engineering, University of Washington (Seattle, Washington)

Professional Engineer

Employment Experience

Washington Natural Gas Co. (Seattle, WA) from 1979-1997.

various positions of increasing responsibility in the distribution system design, engineering, and operational management within system operations.

responsible for development and implementation of operational system tools, including CAD-design and Work Order Resource Management (WORMS).

responsible for development and coordination of plant investment via corporate budgeting process, including subsequent analysis associated with rationale for comprehensive plant investment strategy.

testified before the WUTC regarding historical investment evaluations, and their rationale.

Puget Sound Energy, Inc. (Bellevue, Washington) from merger in early 1997 to current

management of company's electric and gas planning staff, including responsibility for developing facility and operational plans.

development and implementation of key facility improvement strategies, including various technologies and techniques.

advisor to the utility's corporate strategic and Least Cost planning efforts related to facility planning