Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Yohannes K. G. Mariam. My business address is 1300 South Evergreen Park Drive SW, Olympia, Washington, 98504-7250.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed by the Washington Utilities and Transportation Commission (WUTC) as a Utility's Rate Research Specialist (Economist) in the Gas Section.

Q. WOULD YOU PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EMPLOYMENT EXPERIENCE?

A. I received a Bachelor of Science degree from Addis Ababa University (Ethiopia) in 1983 and Masters of Science and Doctor of Philosophy degrees from McGill University (Canada) in 1988 and 1993, respectively. My major areas of specialization are quantitative economics (econometrics and operations research) and agricultural economics. I minored in other social sciences such as applied cognitive psychology and anthropology. I was a fellow of the Natural Science and Engineering Research Council (NSERC) of Canada from 1993-1995. I worked as a regulatory and socioeconomic consultant for Environment Canada from 1995 to 1997. Between 1998-1999, I was a staff economist for the Canadian Federal Department of the Environment (Environment Canada). I have worked on a wide variety of projects and written several manuscripts dealing with economics, environment, agriculture,

development, and regulatory issues. I have served as an invited reviewer for the Journal of Air and Waste Management and as an invited lecturer at McGill University. In September 1999, I was employed as a Utilities Rate Research Specialist by the Washington Utilities and Transportation Commission. In that capacity, I have worked on several aspects of the regulated energy sector including Purchased Gas Adjustments (PGA), tariff revisions, Integrated Resource Planning (IRP), and general rate cases involving issues related to weather normalization and cost of service as filed by Avista Utilities in Docket Nos. UE-991606 and UG-991607, and PacifiCorp in Docket No. UG-991832. I have also contributed to the small business impact statement of the Commission's recently adopted railroad walkway rule. I collaborate with other staff members on issues relevant to economic disciplines and write technical papers dealing with regulated energy industries.

PURPOSE AND SUMMARY OF TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. I present staff's weather normalization adjustment and its impact on revenue.

Q. ARE YOU SPONSORING ANY EXHIBITS?

A. Yes, I present Exhibit ____ (YKGM-2) in support of staff's proposed weather normalization adjustment. The exhibit contains six tables. The descriptions are as follows:

Tables 1a and 1b:	Normalized volume of gas sold
Table 2:	Number of customers and degree days
Tables 3a and 3b:	Base use and unit gas consumption during the winter season
Tables 4a and 4b:	Monthly degree days heating and normals
Tables 5a and 5b:	Staff's regression results to estimate base gas usage
Tables 6a and 6b:	Staff's regression results to estimate weather sensitive gas usage

Q. PLEASE EXPLAIN THE NEED FOR WEATHER NORMALIZATION AND HOW IT IS IMPLEMENTED.

A. Gas consumption for space heating is influenced by changes in temperature. Knowledge of the impact of temperature on gas usage helps planning to meet peak demand and reduce variability in gas sales. In general, a weather normalization adjustment is intended to minimize the impact of abnormal weather conditions on revenue. In order to implement the weather normalization procedure, the impact of degree day heating (DDH) on consumption of gas (also called "the weather sensitivity

factor") is estimated using a suitable statistical method. DDH is the difference between mean daily temperature and 65-degree Fahrenheit *(*the internationally accepted mean daily temperature). The weather sensitivity factor, the number of customers, DDH, and gas consumed are incorporated into a model that allow the calculation of weather normalized gas consumption for the test year.

Q. PLEASE DESCRIBE THE WEATHER NORMALIZATION ADJUSTMENT PROPOSED BY THE COMPANY?

A. The Company employed a two-step weather normalization procedure. First, base gas usage (non-weather sensitive portions) is estimated using data for the summer season (July, August, and September), assuming that customers do not use gas for air conditioning. Exhibit ____ (YKGM-2), Tables 3a and 3b, column labeled "Base Use." Second, gas usage during the winter season (October through May) to satisfy the space heating requirement is estimated. Exhibit ____ (YKGM-2), Tables 3a and 3b, column labeled "Heat Use." Finally, base use, heat use, and the difference in gas usage between normal weather and test year weather were added to determine the weather normalized gas consumption for the test year. Exhibit ____ (YKGM-2), Tables 1a and 1b, column labeled "Company-Recorded Plus Incremental Sales."

Q. WHAT ARE THE DATA AND STATISTICAL ESTIMATION METHODS USED BY THE COMPANY TO DETERMINE WEATHER NORMALIZED GAS USAGE DURING THE TEST YEAR?

A. The Company used data from 1996 to 1999 to estimate gas consumption in the summer season (non-weather sensitive gas). However, data from 1997 to 1999 was used to determine the weather sensitive portion of gas consumption (winter season gas usages). The Company used logarithmic transformation of the data and least squares regression estimation of linear models to determine the base gas use and weather sensitive portions of test year gas consumption.

Q. WHAT ARE THE CHANGES STAFF PROPOSES WITH RESPECT TO THE WEATHER NORMALIZATION PROCEDURE?

A. The changes proposed by Staff include the sources of data and period of time (years) required to calculate monthly degree days heating normal (mean monthly DDH) and the estimation methods and models. Exhibit ____ (YKGM-2), Table 2, column labeled "Heating DD's" and Table 4b.

Q. PLEASE EXPLAIN THE DATA PROPOSED BY STAFF AND THE PERIOD OF TIME FROM WHICH DEGREE DAYS NORMAL ARE DERIVED.

A. The National Oceanographic and Atmospheric Administration (NOAA) produces weather normals (heating and cooling degree days) for 30 years every 10 years. The

data derived by NOAA is used by several utility companies and public utility commissions throughout the United States. NOAA's method of estimating monthly degree day normals is different from the simple average method used by the Company. The Company compared its own test year DDH with normals derived by computing the simple average of 20 years data, where the simple average equals the sums of DDH for 20 years divided by 20. Exhibit ____ (YKGM-2), Table 4a, last two rows. In contrast, the methodology used by NOAA accounts for the impact of factors that may influence normal temperature observed over several years. These include adjustments for missing data, time of observation bias, and other factors. The objective of making these adjustments is to ensure that the impacts of external factors on temperature are taken into account and that the data becomes homogenous and representative. Therefore, staff recommends comparing NOAA's test year data with NOAA's most recent publication of 30 years monthly degree days normal (1961-1990). Exhibit ____ (YKGM-2), Table 2, columns labeled "Vancouver Heating DD's" and "Vancouver Actual" and Table 4b. Normals derived from a simple average would not incorporate adjustments similar to the methodology employed by NOAA. Therefore, normals that are similar to simple average temperature cannot be considered as "representative" average temperature that may occur in any particular month in the future.

Q. WOULD YOU EXPLAIN STAFF'S PROPOSED METHOD FOR ESTIMATING WEATHER SENSITIVITY COEFFICIENTS.

A. The estimation methodology used by the Company is not statistically robust. That is, the methodology does not attempt to correct for serially correlated error terms, especially in estimating the weather sensitivity coefficient. The Company seems to consider the magnitude of R-square as a sole criterion for the choice of a statistical functional form or representation. Staff's proposed method examined the data for existence of serial correlation (autocorrelation), and applied relatively robust estimation methods (*e.g.*, least square regression or autoregressive procedure) depending on the observed statistical problem. Exhibit ____ (YKGM-2), Tables 5a and 5b, statistical estimates for base gas usage, columns labeled "Coefficient" and "Durbin-Watson" and Tables 6a and 6b, statistical estimates for weather sensitive gas usage, columns labeled "Coefficient" and "Durbin-Watson." In addition, the data utilized by the Company in performing regression analysis for the winter season covered 1997 to 1999, while data used in determining base gas usage covered 1995 to 1999. In order to be consistent in combining estimates from these two-step weather normalization procedures, the data has to be from the same time period. Therefore, staff proposes to use data from 1996 to1999 in estimating base gas usage and the weather sensitive portion of the test year total gas consumption.

Q. WHAT IS SERIAL OR AUTOCORRELATION AND WHY IS IT IMPORTANT TO TAKE INTO ACCOUNT IN WEATHER NORMALIZATION ADJUSTMENT?

A. Serial correlation, or autocorrelation, refers to the relatively higher degree of association between components of two observations (often adjacent or consecutive time periods) that cannot be explained by variables included in the analysis (also called error or residual terms). The statistical measure that helps determine the existence of serial correlation is called the "Durbin-Watson" or D-W statistic. In general, if the value of the D-W statistic is close to 2.00, then there is no problem of serial correlation. Exhibit ____ (YKGM-2), Tables 5a, 5b, 6a, and 6b, column labeled "Durbin-Watson." The impact of serial correlation is that it will lead to a conclusion that the statistical estimates are more precise than what they really are. It will result in consistent under- or over-estimation of future values of the same variables. For example, it may show significantly higher or lower usage of gas for the next one, two, three, or five years that is substantially different from results derived from a model that makes correction for these kinds of correlations. Therefore, in order to increase the reliability of estimates of weather sensitive gas usage, it is necessary to make correction for correlations between residuals of adjacent observations.

Q. WHAT IS THE IMPACT OF STAFF'S RECOMMENDED CHANGES TO THE COMPANY'S WEATHER NORMALIZATION ADJUSTMENT?

A. The results of staff's recommended changes increase weather sensitive gas usage by 1,916,619 and 921,535 therms for residential and commercial customers, respectively, or revenue of approximately $1,178,280 and $546,784, respectively. Exhibit ____ (YKGM-2), Tables 1a and 1b, column labeled "Staff- Recorded Plus Incremental Sales" minus Column labeled "Company- Recorded Plus Incremental Sales."

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes.