UG-__ – Load Forecast

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I. Introduction & Summary

Q. Please state your name and position with NW Natural.

A. My name is Dr. John A. Hanson. I am NW Natural's (NW Natural or company) Director of Integrated Resource Planning. I report to the company's General Manager of Rates and Regulatory Affairs. My qualifications appear at the end of my testimony.

Q. What is the purpose of your testimony, and what are your principal conclusions?

A. The purpose of my testimony is to provide a brief overview of the econometric analysis we used to adjust, or normalize, Washington residential and commercial test-year sales volumes. Sales volumes underlying the revenue requirements shown in Kevin McVay's Test Period & Adjustments testimony, *Exhibit No. ____(KSM-1)*, are based on the last six months of 2002 and the first six months of 2003. Normalized test year sales volumes amount to 34,146,825 therms for the residential customer class and 18,738,357 for the commercial class. *Exhibit No. ____(JAH-2 – 3)* provides a review of actual sales, normalized sales, and customer counts for the test year. Industrial sales volumes are addressed in Kevin McVay's Test Period & Adjustments testimony, *Exhibit No. ___ (KSM-1)*.

Q. Is the company's adjustment properly termed a "forecast" of load?

A. "Backcast" is probably a more accurate term. When a regression equation is applied to a future period of time we think of this as forecasting. When a regression equation is applied to a past period of time — specifically, the period used in the estimation of regression equation's coefficients — we think of this as

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backcasting. Here we are backcasting use per customer for a period of time used in the calibration of the regression equation. However, the backcast of test-year use per customer is driven by expected (normal) weather and the energy rates expected to prevail during the period of time rates will be in effect. The backcast is not based on actual weather or the actual prices experienced during the test year.

Q. Did you perform the regression analysis discussed in this testimony?

A. No. An independent consultant performed the underlying regression analysis leading to the backcast equations used for the restatement of test year sales volumes.

Q. Why did NW Natural use an independent consultant to perform this statistical analysis?

A. The same consultant, Forefront Economics, Inc. (Forefront Economics), developed NW Natural's sales forecast used in its recent Oregon General Rate Case. In that instance, since it was the company's first general rate case using a forward test year, we felt it was important to provide an independent and professionally developed forecast of customer gains and use per customer. The Forefront Economics sales forecast methods were adopted in their entirety in Oregon, and NW Natural advocates extending the same methods to the current Washington rate case. The company also intends to use the same methods in its forthcoming 2004 Integrated Resource Plan.

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Q. What is meant by the term "econometric?"

A. The word econometric applies because regression analysis is used to make the statistical connection between use-per-customer drivers (such as weather conditions and gas prices) by employing appropriate econometric modeling techniques. The Forefront Economics forecast also provides price index information that allows prices to be expressed in real rather than nominal terms.

II. Backcast Overview

Q. Please provide an overview of backcast results.

A. *Exhibit No. ____(JAH-2 – 3)* provides a simplified overview of backcast results for the state of Washington. Page 1 summarizes residential and commercial annual therm sales volumes on a cycle sales basis, and page 2 provides the same information on a sendout basis. Cycle sales reflect volumes of gas billed in each month and sendout reflects the volume of gas delivered during each month. The underlying regression equations were calibrated using cycle sales data and for this reason, page 1 is adopted and used by Mr. McVay in developing test-year revenues. As is often the case when a sendout pattern of normal degree days is introduced into a cycle sales-based model, total annual sendout estimates differ slightly from cycle-sales estimates and in this instance, sendout estimates are slightly lower than cycle-sales estimates.

Q. How are test period customers established?

A. Residential and commercial customers shown in *Exhibit No. ____(JAH-2 – 3)* reflect actual billed customers for each month of the test year.

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Q. Please explain the development of use-per-customer estimates.

A. We model gas use per residential customer and use per commercial customer as a function of temperature and gas rates. Heating degree days (HDDs) for residential customers use a 59 degree balance point assumption and 58 degrees for commercial. Past Washington rate cases have used a 65 degree base for HDD computations.

Q. Why has the company changed balance point assumptions?

A. The company's load research, and the analysis performed by Forefront Economics, indicates that a balance point or HDD base of 65 degrees no longer applies.

Q. Please elaborate.

A. With each passing year, the traditional 65 degree Fahrenheit balance point assumption commonly used as a base in heating degree day computations becomes more and more obsolete. During its development in the 1915 to 1932 time period, it was probably correct. This was a time when homes could be characterized as uninsulated, drafty, solar-gain limited, and as experiencing very little reject heat from electrical appliances. Since that time, the thermal performance of homes and other buildings has improved dramatically and appliance reject heat levels have risen with increased electrical appliance saturations.

In recent years, all of NW Natural's evaluations of conservation measure performance have involved the use of balance points lower than 65 degrees. These studies typically use PRISM (PRInceton Score-keeping Method) or variants administered by consultants to the conservation evaluation industry. PRISM and its alternatives seek the balance point temperature that produces the lowest Root Mean Squared Error (RMSE) of predicted energy use in comparison to observed use. Studies submitted by NW Natural for its conservation programs used balance points lower than 65 degrees. The same is true for jurisdictional electric utilities that have performed a far greater number of measurement and evaluation studies.

In the commercial sector, the need to use balance point assumptions lower than 65 degrees is even more apparent. In addition to improvements in the thermal integrity of commercial structures that take place over time and lead to downward trends in balance points for commercial structures, other factors are also in play. Commercial structures often involve higher levels of reject heat from lighting and electrical equipment. And, of major importance, many commercial structures and end uses for gas involve freeze protection that does not activate until outdoor temperatures fall to near freezing levels.

Use per customer equations developed by Forefront Economics in support of the company's test-year sales volumes involve both heating degree day and gas price level arguments. Actual HDD observations matched to periods of measured gas consumption (along with corresponding price levels) were experimentally regressed using a sequence of balance point assumptions. Each regression was then examined for RMSE, r squared, and t statistics. The balance point assumption producing the best predictive (backcast) results was then selected leading to 59 degrees for the residential class and 58 degrees for the commercial

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class. *See, Exhibit No. ____(JAH-4)* for a summary of the effects of the choice of HDD base and the resulting impact on RMSE.

Each regression produced unique estimates of the HDD and price coefficients. The price coefficient ultimately leads to a price elasticity estimate (evaluated at the mean price level using the estimated coefficient). Correct price coefficient estimates are desired and depend on the balance point assumption used in the regression, thus finding the correct balance point assumption is doubly important. The incorrect use of a HDD base of 65 degrees increases price coefficient estimates and produces unrealistically low estimates of monthly summer use.

Q. Why is the inclusion of a price variable important in the determination of normal use per customer?

A. The chart at *Exhibit No. ____(JAH-5)* shows a history of residential energy rates and the rates expected to prevail following the application of the general revenue requirement in this proceeding. Note that the test year was dominated by prices significantly below the prices we expect to be in place after this rate proceeding. The sales repression effect of higher rates must be recognized, and has been recognized in *Exhibit No. ____(JAH-2 – 3).*

Q. How much would test year cycle sales volumes increase if the effect of the 12.0 percent general rate case increase prices were ignored?

A. Residential cycle sales would change to 35,249,520 million therms, a 1,102,695 therm increase. Commercial cycle sales would change to 19,352,410 therms, an increase of 614,053 therms.

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Q. In developing use-per-customer estimates for normal weather conditions, what measurement of normal or average weather was employed?

A. As in all previous testimony sponsored by the company on normal weather determination in Washington, we calculated arithmetic means of daily weather observations for the most recent 20-year period of time. We use a 20-year daily history of minimum and maximum temperatures for each day ending with December of 2002 for the Vancouver, Washington, weather station (Vancouver 4NNE).

Q. Has the company sought assistance in the determination of normal or average HDDs that best reflect the conditions expected to prevail during the period of time rates determined in the proceeding will be in effect?

A. Yes. During the UG 152 general rate case in Oregon, the company retained Risk Management Solutions (RMS) to perform an analysis of weather trends for each of the company's principal weather stations, including Vancouver, Washington. During the past decade the weather derivatives industry has developed a number of financial products that allow entities faced with weather risk to purchase hedges against weather risk. At the heart of this sort of analysis, where parties "bet" large sums of money on weather-related outcomes, the determination of most likely future weather is of foremost importance. RMS applied common weather derivative industry tools to determine the most likely level of HDDs for Vancouver and the company's other weather stations. Their report is included in workpapers accompanying my testimony.

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The level of HDDs the company sponsors in this proceeding is substantially colder than that recommended by RMS. We have used 3,243 Base 59 HDDs for the residential class. In comparison, RMS recommended 3,116 HDDs within a range of 3,070 to 3,225 HDDs. The discrepancy arises because RMS applies statistical techniques to remove trends in weather station histories, whereas, NW Natural uses a relatively short period of observation in lieu of detrending. Therefore, the company sponsors a more conservative standard than weather science would suggest.

Q. Does the company have a proposal that would potentially eliminate contention over the determination of normal use per customer?

A. The company has proposed a Distribution Margin Normalization (DMN) or Decoupling mechanism in my subsequent Decoupling testimony. *Exhibit ___ (JAH-1).* The major purpose of the mechanism is to align customer and shareholder interests in the pursuit of energy efficiency. Another important feature of the DMN proposal is its ability to eliminate contention over the development of normal use per customer in the rate case process itself. Staff and company may strongly disagree over how to estimate use per customer equations, measure or estimate normal weather, determine prices expected to prevail during the time rates are in effect, and measure how those prices will impact customers' gas usage patterns. With the proposed DMN balancing account in place, incentives for the company to understate normal use per customer or for the Staff to overstate normal use per customer disappear. The focus shifts to development of normal use per customer estimates that lead to a zero expected value for the

DMN use balancing account. Both Staff and company would seek to avoid either chronic refund, or chronic collect balances in the account as we go forward in time after a rate case. If, for whatever reason, the wrong level of normal use per customer is adopted in this rate case, the balancing account brings revenues per customer back to the levels authorized in the rate case.

III. Qualifications

Q Please describe your educational and employment background.

A. I received a B.S. in Financial Management from California State University, Sacramento, in 1967; an M.A. in Economics from the University of Oregon in 1971; and the Ph.D. in Economics from the University of Oregon in 1972. My particular areas of study and expertise are economic theory, urban and regional economics, and monetary theory and policy. I have studied and conducted numerous applications of economic analysis and statistics to urban and regional problems in the Pacific Northwest.

Before joining NW Natural in January of 1980, I conducted graduate level seminars in urban and regional economics in the Urban Studies Ph.D. program at Portland State University (1971-79). For NW Natural, I conduct financial and planning studies involving analysis of gas supply and utilization under the range of conditions which, at present or in the future, may confront the company.

Q. What are your responsibilities at NW Natural?

A. As Director of Integrated Resource Planning, I am responsible for coordinating and assuring consistency among planning studies, particularly long-term gas requirements and supply analysis affecting future operations which cross divisional lines. I have undertaken numerous evaluations of new customer financial performance, main extension policy, and the incremental cost of serving new customers.

Q. Have you ever testified in a regulatory proceeding before?

A. Yes. I have testified before the Washington Utilities & Transportation Commission in Olympia, Washington, and the Oregon Public Utility Commission in Salem, Oregon.

Q. Does this conclude your direct testimony?

A. Yes, it does.

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