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A Review of Distribution Margin Normalization as Approved by the Oregon Public Utility Commission for Northwest Natural

by

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1. INTRODUCTION AND BACKGROUND

Traditional rate-of-return regulation may create incentives for energy utilities that are counter to public policy objectives. In the case of natural gas, this occurs in large part because utilities have costs that are both fixed and variable, but collect revenue to recover those costs primarily through volumetric prices (*i.e.*, retail $/therm prices applied to consumers' energy consumption). To recover their fixed costs, including their allowed return on capital, utilities typically forecast the total amount of energy they expect to sell in a given period, and set a price that will recover the appropriate amount of revenue toward fixed costs on the planned level of sales. This process tends to produce the following outcomes:

- The utility has an incentive to under-forecast sales for the rate-making period, thus increasing the retail price and improving the opportunity to recover fixed costs. The regulatory agency has a corresponding interest in over-stating sales forecasts, which would lead to lower prices. The resulting contrast in incentives typically leads to contentious rate cases.
- Variation in consumers' energy consumption due to factors such as unexpected weather conditions causes variation in both consumers' bills and the utility's net revenue (*i.e.*, revenue toward fixed-cost recovery).
- Once rates are set, the utility has a disincentive to take actions to encourage their customers to adopt energy efficient practices that may result in lower sales, as this will reduce their net revenues, and thus their ability to recover their fixed costs.

Consequently, utilities and regulatory agencies in a number of states have experimented with alternative mechanisms designed to alter some of the above incentives and outcomes. In 2002, the Oregon Public Utilities Commission (Commission) approved a Distribution Margin Normalization (DMN) mechanism for Northwest Natural Gas Company (NW Natural). As part of the Order, the Commission also approved NW Natural's proposal for Public Purposes Funding to support low-income bill payment assistance, low-income weatherization assistance, and enhanced energy efficiency programs. Finally, the Order imposed service quality standards on NW Natural, specifying penalties associated with violating specific service quality measures.

The Commission Order implementing DMN required NW Natural to submit an independent study regarding the effectiveness of the mechanism. The study will contribute to the process of determining whether to continue DMN beyond September 30, 2005. NW Natural has retained Christensen Associates Energy Consulting, LLC (CAEC) to perform this study, and has expanded the scope of the study to also include a partial evaluation of the Weather Adjusted Rate Mechanism (WARM) as well as a comparison of the combination of DMN and WARM to a full decoupling mechanism.

The report is organized as follows. Section 2 provides an overview of DMN, including a description of the calculations and its expected incentive effects. Section 3 provides a similar overview of WARM. Sections 2 and 3 focus on *theoretical* evaluations of DMN

and WARM, or what we would expect to happen given the calculations contained in the mechanisms. Section 4 presents data and analysis regarding the effects of DMN, including revenue effects, changes in marketing efforts, organizational changes, financial effects, and service quality issues. Section 5 compares DMN to other rate mechanisms that may be able to achieve similar goals. Section 6 provides a summary and conclusions, including answers to the specific questions raised by the Commission in Order 02-634.

2. OVERVIEW OF DISTRIBUTION MARGIN NORMALIZATION[1]

2.1 Description of Mechanism

A primary goal of DMN is to reduce the uncertainty around NW Natural's distribution fixed cost recovery. That is, because distribution fixed costs are recovered through volumetric rates that are established based upon an expected level of sales, deviations from expected usage (caused by weather, economic conditions, price changes, random variations, etc.) will affect the amount of fixed costs recovered. In addition, by ensuring that the utility recovers its fixed costs regardless of customer usage levels, DMN reduces the utility's disincentive to promote energy efficiency. The DMN mechanism agreed to in Oregon is limited to "decoupling" revenues associated with 90% of the non-weather induced variation in usage for residential and commercial customers.

2.1.1 Elasticity Adjustment

There are two ways in which DMN affects revenues: the *elasticity adjustment* and the *deferral component*. The elasticity adjustment adjusts margin recovery for the effects that changes in retail tariff prices are expected to have on use per customer (*e.g.*, customers are expected to reduce consumption if natural gas prices increase). To understand the elasticity adjustment, consider an example in which the retail price increases over a particular time period. The elasticity adjustment mechanism first adjusts original "baseline" use per customer downward (using a price elasticity value specified in the tariff) to account for the fact that customers are expected to reduce usage when prices increase. This reduction in baseline usage is then used to calculate the increase in the dollar per therm margin required to keep the allowed fixed cost recovery constant on a per-customer basis. This new margin value is then passed through to the standard tariff, which in this example implies increasing the per therm rate. Ultimately, the change in the baseline use per customer value produced by the elasticity adjustment also affects the deferral component of DMN, which is described in detail later in this section.

The revenue effects of the elasticity adjustment alone are described in Equations 1a through 1c.[2]

Equation 1a: Elasticity Adjustment Revenues = $(M' - M) * Q^{A,M}$

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[1] This mechanism has also been referred to as the Partial Decoupling Mechanism (PDM) and the Conservation tariff.

[2] For simplicity, we represent the calculations in the first year after a rate case, so that the initial margin (M) and baseline use per customer (QPC^{B}) are determined in the rate case. In practice, each year's DMN adjustment uses the baseline use per customer and margin values from the previous year.

Equation 1b: $M' = M * QPC^{B} / QPC^{B,P} + \Sigma_i M_i * QPC^{B}{}_i / QPC^{B,P}$

Equation 1c: $QPC^{B,P} = QPC^{B} * [(P/P^{B} - 1) * \varepsilon_d + 1]$.

Where,

M = initial margin for recovery of fixed costs in the standard tariff;
M' = the adjusted margin resulting from the elasticity adjustment;
$Q^{A,M}$ = metered natural gas consumption in therms;
QPC^{B} = baseline use per customer, initially determined through a rate case;
$QPC^{B,P}$ = price elasticity adjusted baseline use per customer;
M_i = margin components approved subsequent to the most recent rate case;
$QPC^{B}{}_i$ = baseline use per customer at the time that M_i was approved;
P = total dollar per therm tariff price for the coming year (excluding the elasticity adjustment to margin);
P^{B} = baseline total price per therm, initially determined through a combination of a rate case and the calculations resulting from the purchased gas cost adjustment; and
ε_d = the class-specific price elasticity stipulated in the Order (-0.172 for residential customers and -0.110 for commercial customers).

Equation 1a shows that the total revenue effect associated with the elasticity adjustment equals the change in margin times the total metered consumption. Equation 1b shows how the margin is affected by the elasticity adjustment. The margin is adjusted so that the product of baseline use per customer and the margin remains constant (*i.e.*, so that the total margin contribution per customer remains constant). The summation term in Equation 1b accounts for any additions to allowed margin since the rate case that established the baseline. Equation 1c shows how the baseline use per customer is adjusted for price changes. This is accomplished by determining the percentage change in price, multiplying it by the price elasticity in order to obtain the percentage change in baseline quantity, and applying this percentage change to the baseline use per customer.

2.1.2 Deferral Component

Equations 2a and 2b show the calculations contained in the deferral component, which is the part of the DMN revenue adjustments that is intended to compensate NW Natural for conservation efforts (and stabilize fixed cost recovery more generally).[3]

Equation 2a: DMN deferral amount = 90% * $[(QPC^{B,P} * C) - Q^{WN}] * M'$

Equation 2b: $Q^{WN} = Q^{A,S} + C * \beta * (HDD^{N} - HDD^{A})$.

Where,

[3] This simplified description does not consider many complicating factors that have arisen in practice, such as the modifications to the baseline quantities due to the reclassification of customers following the last rate case.

$QPC^{B,P}$ = baseline use per customer adjusted for price elasticity effects;
M' = the per therm margin, adjusted for price elasticity effects;
Q^{WN} = weather normalized sendout therms for the residential or commercial class;
$Q^{A,S}$ = actual sendout therms for the residential or commercial class;
C = the number of customers in the residential or commercial class;
β = a parameter representing the change in therms per customer per change in heating degree day (HDD), as contained in the WARM tariff;
HDD^N = normal heating degree days for the billing period, using a base of 59 degrees for residential customers and a base of 58 degrees for commercial customers; and
HDD^A = actual heating degree days for the billing period, using a base of 59 degrees for residential customers and a base of 58 degrees for commercial customers.

These calculations are made each month. The resulting surcharges or refunds accumulate in a deferral account, and are collected or refunded through rates in the following year (which begins on October 1).

The weather normalization of actual usage shown in Equation 2b is performed using methods developed in NW Natural's most recent rate case. Heating degree day (HDD) data are adjusted ("cycle-ized") to match the timing of the billing data. The normal weather measure is a district-weighted average for the 25 years ending in 2000. The weather normalization method adjusts actual usage (measured on a sendout basis) for the expected difference in usage between normal and actual weather conditions.

2.2 Expected Risk Effects

In this section, we discuss the risk properties of DMN. For this purpose, we define "risk effects" as the changes in revenue flows due to changes in the outcomes of uncertain variables. We consider four sources of uncertainty that create risk in NW Natural's fixed cost recovery and customer bills: weather, natural gas prices, economic conditions, and other random factors.

DMN does not change the risk associated with uncertainty in weather conditions, as the usage amount used to calculate deferrals is weather normalized.

Changes in natural gas prices affect the amount of natural gas that customers will use. Therefore, the risk that NW Natural faces with respect to gas price uncertainty is that when prices rise, customer usage levels decrease, reducing fixed cost recovery. At the same time, the price increase causes customers' bills to increase (as long as any reductions in usage are not offset by the increase in the gas price). Because both NW Natural and its customers are made worse off by increases in natural gas prices, the fact that DMN reduces this risk for NW Natural means that the risk is shifted to customers. However, the component of DMN that shifts this risk is the elasticity adjustment, over which there appears to be no dispute with respect to its appropriateness. That is, various parties' views regarding the efficacy of DMN seem to hinge on their opinion of the decoupling mechanism, not the elasticity adjustment.

DMN has the *theoretical* potential to shift economic risk from NW Natural to its customers. For example, in a period of declining economic conditions (*e.g.*, an increasing unemployment rate) customers may reduce usage in an attempt to reduce their bills due to income constraints. However, the DMN deferral component would increase customer bills (in the following year), thus reducing the amount of bill reduction that customers can achieve. While the possibility of this form of risk shifting exists in theory, our analysis in Section 4.3 indicates that this problem does not appear to exist in practice in NW Natural's service territory (*i.e.*, the analysis of residential and commercial use per customer indicates that they do not appear to be significantly affected by changes in economic conditions).

Controlling for weather conditions, natural gas prices, and economic conditions, some residual variation can be observed in use per customer that must be due to other uncertain factors. (The analysis in Section 4.3 indicates that the residual variation in use per customer is small relative to the variation explained by weather and natural gas prices.) For these other factors, DMN reduces risk for both NW Natural and its customers. That is, the reduction in the variability of revenues under DMN leads to more certainty (*i.e.*, less risk) for both NW Natural and its customers. However, because the customers experience a DMN rate adjustment as a change in the volumetric price in the *following* year, DMN does not reduce their *current* cash flow risk. For example, when usage exceeds baseline levels, customers' current bills reflect the over-payment of distribution costs. They are not "paid back" for the over-recovery until the following year. Therefore, while customer bill risk is reduced over long periods of time (*i.e.*, their "wealth" risk is reduced), customers may not perceive their risk reduction to be significant.[4]

In theory, DMN should be effective in reducing the variability of distribution cost recovery. By design, the effectiveness of DMN in accomplishing this task has been reduced in two ways (relative to full decoupling or fixed/variable rates). First, weather-induced variations in fixed cost recovery are eliminated from the adjustment mechanism through the weather normalization of usage. Second, only 90% of the remaining margin variability is covered by the deferral component of DMN. Therefore, NW Natural retains all weather-related variability and 10% of non-weather related variability in distribution fixed cost recovery from customers on DMN.[5]

In testimony supporting decoupling, NW Natural has asserted that the risk reduction to NW Natural caused by DMN is mirrored by a corresponding reduction in risk to its customers. For example, when NW Natural over-recovers revenue, its customers over-pay, thus providing the opportunity to reduce risk for both parties. This assertion is valid with respect to weather risk (which is addressed by full decoupling, which was the topic of NW Natural's testimony) and risk due to the other non-price and non-economic factors. The theoretical potential for DMN to shift economic risk from NW Natural to its

[4] Another reason that customers may not perceive a large reduction in their risk is that DMN covers only the distribution portion of the bill and not the energy costs. Therefore, DMN adjustments will tend to be small in proportion to the total bill regardless of when they are applied.
[5] Note that WARM addresses weather-related variations in revenue toward distribution cost recovery.

customers is not supported by empirical analysis (see Section 4.3), and the shift of natural gas price risk from NW Natural to its customers that is caused largely by the elasticity adjustment is accepted by both Commission Staff (through its support of a stand-alone elasticity adjustment) and NW Natural.

2.3 Expected Incentive Effects

DMN has the potential to produce a number of incentive effects. Four potential NW Natural incentive effects are addressed in this section, followed by a discussion of the effect of DMN on customer incentives.

2.3.1 Reduced Disincentive to Promote Conservation

Prior to the introduction of DMN, NW Natural had a strong disincentive to promote energy efficient appliances and general conservation efforts. This was due to the fact that any conservation that occurred (*i.e.*, any reductions in natural gas sales from the levels on which retail rates were based) reduced the amount of distribution cost recovery.[6] In fact, NW Natural benefited by promoting load growth because it could achieve excess distribution cost recovery whenever usage levels exceeded the levels used in setting retail rates. By reducing the link between sales and distribution revenues, DMN should be effective in reducing NW Natural's disincentive to promote conservation. However, it does not eliminate the disincentive completely, as NW Natural continues to retain 10% of any non-weather related over- or under-recovery of distribution costs.

The change in incentives with regard to conservation has a less appealing aspect. That is, NW Natural has asserted that direct use of natural gas is itself energy efficient. This is based on the idea that using electricity generated from natural gas is less efficient than using the natural gas directly in applications such as cooking, space heating, clothes drying and water heating. However, with DMN, NW Natural has a reduced incentive to promote fuel switching among current customers. For example, prior to DMN, if a customer converted to a natural gas water heater, NW Natural's revenues increased through the standard tariff. With DMN, the 90% of the increase in revenues is offset by a customer refund generated through the deferral component (though only a very small percentage of this refund will go to the customer that converted the water heater). It could be that in the absence of DMN, NW Natural's incentives to promote these conversions were too high (by causing conversion customers to pay increased fixed costs as well as natural gas energy costs), but the *change* in incentives caused by DMN could cause NW Natural to reduce its efforts to promote conversions that it has advocated as being energy efficient.

2.3.2 New Customer Connections

The DMN deferral mechanism incorporates a baseline use per customer measure that is intended to represent the average usage of the customers in the class (adjusted for responses to changing prices). Because of this, DMN gives NW Natural a short-term

[6] Lost revenue adjustments were in place prior to DMN. These compensated NW Natural for reductions in revenues attributed to some programs, such as the residential high-efficiency furnace program. Section 5.3.2 presents a discussion of the effectiveness of lost revenue adjustments in reducing disincentives to promote energy efficiency.

incentive to provide new connections to low usage customers. Each additional customer that is smaller than average generates surcharges through the deferral mechanism that result in additions to NW Natural's net revenues.

At the time DMN was approved, NW Natural agreed that it would not modify its main extension policies in response to DMN. One way to remove this potential incentive regarding new customer connections is to apply DMN only to existing customers. This would maintain non-DMN incentives for new connections customers, who would only be included in DMN adjustments following the next rate case. However, an offsetting effect of removing new connections customers from DMN is that it might make NW Natural more resistant to altering building codes to improve energy efficiency and reduce their incentive to promote the use of high efficiency appliances in new construction. Section 4.4.3 contains a more complete discussion of new connections.

2.3.3 *Uncollectible Accounts*

A concern was communicated to us regarding whether DMN affects NW Natural's incentive to pursue uncollectible accounts. An examination of the calculations in Section 2.1 reveals that uncollectible revenues are unrelated to the DMN mechanism. That is, because uncollectible revenues do not flow into the DMN deferral mechanism, we conclude that DMN does not have undesirable incentive effects in this area.

2.3.4 *Customer Service*

Two factors lead us to believe that the DMN Order does not present negative incentive effects with respect to the provision of customer service. First, the Commission implemented service quality standards and penalties as part of the Order approving DMN. Second, although NW Natural is a monopoly provider of natural gas services in its territory, it does compete with other fuels to serve customers. This fact, combined with the fact that the DMN deferral mechanism compensates NW Natural based on the *current* number of customers in the class, leads us to conclude that DMN provides NW Natural with the same incentive to attract and retain customers. A related concern has been expressed to us that DMN may provide NW Natural with a disincentive to resolve outages in service. The thinking behind this concern is that DMN compensates NW Natural for reductions in usage that occur during outages (while under standard rates, NW Natural loses revenues until the outage is repaired). Given NW Natural's competitive concerns and the fact that natural gas outages can present a significant safety hazard, we do not believe that this effect will exist in practice. Section 4.6.2 provides additional discussion of this issue.

2.3.5 *Incentives on Customer Behavior*

Regarding the incentive effects of DMN on customer behavior, there is only one minor effect to consider. That is, relative to standard tariffs, DMN may slightly reduce customers' incentives to independently conserve energy (and conversely, DMN slightly decreases the cost of increasing consumption). In the absence of DMN, customers are "over-paid" for conservation efforts, as they pay less fixed distribution cost in addition to

the reduction in their energy cost.[7] By ultimately reducing the amount of this over-payment by 90%, DMN reduces the aggregate incentive for customers to conserve.

However, the effect is likely to be very small in practice because the revenue effects of *individual* customer conservation efforts are spread across the *entire* customer class, and delayed until the following year. That is, in the month that the conservation activities are undertaken, the conserving customer receives the full "over-payment" of fixed distribution costs through the standard tariff rate. The shortfall in revenues that this produces is added to the tracking account (with a 10% reduction), deferred until the following year, and recovered through an increase in rates to the *entire* class. Therefore, the conserving customer only re-pays its avoided distribution costs in proportion to its share of total class usage in the following year. Because of this dilution effect, the incentives for individual customers to conserve energy is largely unaffected by the presence of DMN.

2.4 Possibilities for Gaming the Mechanism

In order to implement DMN, NW Natural and the Commission must agree to certain parameter values, including:

- Price elasticity values for residential and commercial classes;
- Definition of normal weather;
- Weather sensitivity parameter (used to weather normalize use per customer); and
- Baseline use per customer for residential and commercial classes.[8]

Each of these parameters introduces the potential for "gaming" the outcome, by which we mean that parties may have an incentive to influence the calculations in order to produce an outcome that is more favorable to customers or the utility.

This gaming issue must be considered from two perspectives: DMN as a stand-alone mechanism; and DMN in combination with WARM. That is, as we will point out, some of the ways in which DMN outcomes might be influenced are countered by an offsetting effect from WARM, thus reducing or eliminating the incentive to game the parameter value.

2.4.1 Price Elasticity Values

The primary effect of setting the price elasticity incorrectly is that it changes the amount of revenues that flow through the deferral accounts, which leads to a reduction in the extent to which distribution revenues are adjusted for price effects (because deferrals are subject to the 90% factor). Note that if the 90% factor were removed, the price elasticity value would have no effect on total revenues collected or refunded; errors in the price

[7] Environmental organizations argue that the "over-payment" does not exist because energy prices do not account for all of the costs that energy use imposes on society (in terms of environmental impacts).
[8] There is an additional gaming concern with respect to new customer connections, which is discussed in Section 2.3.2.

elasticity would simply shift dollars from the elasticity adjustment to the deferral component.[9]

However, because of the 90% factor, only small revenue effects are associated with setting the price elasticity incorrectly. Table 2-1 shows the net revenue effect associated with increasing or decreasing prices when the elasticity value is too high or too low.

Table 2-1: DMN Revenue Effects of Setting the Price Elasticity Incorrectly

	Price Increase	**Price Decrease**
ε_d too low	Surcharge too low	Refund too low
ε_d too high	Surcharge too high	Refund too high

To better understand this table, we will walk through the reasoning associated with the upper left cell ("surcharge too low"). For this example, assume that normal weather conditions occur. When the base tariff price increases, use per customer is expected to decrease. When this happens, DMN produces surcharges to customers that should make NW Natural whole for the lost margins. However, if the elasticity value is set too low (*e.g.*, suppose the true elasticity is -0.3, but it is set at -0.172 for DMN calculations), the use per customer is assumed to fall by less than it actually will. This causes the per therm margin to be set too low, reducing the revenues from the elasticity effect shown in Equation 1a. Offsetting this effect is the fact that, because baseline use per customer is too high, the deferral component will produce surcharges to customers (that would not have existed had the baseline usage been adjusted correctly). In the absence of the 90% factor applied to deferrals, the error in the deferrals would exactly offset the error in the elasticity adjustment. However, because of the 90% factor, total surcharges to customers end up being too low, resulting in lost distribution cost recovery for NW Natural.

Examining each cell of Table 2-1 leads to the following conclusions with respect to gaming the price elasticities: if prices are expected to increase, customers will benefit if the price elasticity is set too low and NW Natural will benefit if the price elasticity is set too high. Conversely, if prices are expected to decrease, customers will benefit if the price elasticity is set too high and NW Natural will benefit if the price elasticity is set too low.

The magnitude of this incentive is relatively small, and would disappear completely if the 90% factor were eliminated. The gaming effects of this parameter are unaffected by the presence of WARM.

2.4.2 Normal Weather Definition

The definition of normal weather in the form of heating degree days (HDD^N) is required for the DMN deferral calculation. To evaluate the effects of setting HDD^N incorrectly,

[9] In the absence of the 90% factor, the price elasticity value would change the *timing* of revenue recovery, but not the *level* of revenue recovery. That is, revenues recovered through the elasticity adjustment come from current bills, while revenues recovered through the deferral component come from bills in the following year.

assume that the weather sensitivity parameter (β) is set correctly and actual heating degree days (HDD^A) are at their true normal value. Setting HDD^N too low (the equivalent of assuming that winters will be too warm) leads to a consistent over-adjustment of use per customer for weather, producing surcharges to customers. Conversely, setting HDD^N too high (the equivalent of assuming that winters will be too cold) leads to a consistent under-adjustment of use per customer for weather, producing refunds to customers. Therefore, all else equal, customers benefit when normal weather is set too cold, and NW Natural benefits when normal weather is set too warm.

The incentive to influence the definition of normal weather is dramatically reduced when DMN is combined with WARM. This is discussed in more detail in Section 3.4.

2.4.3 *Weather Sensitivity Parameter (β)*

The weather sensitivity parameter determines how much use per customer is assumed to change as weather conditions (HDDs) change. Currently, the same values are used in DMN and WARM, and they were estimated as part of the load forecasting process undertaken during the UG-152 rate case.

The effect of errors in setting β depends upon whether HDD^A is above or below the assumed value of HDD^N, as shown in Table 2-2.

Table 2-2: Revenue Effects of Errors in Setting the Weather Sensitivity Parameter

	$HDD^A < HDD^N$	$HDD^A > HDD^N$
β too low	Surcharges	Refunds
β too high	Refunds	Surcharges

Consider the result when β is set lower than its true value and winter weather is warmer than normal (represented by the top left cell in Table 2-2). Warm winter weather reduces actual use per customer below baseline values. If β is too low, the weather adjustment does not bring the weather-adjusted actual use per customer all the way up to baseline use per customer, which produces a surcharge to customers through the deferral mechanism.

Therefore, the way in which β might be influenced depends upon the forecast of weather conditions, or equivalently, whether the definition of HDD^N was influenced upward or downward. If winter weather is expected to be warmer than normal (or if it is expected to be normal, but HDD^N has been set too high), customers benefit if β is set too high and NW Natural benefits if β is set too low. Conversely, if winter weather is expected to be colder than normal (or if it is expected to be normal, but HDD^N has been set too low), customers benefit if β is set too low and NW Natural benefits if β is set too high.

As with the incentive to influence the definition of normal weather, the incentive to influence the weather sensitivity parameter is dramatically reduced when DMN is combined with WARM (and the incentive would be eliminated if the 90% factor on the deferral component of DMN were to be removed).

2.4.4 Baseline Use per Customer

Baseline use per customer is initially established through a rate case. Because of the methods associated with standard ratemaking (see Section 1), there is a history of contentiousness between regulators and utilities in determining forecast customer usage. In standard ratemaking, regulators can *reduce* customer rates by pursuing high short-term forecasts of customer usage, and utilities can *increase* rates by pursuing low forecasts of customer usage. (That is, once the revenue requirement is determined, rates are set by dividing revenue by forecast billing determinants.) The presence of DMN reduces these incentives, as the deferral component will tend to produce refunds to customers when baseline use per customer is set too low, and surcharges when baseline use per customer is set too high.

In the absence of DMN, any factor that is included in the forecast of customer usage that must itself be forecast (or assumed) can be manipulated to the benefit of either customers or the utility. In particular, note that forecasting customer usage requires an assumption regarding normal weather conditions. This provides a further incentive for the regulator to promote a normal weather definition that is too cold, as this will produce a baseline use per customer value that is too low, and lead to persistent refunds to customers. The incentive for the utility is the opposite.

Baseline use per customer and the baseline margin rate are jointly determined. If baseline use per customer is set too low, the margin rate will be set too high. Therefore, there are offsetting effects associated with influencing baseline use per customer. Setting baseline use per customer too low will lead to a margin rate that is too high, increasing revenues from the standard tariff. However, it will also lead to persistent refunds to customers through the DMN deferral mechanism.

In the absence of the 90% factor in the deferral mechanism, these two effects exactly offset one another, removing contentiousness over the value of baseline use per customer. In this case, the only effect of setting baseline use per customer incorrectly is that the change in revenues with respect to changes in usage (not due to weather or expected price effects) will be too high or too low because the margin rate will also deviate from its correct value. However, this does not benefit either customers or NW Natural on average, and all parties should be better off by setting the correct baseline value, ensuring that the revenue adjustments are of the appropriate magnitude.

2.5 Potential Improvements in the Mechanism

2.5.1 Methods of Refunding or Collecting Deferral Account Funds

Currently, DMN recovers revenue shortfalls or refunds excess revenues by adjusting the per-therm rate for the following year. There are two potential problems with this approach. First, it introduces the potential for customers to be credited or charged an incorrect share of the revenue adjustment. This would occur whenever a customer's share of total usage differs between the two years. Second, by rolling the adjustment into the per-therm rate, DMN alters the price signal to customers (albeit only slightly), changing the marginal incentives for increasing or decreasing usage.

An alternative that would address both of these concerns would be to calculate, for each month, the dollar amount that each customer should be credited (charged) based on current usage. That is, the calculation of the deferral amount would be identical to the current method. However, instead of calculating a change to the per-therm rate for the coming year, the deferral adjustment would be credited or charged to customers in a lump sum adjustment based on their share of class usage in that month.

There would then be several options for refunding (collecting) the deferral amounts. First, the credits (charges) could be applied to customers' current bills, which would have the added benefit of reducing cash flow risk for customers. Second, the credits (charges) could be refunded (collected) in a lump sum at the end of the year. However, customers may not find this alternative appealing in years in which they pay a large lump-sum charge. Third, the refunds (collections) could be spread across the twelve months of the following year.

It is possible that this alteration to DMN would increase the administrative costs of the rate. However, given the complexity of WARM, we believe that NW Natural's billing system would be able to accommodate the proposed changes. In addition, these changes would make DMN more visible to customers. Currently, DMN adjustments to rates are not separately listed on customer bills, which has reduced awareness of the mechanism and therefore (we expect) has reduced the number of customer service issues associated with DMN. Changing the way in which DMN adjustments are allocated and refunded (or recovered) will likely increase the awareness of DMN, which could lead to increased customer service expenses.

2.5.2 Incomplete Coverage

Removing the 90% factor applied to the deferral component would improve DMN's incentive properties (*i.e.*, it would further reduce NW Natural's disincentive to promote energy efficiency) and eliminate some incentives to game DMN parameter values. Given that this factor can help or harm customers (*i.e.*, it reduces both surcharges and refunds), it does not seem to serve any useful purpose and should be eliminated.

2.5.3 Complexity

Especially in combination with WARM, DMN is a complex mechanism to understand and communicate to others. A full decoupling mechanism, which produces nearly identical total revenue effects to the combination of DMN and WARM, requires the setting of fewer parameters, and is much more easily explained and understood. A more detailed discussion of the tradeoffs between DMN, WARM, and full decoupling is contained in Section 5.

3. WEATHER ADJUSTED RATE MECHANISM

3.1 Description of Mechanism

The Commission approved WARM in 2003 as a means of reducing weather-related risk for both NW Natural and its customers. That is, fixed distribution costs are recovered

through volumetric rates, and customer usage is sensitive to weather conditions. Therefore, in cold winters when usage is above expected levels, NW Natural over-recovers distribution costs and customers' bills are higher than usual. Conversely, in mild winters, NW Natural under-recovers distribution costs and customers' bills are lower than usual. Because NW Natural's exposure to weather is the opposite of its customers (*i.e.*, when NW Natural is made worse off by weather, its customers are better off), mechanisms such as WARM can reduce risk for both parties. In 2004, WARM was altered in two ways. First, limits were placed on the size of the WARM adjustment in any one month (though the full adjustment is still recovered in subsequent months). Second, the calculation of the WARM adjustment was altered so that it is determined on a customer-specific basis instead of a class-wide basis. The description below is of the current form of WARM.

A discussion of WARM in this report is appropriate because the combination of WARM and DMN produce effects that are very similar to full decoupling, which was the initial proposal of NW Natural (in place of DMN). In addition, some aspects of DMN (*e.g.*, incentives to game parameter values) can only be fully understood by introducing WARM effects.

Equation 3 shows the formula used to calculate the WARM adjustment (prior to the application of maximum bill change provisions). It is calculated for each customer based on their billing cycle usage and weather data from the closest available weather station (among the eight established district weather stations used by NW Natural).

Equation 3: WARM Adjustment = $\Sigma_d (HDD^N_d - HDD^A_d) * \beta * M$.

In this equation, d indexes the days of the customer's billing month; HDD^N_d is normal heating degree days (HDDs) for day d of the billing month, based on a 25-year average ending in 2000; HDD^A_d is the actual heating degree days for day d of the billing month; β is the weather-sensitivity parameter (an estimate of the change in customer usage with respect to a one unit change in HDDs); and M is the distribution margin in dollars per therm.

β is statistically estimated as part of the class load forecasting process. Its units are in therms per HDD, and the same value for β is used for all customers within a class. For residential customers, the WARM adjustment is capped at the lesser of $12 or 25% of the volumetric portion of the bill. For commercial customers, the WARM adjustment is capped at the lesser of $35 or 25% of the volumetric portion of the bill. However, the portion of the WARM adjustment that exceeds the cap is collected in subsequent months. While WARM is the default service for residential and commercial customers, customers may opt out of the program.

3.2 Expected Risk Effects

From NW Natural's perspective, WARM is an effective means of reducing weather-related distribution cost recovery risk provided that few customers decide to opt out of the program. The effect of the opt-out provision upon NW Natural's risk depends upon

the characteristics of the customers that opt out relative to those of the class. A more detailed discussion of the effects of the opt-out provision is included later in this section. Under the assumption that no customers opt out of the program, WARM will be effective in reducing NW Natural's weather risk provided that β accurately reflects the average customer response to weather variations, and that the definition of normal weather is correct.[10]

From a customer perspective, WARM is a less effective tool for reducing risk. This is because β is set on a class-wide basis and is constructed in units of therms per HDD. Thus, the amount of risk coverage varies across customers. Customers who are smaller or less weather sensitive than the class average are *over-insured* by WARM.[11] Conversely, customers who are larger or more weather sensitive than the class average are *under-insured* by WARM. The added provisions that cap the amount of the WARM adjustment in any month do not alter our conclusions about over- or under-insurance because the total WARM adjustment is collected from each customer in subsequent months. In Section 3.5 below we discuss the potential value of re-designing the weather adjustment parameter so that it is in units of *percentage* changes in therms per HDD.

3.3 Expected Incentive Effects

The WARM program does not alter NW Natural's behavioral incentives. This is because WARM affects only weather-related fluctuations in distribution revenues, and weather is out of NW Natural's control. The incentives to promote conservation, load growth, the addition of new customers, and the provision of high quality customer service are not affected.

WARM also does not affect participating customers' incentives. WARM may provide customers with benefits through a reduction in their bill variability, but the customers' marginal cost of changing usage levels is not affected by WARM.

3.4 Possibilities for Gaming the Mechanism

Neither the Commission nor NW Natural has an incentive for β to deviate from its true value. (This is true whether WARM is considered by itself or in combination with DMN.) Setting the value correctly ensures that the WARM adjustments have the appropriate magnitude. A value that is too high introduces more weather risk (relative to the "correct" value of β) for both NW Natural and its customers (on average). Setting β too low leads to an adjustment that under-insures NW Natural and its customers (on average).

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[10] However, if DMN and WARM use the same definition of normal weather, the errors in the revenue recovery for DMN and WARM due to an incorrect definition of normal weather largely cancel out. This reduces the incentive to "game" the definition of normal weather.

[11] Because WARM only intends to cover the risk associated with distribution fixed cost recovery, it is unlikely that customers will be over-insured against the weather risk associated with their *entire* bill. That is, any over-insurance on the distribution component will likely be smaller than the remaining weather risk on the energy component of the bill.

When WARM is considered by itself, the Commission and NW Natural have an incentive to manipulate the definition of normal heating degree days. Setting HDD^N below its "true" value leads to a situation in which, on average, WARM produces refunds to customers. (If HDD^N equals its true value, WARM will, over time, benefit neither NW Natural nor its customers.) Conversely, if HDD^N is set above its true value, WARM will tend to increase customers' bills.

However, when WARM is evaluated in combination with DMN, the incentive to game the definition of normal heating degree days is dramatically reduced, provided that both programs use the same definition. An example will help to illustrate this effect. To simplify the example, the timeframe of the analysis is reduced to one month and we will assume that the residential class consists of only one customer who uses 100 therms in normal weather conditions. Furthermore, we will assume that there is no price change (and therefore no elasticity adjustment to the baseline quantity), and that the customer does not deviate from its non-weather related usage. Consider the following case, in which the tariff value for HDD^N is higher than the true value, and actual heating degree days (HDD^A) match the true value:

"True" $HDD^N = 400$
Tariff $HDD^N = 500$
$HDD^A = 400$
$\beta = 0.1958$
$M = \$0.42569$

In this case, both the "true" WARM and DMN adjustments are zero. That is, weather is at normal conditions and there is no non-weather related usage change, so the mechanisms do not affect revenue collection. However, because the tariff contains an incorrect value of HDD^N, both DMN and WARM lead to non-zero adjustments, as shown below.

DMN deferral amount = $90\% * (QPC^{B,P} - Q^{WN}/C) * M * C$
$Q^{WN} = Q^{A,S} + \beta * \Sigma_d (HDD^N_d - HDD^A_d) = 100 + 0.1958 * (500 - 400) = 119.58$
DMN deferral amount = $90\% * (100 - 119.58) * \$0.42569 * 1 = -\$7.50$
WARM adj. = $\Sigma_d (HDD^N_d - HDD^A_d) * \beta * M = (500 - 400) * 0.1958 * \$0.42569 = \$8.34$

These equations show that, while WARM over-collects by $8.34, DMN offsets 90% of the over-collection, so that the net over-collection is only $0.83. Assuming that the intended distribution margin recovery is equal to $Q^{B,P} * M = \$42.57$, the over-collection amounts to only about 2% of the distribution revenue requirement, versus about 20% when considering WARM by itself. This demonstrates how the combination of DMN and WARM reduces the incentive to game the definition of normal weather.

This example highlights an additional incentive problem caused by setting HDD^N too high. That is, given that customers may opt out of WARM, setting HDD^N too high provides customers with an opportunity to game rates. If the customer realizes that WARM is established in way that consistently produces surcharges to their bills, they

will rationally opt out of the program. This decreases the effectiveness of WARM in reducing weather risk, and negates the offsetting effects of DMN and WARM described above. In the example above, if the customer opts out of WARM, the $7.50 refund produced by DMN remains, but the offsetting surcharge of $8.34 generated by WARM is lost, leaving NW Natural with reduced overall revenues. (Alternatively, if HDD^N were set too low, rational customers would not opt out of WARM, as its persistent refunds would offset the persistent surcharges created by DMN, which does not allow them to opt out.) This example therefore highlights the beneficial effects of combining DMN and WARM in terms of compensating for inaccuracy in the program parameters.

3.5 Potential Improvements in the Mechanism

The use of a class-wide value of β reduces the economic value of WARM for many customers, increasing the potential that customers will opt out of WARM. NW Natural's benefits from WARM decline when customers opt out of WARM.

Two options exist for addressing this problem. First, NW Natural could continue to use a class-wide value of β, but instead calculate it as a *percentage* change in the usage per HDD. This would address the customer size problem (that small customers tend to be over-insured by WARM in its current form). For example, if β were expressed in percentage terms, smaller customers would experience lower WARM adjustments to their bill than under the current system.

The second option is to calculate *customer-specific* values of β for use in calculating the WARM adjustments. (These could either be in percentage or level terms.) This approach would address two problems: the inaccurate treatment of customers with respect to size, and the inaccurate treatment of customers with respect to weather sensitivity. Calculating customer specific β parameters would also have the effect of automatically excluding non-weather sensitive customers from the WARM program.

CAEC has developed software that is capable of calculating customer-specific values of β.[12] The software requires twelve months of billing data for a customer in order to estimate β, and screens are used to weed out "bad" estimates. Therefore, if WARM is modified to use an algorithm such as this, the program would be limited to customers with sufficient billing data (at their current site) and for whom the statistical model provides a reliable estimate of weather sensitivity.

A more complete analysis of the implications of modifying the WARM program will be performed in a subsequent report.

4. EVIDENCE OF DMN EFFECTS

Sections 2 and 3 presented theoretical discussions of the expected effects of DMN and WARM. This section explores the extent to which evidence may be found that is consistent with the theoretically expected effects of DMN. In addition, this section discusses the three programs funded by the Public Purposes Funding approved along with

[12] The software has been used to calculate offers for fixed bill programs.

DMN: the Energy Trust of Oregon administered energy efficiency programs (specifically, the residential high-efficiency furnace program), the Oregon Low-Income Energy Efficiency Program (OLIEE), and the Oregon Low-Income Gas Assistance Program (OLGA).

4.1 "Back Cast" of DMN Financial Effects from 1993 to 2004

The financial effects of DMN can be divided into two categories: the price elasticity effect and the deferral component. The price elasticity effect is equal to the change in the per therm margin multiplied by total class usage. That is, as natural gas prices increase, the baseline usage is adjusted downward and the dollar per therm margin is adjusted upwards, so that the margin multiplied by baseline usage per customer remains constant (all else equal). This portion of the adjustment is intended to adjust revenues for changes in use per customer that occur because of changes in energy prices.

The deferral component is intended to adjust revenue recovery for 90% of the non-weather driven fluctuations in use per customer. Deferral revenues can be caused by changes in use per customer due to conservation efforts, an imperfect price elasticity adjustment, or simply random factors. The deferral amount is calculated as 90% of the difference between the price-adjusted baseline usage and the weather-adjusted actual usage, multiplied by the adjusted dollar per therm margin.[13] Table 4-1 below shows the dollar amounts associated with these two categories of revenue effects by customer class for the first two full years of DMN.

The first year of DMN, October 2002 through September 2003, contained large revenue effects because of the need to "catch up" with respect to substantial price increases (and therefore substantial load decreases) since the previous rate case. The following year, October 2002 through September 2003, experienced much smaller revenue adjustments because the baseline values were based on a rate case that concluded in 2003.

Table 4-1: Revenue Effects of DMN Mechanism: October 2002 through September 2004

Time Period	Customer Class	Elasticity Effect ($000)	Deferral ($000)	Total ($000)
Oct. 2002 to Sep. 2003	Residential	7,665	3,093	10,758
	Commercial	2,529	1,573	4,102
	Total	10,194	4,666	14,860
Oct. 2003 to Sep. 2004	Residential	940	-788	152
	Commercial	335	91	426
	Total	1,275	-697	578

Notes: positive values indicate surcharges to customers and negative values indicate refunds to customers.

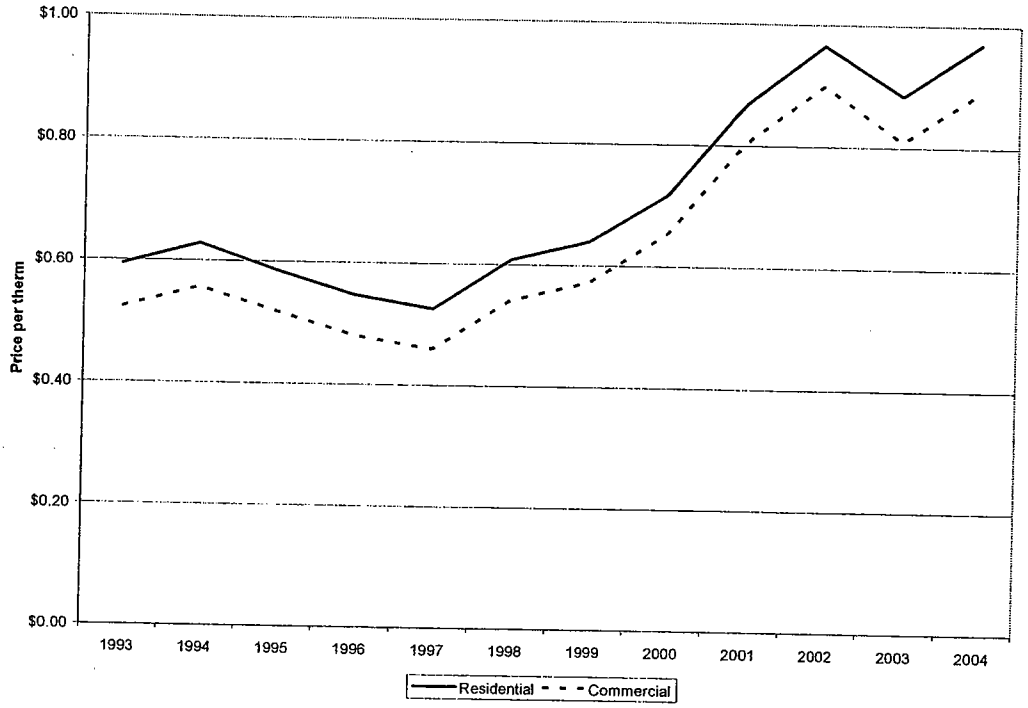
[13] Section 2.1 specifies the elasticity adjustment and deferral component in equation form.

Because DMN was approved relatively recently, there is a limited amount of direct experience to examine. In order to determine how DMN might function under a wider range of possible outcomes (*e.g.*, when prices are decreasing as well as increasing), we performed a "back cast" of DMN financial outcomes using annual data from 1993 through 2004. That is, we calculated the amounts of the price elasticity adjustment and deferral amounts for each of those years, at the price and weather conditions in those years, and using 2000 values of price and use per customer as baseline values. In order to facilitate this simulation, we made the following simplifying assumptions:

- We used annual data (*i.e.*, from January through December) as opposed to October through September monthly data.
- For the commercial class, we used Schedule 3 prices throughout instead of blending the price across the applicable commercial schedules. These prices are used to determine the percentage change in price that, combined with the price elasticity, determines the adjustment to baseline use per customer and margin rate.
- "Normal Weather" was defined as the average HDD value across the 12-year sample timeframe. This allows us to ignore issues about the "correct" definition of normal weather, as we use the *ex post* actual average value for this time period.
- Calendar year 2000 was set as the baseline year for use per customer (which is then weather normalized). Using 2000 as the baseline year allows us to examine DMN effects in years of flat or rising use per customer (prior to 2000), as well as declining use per customer (after 2000)
- The baseline dollar per therm margin was set as the October 2002 through September 2003 actual value, or $0.34055 for residential customers and $0.21692 for commercial customers. These values were simply used to provide an appropriate scale for the financial outcomes.
- The price elasticities and β coefficients (which define the change in use per customer per change in HDD and were used in weather normalization) are based on the values used in the actual DMN (and WARM) calculations. Specifically, the residential price elasticity is -0.172, the commercial price elasticity is -0.110, the residential $\beta = 0.1958$, and the commercial $\beta = 0.7669$.

Figure 4-1 shows the residential and commercial prices for each year. Using a base year of 2000 for this analysis allows us to examine outcomes when the price is below the baseline value (prior to 2000) and above the baseline value (after 2000).

Figure 4-1: Residential and Commercial Prices: 1993 to 2004



Figures 4-2 and 4-3 show the annual DMN revenue adjustments for the residential and commercial classes, respectively. The results for each year consist of three bars. The first bar shows the deferral revenues, the second bar shows the price elasticity adjustment, and the third bar shows the total DMN revenue adjustment (*i.e.*, the sum of the other two bars).[14] Positive values indicate surcharges to customers and negative values represent refunds to customers. Notice that there are no DMN adjustments for the year 2000 because it is the base year.

Figure 4-4 shows residential and commercial weather-normalized use per customer. In both cases, use per customer is declining over time, with 2000 as a transitional year between high and low values. This is reflected in the DMN revenue adjustments shown in Figures 4-2 and 4-3, in which pre-2000 adjustments are negative (refunds to customers), and post-2000 adjustments are positive (surcharges to customers).

[14] A spreadsheet containing the underlying data and calculations is available from the authors.

Figure 4-2: Simulated Residential DMN Revenue Adjustments: 1993 to 2004

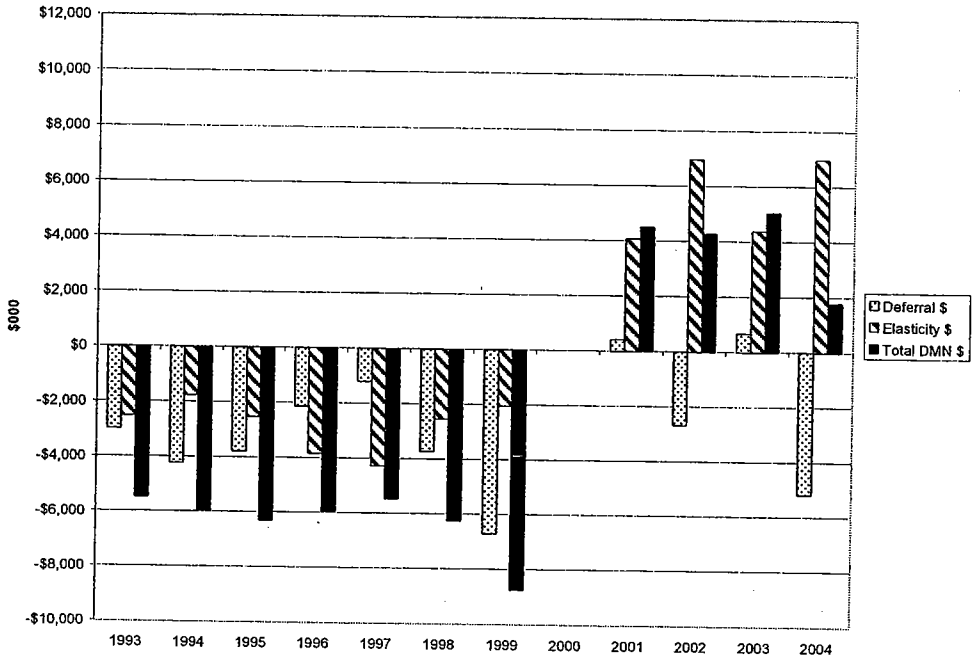


Figure 4-3: Simulated Commercial DMN Revenue Adjustments: 1993 to 2004

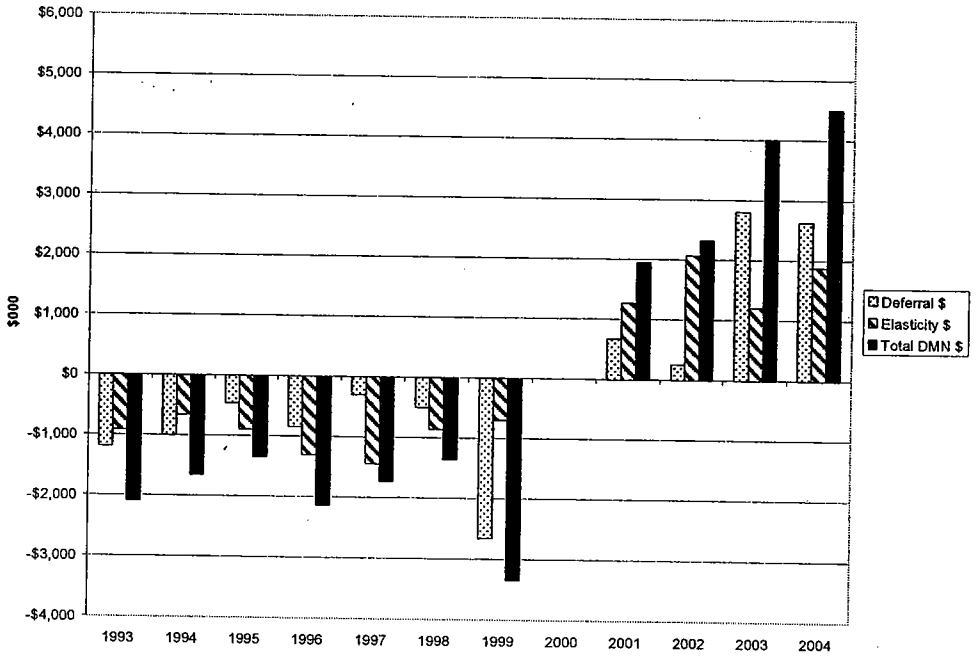
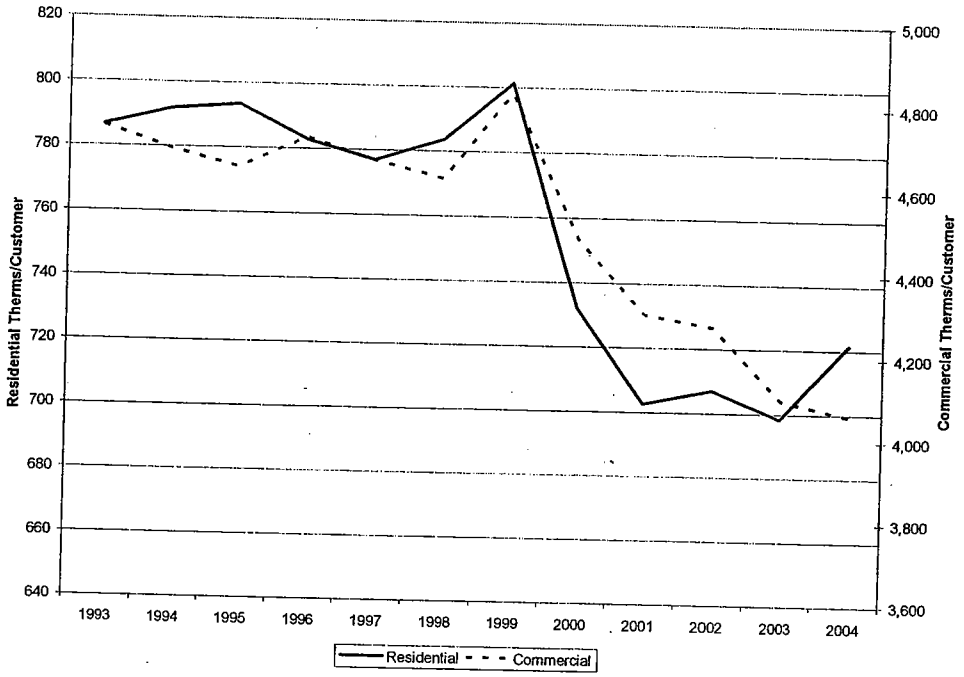


Figure 4-4: Residential and Commercial Weather-Normalized Use per Customer: 1993 to 2004



An examination of the margin recovery per customer with and without DMN shows that DMN reduces the variability. For residential customers, DMN reduces the standard deviation of per-customer margins across the simulated years by 30%. For commercial customers, DMN reduces the standard deviation of per-customer margins across the simulated years by 42%. This is the effect that we expected to observe, and the magnitude indicates the effect of implementing DMN instead of full decoupling, which would produce a 100% reduction in the standard deviation of per-customer margins.

One surprising aspect of Figures 4-2 and 4-3 is the size of the deferrals with respect to the elasticity revenue adjustments. That is, we might expect that the price elasticity adjustment would account for the majority of the revenue effects associated with the change in use per customer, leaving a relatively small amount to be "cleaned up" by the deferral mechanism. However, in several years (*e.g.*, 1993 and 1994), the deferral revenues actually exceed the elasticity adjustment revenues.

A closer inspection of the DMN calculations reveals a potential explanation for this effect. Figures 4-5 and 4-6 illustrate the price-adjusted baseline use per customer and weather-adjusted actual use per customer for the residential and commercial classes, respectively. The two figures tell a similar story, with price-adjusted baseline use per customer lying below weather-adjusted actual use per customer in the early years (in

Figure 4-5: Residential Price-Adjusted Baseline and Weather-Normalized Use per Customer: 1993 to 2004

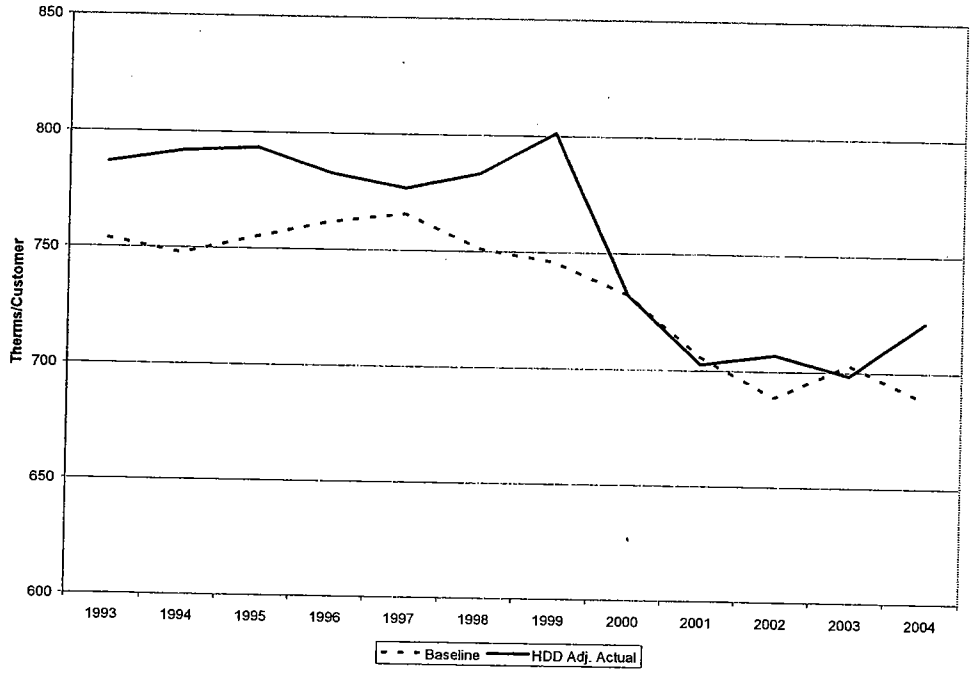
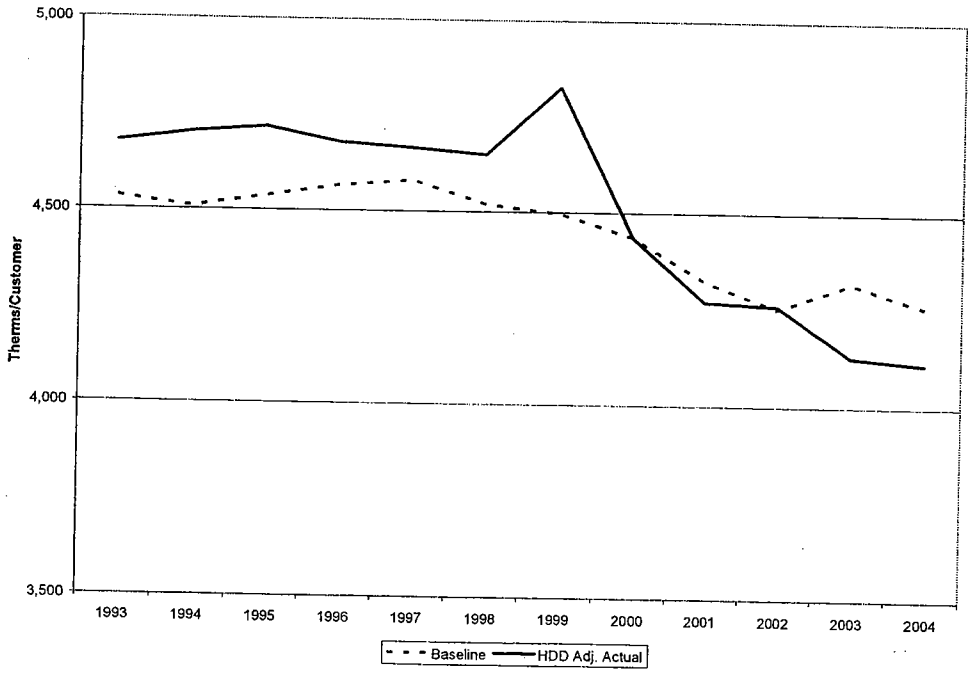


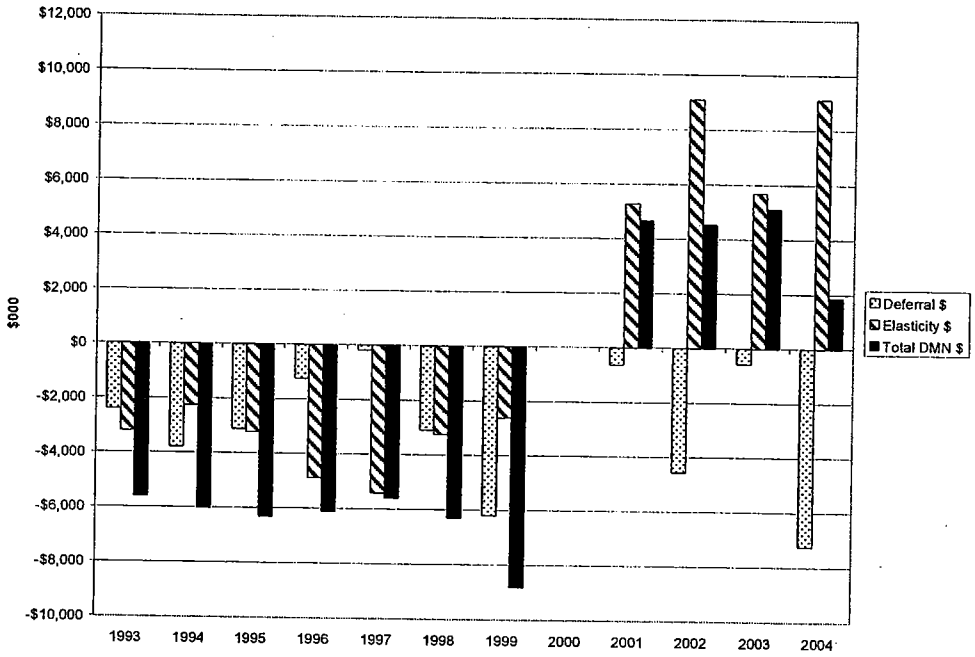
Figure 4-6: Commercial Price-Adjusted Baseline and Weather-Normalized Use per Customer: 1993 to 2004



which prices are low relative to 2000). This could indicate that the stipulated price elasticity values are too low (in absolute value). That is, under the assumption of a higher price elasticity, the usage changes would be larger for a given price difference. This would have the effect of bringing the baseline curves closer to the weather-adjusted actual curves.[15]

We estimated the price elasticities that would minimize the difference between price-adjusted and weather-normalized actual use per customer for each class.[16] Figures 4-7 and 4-8 show the deferral and price elasticity revenue adjustments using the "calibrated" price elasticity values.

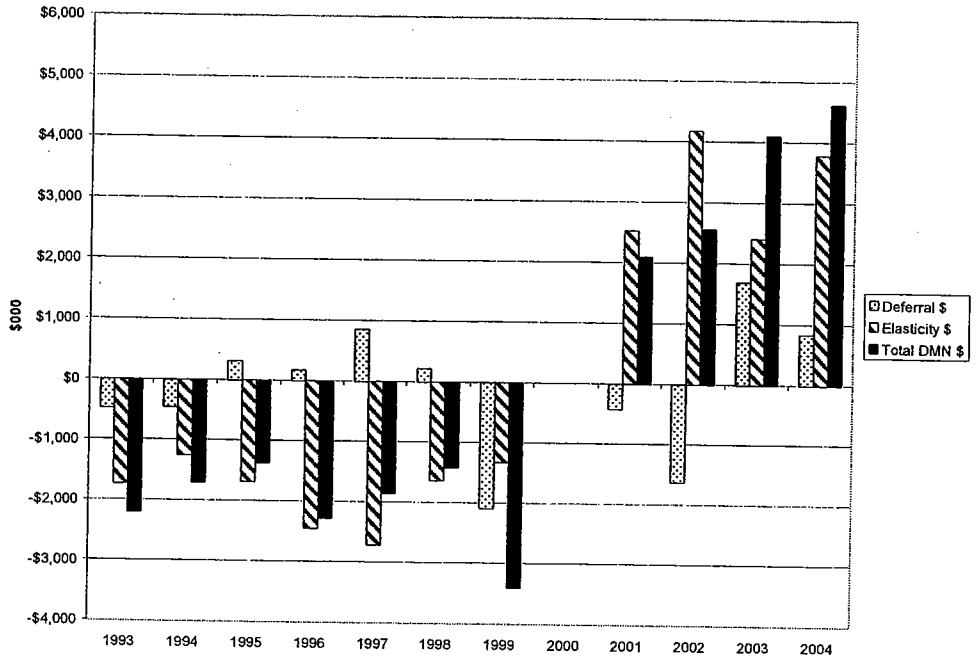
Figure 4-7: Simulated Residential DMN Revenue Adjustments Using Calibrated Price Elasticity: 1993 to 2004



[15] The weather-adjustment parameter (β) is another potential culprit. Our research indicates that "errors" in the value of β contribute to the high level in deferrals in the residential class, but not in the commercial class.

[16] This was done by setting the price elasticity to minimize the sum of squared differences between price-adjusted baseline and weather-adjusted actual use per customer. The weather-adjustment parameters (β) are held at its tariff values for this exercise.

Figure 4-8: Simulated Commercial DMN Revenue Adjustments Using Calibrated Price Elasticity: 1993 to 2004



A comparison of Figure 4-7 to Figure 4-2 (the initial residential deferral and price elasticity adjustment revenues); and of Figure 4-8 to Figure 4-3 shows that calibrating the price elasticity value tends to increase the size of the price elasticity revenue adjustment compared to the deferral amounts. This effect is larger in the commercial class, in which the price elasticity calibration produced a larger change in the price elasticity. The calibrated residential price elasticity is -0.221, compared to the stipulated value of -0.172; and the calibrated commercial price elasticity is -0.213, compared to the stipulate value of -0.110. Note that these values were created to illustrate how the DMN revenue adjustments change as the price elasticity changes. While we believe that this section provides an indication that the stipulated price elasticities may be too low, we do not necessarily recommend using this calibration method to revise the price elasticities. A more reliable method would be estimate the price elasticities directly from historical data, including use per customer, price, and weather data.

4.1.1 Conclusions

We draw two primary conclusions from this analysis. First, DMN revenue adjustments produce adjustments in the intended direction. That is, when non-weather adjusted use per customer increases (primarily because of a response to price decreases), DMN produces refunds to customers. Alternatively, when non-weather use per customer decreases (primarily because of a response to price increases), DMN leads to surcharges to customers. This has the effect of reducing the variability in margin recovered per customer.

The second conclusion that we take from this analysis is that NW Natural and the Commission should investigate whether the price elasticity values should be modified. There is some indication from this analysis that they are set too low (in absolute value), which could lead to relatively large deferrals. Setting the price elasticities "correctly" will minimize deferrals and prevent the 10% slippage of revenues built into DMN (which can work for or against customers).

4.2 Comparison of Revenue Variability across Natural Gas Utilities

One goal of DMN is to reduce the variability of commercial and residential distribution revenues. The Commission Staff requested an examination of NW Natural's revenue variability compared to that of a representative sample of utilities. The sample used here corresponds to the sample used to determine return on equity in NW Natural's last rate case (UG-152). It consists of the following utilities:

1. AGL Resources
2. Atmos Energy
3. Cascade Natural Gas
4. Energen
5. Laclede Gas
6. Nicor
7. NW Natural Gas
8. Peoples Energy
9. Piedmont Natural Gas
10. SEMCO Energy
11. Southwest Gas
12. WGL Holdings

The data were obtained from annual reports and SEC 10-K filings available on the corporate websites. The following information was collected for the years 1993 through 2004 (in most cases, not all years were available):

- Number of residential accounts (expressed either as the number of customers at year-end, or average number of customers during the year)
- Number of commercial accounts (expressed either as the number of customers at year-end, or the average number of customers during the year)
- Residential natural gas sales (expressed in either MDth or MMcf)
- Commercial natural gas sales (expressed in either MDth or MMcf)
- Residential operating revenues
- Commercial operating revenues
- Annual heating degree days

Appendix Table A1 contains all of the data that we were able to collect for the sample utilities. Figures 4-9 through 4-11 present comparisons of the variability of various measures across the utilities. Figure 4-9 compares residential and commercial operating revenues across utilities, expressed as a coefficient of variation (*i.e.*, the standard deviation of revenues divided by the mean, which facilitates comparisons across utilities

of different sizes). Eleven of the twelve utilities had sufficient data for inclusion in this figure, though the period of available data varies across utilities.

Figure 4-9: Variability of Residential and Commercial Operating Revenues

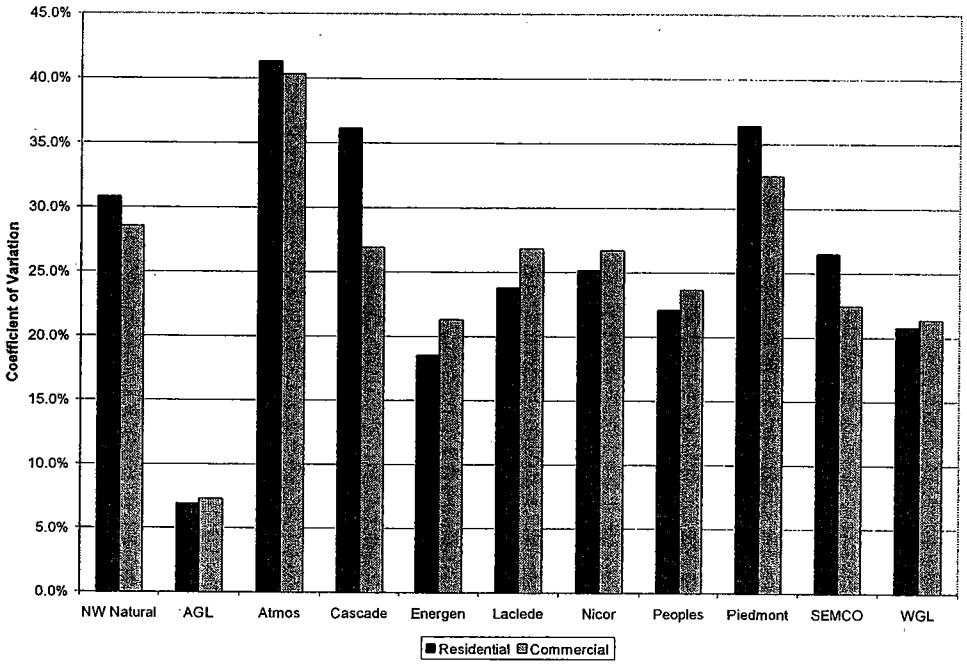


Figure 4-10 compares the variation of residential and commercial sales per customer across utilities. This comparison removes tariff price differences, allowing for an examination of variability differences that are driven only by fluctuations in use per customer. Because several utilities do not report the number of customers by rate class, only eight of the twelve utilities are included in this figure.

Figure 4-11 examines the variation in heating degree days (HDD) across utilities. This is a potentially useful comparison because weather is a primary driver of fluctuations in use per customer across years. In this case, we express variability as the standard deviation of annual HDD.

The information presented here provides mixed evidence regarding NW Natural's revenue variability as compared to other utilities. In terms of class operating revenues, NW Natural's variability is among the highest of the group. However, an examination of the underlying drivers of revenue variability in Figures 4-10 and 4-11 (sales per customer and heating degree days, respectively) reveals that NW Natural's variability is toward to low end of the sampled utilities.

Figure 4-10: Variability of Residential and Commercial Sales per Customer

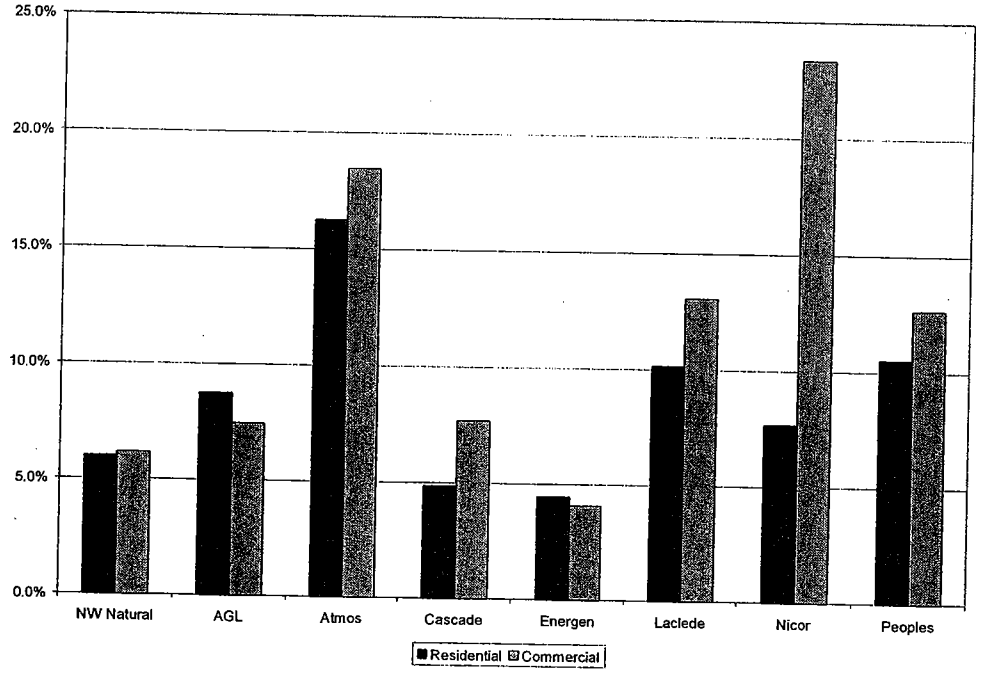
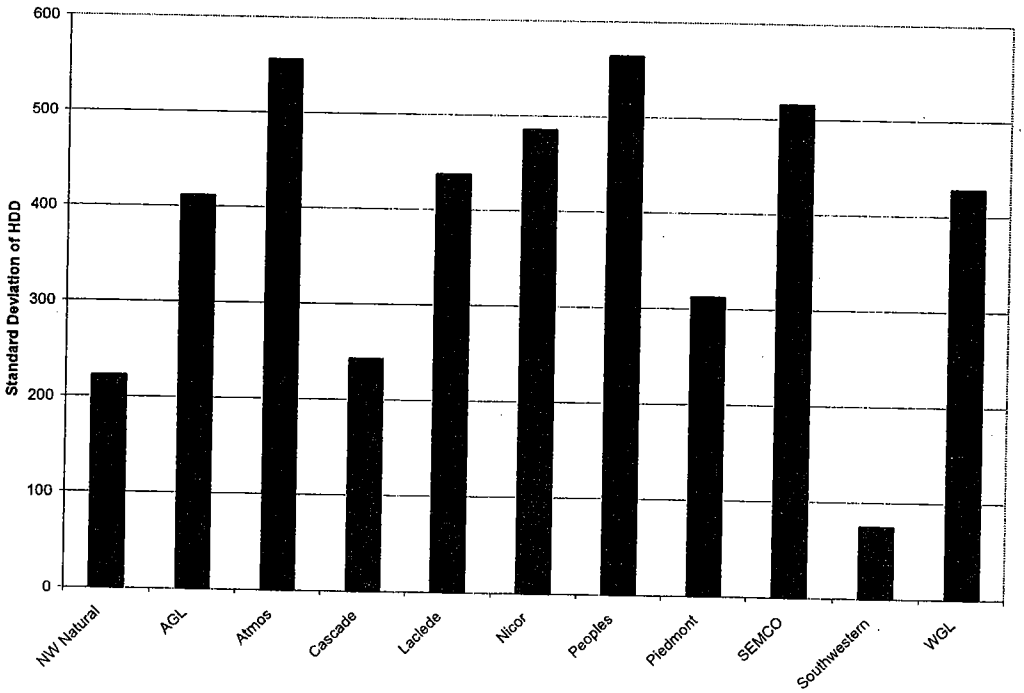


Figure 4-11: Variability of Heating Degree Days



This discrepancy appears to be due to NW Natural's relatively high growth in the number of customers. That is, as the number of customers increases, revenues increase as well. This increases the standard deviation of revenues over the sample time frame. To illustrate this point, note that three utilities had a higher standard deviation of residential revenues (shown in Figure 4-10): Atmos Energy, Piedmont Natural Gas, and Cascade Natural Gas. These same three utilities are the only utilities that had a higher growth rate in the number of residential customers than NW Natural during the sample period.

Note that the variability in use per customer is most relevant in the context of DMN. That is, the majority of the DMN revenue adjustments are due to fluctuations in use per customer. DMN affects revenues associated with a change in the number of customers only to the extent that the average size of new connections customers differs from the baseline use per customer. Therefore, based on the information in Figure 4-10, we conclude that NW Natural has a lower than average variation in distribution fixed cost recovery due to fluctuations in usage per customer.

4.3 Econometric Analysis of Use per Customer

The Commission Staff requested that we investigate the share of DMN revenue adjustments that are attributed to conservation, price elasticity effects, and economic activity. Unfortunately, because changes in use per customer are not directly assigned to these categories, this task cannot be accomplished using a simple accounting exercise. For example, if use per customer goes down during a time in which both the retail price and the unemployment rate increases, we must perform a statistical study to determine the relative influences of these factors.

This section performs that statistical study using historical data to assess the sources of variations in annual use per customer from 1993 through 2004. The results will allow us to infer the major sources of DMN revenue adjustments.

We examined residential and commercial customers separately. The analysis was conducted using ordinary least squares (OLS) regression analysis, which is a statistical technique that estimates the effect that *independent* (or explanatory) variables have on a *dependent* variable, which in this case is use per customer. The independent variables that were considered include:

- Annual heating degree days (HDD)[17];
- Price in dollars per therm;
- Oregon unemployment rate;
- Cumulative units adopted under NW Natural's High Efficiency Furnace (HEF) Program (used in the residential analysis only); and
- A time trend variable to account for changes over time in building codes, housing types, or appliance stock.

[17] HDD is calculated using a 59 degree base for residential customers and a 58 degree base for commercial customers. We use the weighted average HDDs across NW Natural's seven districts, where the weights are set according to each district's share of total customers.

Tables 4-2 and 4-3 present the OLS coefficient estimates for residential and commercial customers, respectively. Three sets of results are presented for each customer class, which differ according to the independent variables that were included in the regression equation. The model used in the first column of each table includes all independent variables, the model used in the second column excludes the time trend variable, and the model used in the third column includes only the weather and price variables (*i.e.*, HDD and price).

Table 4-2: OLS Estimates of Residential Usage per Customer from 1993-2004

Variable	All Variables	No Time Trend	Only HDD, Price
	(1)	(2)	(3)
HDD	0.166** (0.040)	0.152** (0.033)	0.161** (0.028)
Price	-173.0 (108.8)	-151.4 (99.3)	-224.4** (34.0)
Unemployment Rate	-4.392 (12.386)	1.759 (7.700)	n/a
HEF Adoptions	0.0011 (0.0036)	-0.0011 (0.0013)	n/a
Time trend	-6.226 (9.539)	n/a	n/a
Constant	475.3** (107.0)	449.1** (95.0)	472.0** (83.9)
R-squared	0.921	0.915	0.907

Notes: The number of observations = 12. The dependent variable is residential use per customer in therms. Standard errors are in parentheses. ** denotes that the variable is statistically significant at the 5 percent level. * denotes that the variable is statistically significant at the 10 percent level.

4.3.1 Residential Results

As Table 4-2 shows, the independent variables explained a very high percentage of the variation in residential usage per customer, with R-squared values ranging from 0.907 to 0.921.[18] Weather, represented by HDD, was a statistically significant determinant of usage per customer in each column. The estimated coefficient for HDD is interpreted as follows: a one unit increase in annual HDD leads to an increase in residential therms per customer of about 0.16.

[18] R-squared values range from zero to one, with zero indicating that the model has no explanatory power, and one indicating that the model explains all of the variation in the dependent variable.

Table 4-3: OLS Estimates of Commercial Use per Customer from 1993-2004

Variable	All Variables	No Time Trend	Only HDD, Price
	(1)	(2)	(3)
HDD	0.983**	1.004**	0.979**
	(0.180)	(0.177)	(0.169)
Price	-939.3*	-1,299.7**	-1,431.1**
	(476.5)	(271.5)	(202.2)
Unemployment Rate	-36.39	-30.71	n/a
	(41.82)	(40.99)	
Time trend	-17.78	n/a	n/a
	(19.23)		
Constant	2,970.1**	2,997.1**	2,954.1**
	(482.3)	(477.1)	(461.9)
R-squared	0.927	0.918	0.912

Notes: The number of observations = 12. The dependent variable is commercial use per customer in therms. Standard errors are in parentheses. ** denotes that the variable is statistically significant at the 5 percent level. * denotes that the variable is statistically significant at the 10 percent level.

The price per therm, unemployment rate, and cumulative HEF adoption variables were highly correlated with the time trend variable, which makes the interpretation of their coefficients somewhat more complex. That is, the time trend variable is intended to pick up exogenous changes in use per customer over time (*i.e.*, those changes that cannot be directly attributed to weather, price, economic conditions, or NW Natural conservation efforts). However, because natural gas prices and HEF adoptions increase steadily during the analysis time period (this is true to a lesser extent for the unemployment rate), it is difficult for the regression model to differentiate changes in use per customer that might be attributed independently to any one of the factors.

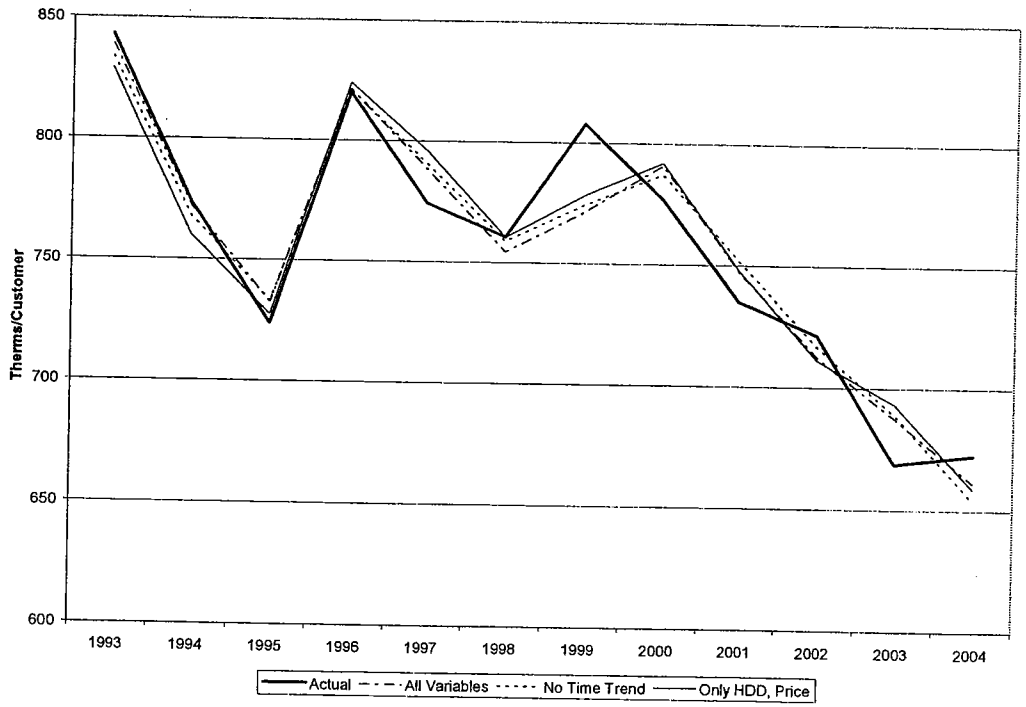
In the full specification, shown in column 1 of Table 4-2, the price variable was the non-weather variable closest to meeting the standard definition of statistical significance.[19] The HEF adoptions coefficient does not have the sign predicted by theory (the result implies that residential use per customer increases as HEF adoptions increase), and is not statistically significant. The coefficient on the Oregon unemployment rate has a very high standard error, and is therefore not statistically significantly different from zero. The time trend coefficient is negative (implying that usage per customer has been declining over time, all else equal), but is not statistically significant.

[19] In regression analysis, the statistical significance of estimated coefficients is evaluated as follows: the null hypothesis is that the estimated coefficient is equal to zero. This hypothesis is tested using the *t*-statistic, which is calculated by dividing the coefficient by its standard error. Using the *t*-statistic, the number of observations, and the number of variables included in the model, the *p-value* is obtained, which is the probability of observing the outcome if the null hypothesis is true. For example, when evaluating a coefficient, a p-value of 5 percent means that there is only a 5 percent chance that we would observe the estimated coefficient if the true value is equal to zero. Traditionally, a 5 percent p-value threshold is considered highly statistically significant, and a 10 percent p-value threshold is considered to be marginally statistically significant.

In an attempt to disentangle the effects of these variables, we first excluded the time trend variable, the results of which are contained in column 2. When we did this, the standard errors of estimated coefficients for price, the unemployment rate, and HEF adoptions all decreased, indicating an increase in the statistical significance of the estimated coefficients. However, aside from the significant HDD coefficient, only the price coefficient was close to being statistically significantly different from zero. Because of this, we include column 3, which shows the results when only HDD and price were included as independent variables. Notice that the R-squared value did not drop substantially, with over 90% of the variation in residential use per customer explained by only these two variables.

Figure 4-12 illustrates the high explanatory power of these regression equations. The bold line shows actual residential use per customer from 1993 through 2004. The three remaining lines show the values predicted by the regression equations. That is, each point in the figure was calculated by multiplying the estimated coefficients by the actual values for the included variables (*e.g.*, HDD or the price) and adding the estimated constant. Each of the three regression models closely tracks actual use per customer. In particular, notice that including variables beyond HDD and the price does not produce large changes in the predicted values.

Figure 4-12: Actual versus Predicted Residential Use per Customer



4.3.2 Commercial Results

As Table 4-3 shows, the results for the commercial customers resemble those of the residential customers in that the independent variables explained a very high percentage of the variation in use per customer. (R-squared values range from 0.912 to 0.927.) In addition, weather was a statistically significant determinant of use per customer in each of the three estimated models. The estimated coefficient for HDD is interpreted as follows: a one unit increase in annual HDD leads to an increase in commercial therms per customer of about 0.98.

The commercial customer data displayed the same high correlation between the time trend and the non-weather independent variables as the residential customer data. We performed a similar set of regression models in an attempt to determine the drivers of use per customer. (However, there is no commercial class equivalent to HEF adoptions.) Among the non-weather variables in the full specification, shown in column 1 of Table 4-3, only the price coefficient is (marginally) statistically significant (though the coefficient on the unemployment rate and the time trend have the theoretically predicted or expected sign).

When we excluded the time trend variable in column 2, the estimated coefficient for the price variable was highly statistically significant, while the estimated coefficient for the unemployment rate did not improve (in terms of an increase in the ratio of the coefficient to its standard error, which is referred to as the *t-statistic*). Because of this, we included column 3, which shows the results when only HDD and price are included as independent variables. Notice that the R-squared value does not drop substantially, with over 90% of the variation in commercial use per customer explained by only these two variables.

Figure 4-13 parallels Figure 4-12, illustrating the high explanatory power of these regression equations. The bold line shows actual commercial use per customer from 1993 through 2004 and the three remaining lines show the values predicted by the regression equations. Once again each of the three regression models closely tracks actual use per customer, and including variables beyond HDD and the price does not lead to large changes in the predicted values.

4.3.3 Implications of the Results

We draw three major conclusions from this analysis.

1. Weather (HDD) and price were the major drivers of changes in residential and commercial use per customer over the time period of the analysis. Table 4-4 illustrates the magnitudes of these effects. The upper portion of the table shows that residential use per customer (unadjusted for weather, prices, or economic conditions) has dropped from 843 to 673 therms per year between 1993 and 2004. Based on our regression estimates, we attribute 51 percent (or 86 therms) of this change to differences in weather conditions, and 49 percent (or 84 therms) to an increase in the price. According to this simple decomposition, there is virtually no change in use per customer that is not explained by changes in weather and prices.

Figure 4-13: Actual versus Predicted Commercial Use per Customer

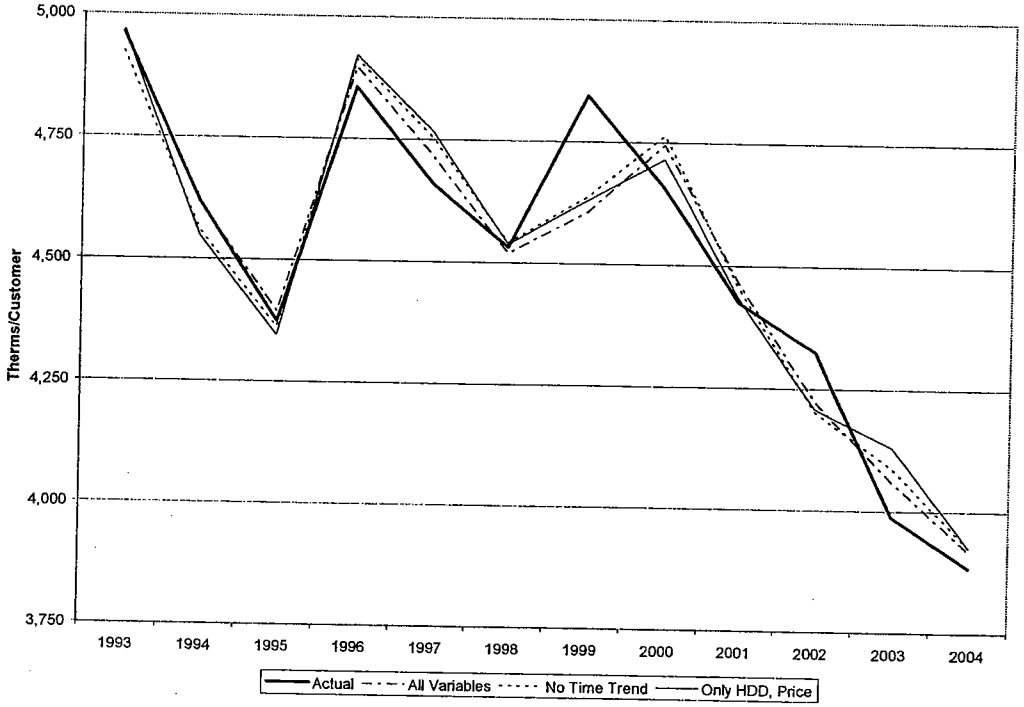


Table 4-4: Breakdown of Change in Use per Customer for Residential and Commercial Classes

Residential	**Use per Customer (therms)**	**HDD**	**Price ($/therm)**
1993 Value	843	3,048	$0.594
2004 Value	673	2,511	$0.969
Change in variable	-170	-537	$0.375
Impact on Use/Cust.	--	-86	-84
% Explained	--	51%	49%
Commercial			
1993	4,963	2,822	$0.524
2004	3,884	2,297	$0.891
Change in variable	-1,079	-525	$0.367
Impact on Use/Cust	--	-514	-526
% Explained	--	48%	49%

The lower portion of the table presents similar results for the commercial class, with differences in weather conditions and an increase in the price explaining a high percentage (97 percent) of the reduction in commercial use per customer.[20] DMN is intended to adjust distribution revenue recovery for non-weather changes in usage per customer (which this analysis indicates consists of price effects and unexplained changes), and WARM adjusts distribution revenue recovery for weather-induced changes in customer usage.

2. Economic conditions, represented by the unemployment rate, did not have a statistically significant effect on residential or commercial use per customer. This is an important result, as it indicates that there is little potential for DMN to shift economic risks from NW Natural to its customers. While the possibility of such a shift exists in theory, the data indicate that the problem is not significant in NW Natural's service territory.

3. The High Efficiency Furnace program did not significantly affect overall average residential use per customer. This result may be explained by NW Natural's estimate that the HEF program produced a 2.4 million therm reduction in total residential usage from 1996 to 2002, which represented only 0.1% of total residential usage over that period. A logical conclusion from this result is that since the HEF program was the most prominent NW Natural conservation initiative during the sample period, NW Natural sponsored conservation was not a major driver of the need for DMN.

4.4 NW Natural Behavior with DMN

The Order approving DMN requires that the independent review address whether DMN affected NW Natural's company culture or operating practices. This will help the Commission to determine whether NW Natural is sincere (and effective) in its efforts to promote conservation. In this section, we address the Commission's requirement by examining NW Natural's marketing efforts, the performance of the residential high-efficiency furnace (HEF) program, a comparison of new connections to existing customers, NW Natural's relevant compensation practices, changes in NW Natural's organizational structure, and third-party views on NW Natural's behavior with DMN. In addition, we interviewed NW Natural employees and third parties (appliance distributors and the NRDC) to provide additional information about changes in NW Natural's culture and business practices.

4.4.1 Marketing Efforts

One way that NW Natural can demonstrate whether it is committed to promoting conservation is through its marketing efforts. We reviewed NW Natural's allocation of marketing resources from 2000 through 2004 in order to evaluate whether a change occurred following the implementation of DMN.

[20] We did not include the other independent variables in this analysis because their estimated coefficients were not statistically significant.

NW Natural allocates its advertising budget to three categories, labeled A, B, and C. They are defined as follows:

Category A: Energy efficiency, conservation, and service information (including rate or account information).
Category B: Safety communication and advertising.
Category C: Promotional advertising and communications to non-customers, or image advertising.

Table 4-5 shows how NW Natural has allocated its Consumer Information budget across these categories from 2000 through 2004. The table shows that resources were shifted away from Category C (promotional and image advertising) and towards Categories A and B beginning in 2001. By 2002, when DMN was approved, the share of Category C had dropped to approximately 20 percent.

Table 4-5: Consumer Information Budget Shares by Category: 2000 through 2004

Year	Category A	Category B	Category C
2000	25%	1%	74%
2001	54%	1%	45%
2002	68%	10%	22%
2003	73%	6%	21%
2004	60%	23%	17%

We also received copies of all marketing materials produced by NW Natural from 2000 through 2004. We reviewed and categorized each print and radio advertisement. Table 4-6 shows the number of advertisements in each category by year. We defined the categories as follows:

- *HEF program*: directly discusses rebates and incentives associated with the residential high-efficiency furnace program;
- *Energy tips*: describes ways that customers can save money by reducing usage;
- *Direct use conservation*: makes the case that direct use of natural gas is an act of conservation;
- *Safety*: warnings about digging or what to do when you smell gas;
- *Load growth*: includes promotions for fireplaces, furnace conversions (primarily from oil), and water heater conversions;
- *Image*: includes general messages (*e.g.*, Black History Month), and messages that provide general support for the use of gas (*e.g.*, clean, efficient, less costly); and
- *Payment options, other regulatory*: includes information about payment options, UNITY, and regulatory notices of changes in rates.

The information provided by this table is limited by the fact that it does not indicate how intensively each item was advertised (*e.g.*, how many times a radio spot was run). However, based only on the number of advertisements, it does appear that NW Natural

shifted away from load growth messages (*e.g.*, converting oil furnaces or installing gas fireplaces) and toward promoting high-efficiency furnaces.

Table 4-6: Number of Print and Radio Advertisements by Category and Year: 2000 to 2004

Category	2000	2001	2002	2003	2004
HEF Program	1	10	10	7	4
Energy tips	0	0	0	0	3
Direct use conservation	1	4	5	7	2
Safety	1	3	4	10	11
Load growth	8	2	3	3	1
Image	3	10	9	5	5
Payment options, other regulatory	0	1	2	1	5

There are at least three potential causes for the shift in marketing resources shown in Tables 4-5 and 4-6. First, in UG-132 the Commission clarified its policy with respect to recovery of advertising expenses. Under these rules, image advertising expenses (Category C) carry no presumption of reasonableness. However, expenses in Categories A and B are presumed to be reasonable up to an allowed amount. It is possible that NW Natural shifted its marketing strategy away from image and promotional advertising and toward conservation advertising simply to ensure recovery of the advertising expenses. (In interviews, NW Natural has denied that this was a significant motivating factor in shifting marketing resources.) This explanation is made less plausible by the fact that Category C expenditures comprised a high percentage of the total in 2000, *after* the UG-132 Order was issued in November 1999.

A second potential explanation for the shift away from Category C advertising is that NW Natural was responding to customers who were upset by rapidly increasing prices. That is, by providing information about energy efficiency, NW Natural may have assisted customers in alleviating bill increases caused by rising prices. This can benefit NW Natural by improving the competitiveness of its product (or the *perception* of the competitiveness of the product, to the extent that not everyone is interested in a high-efficiency furnace).

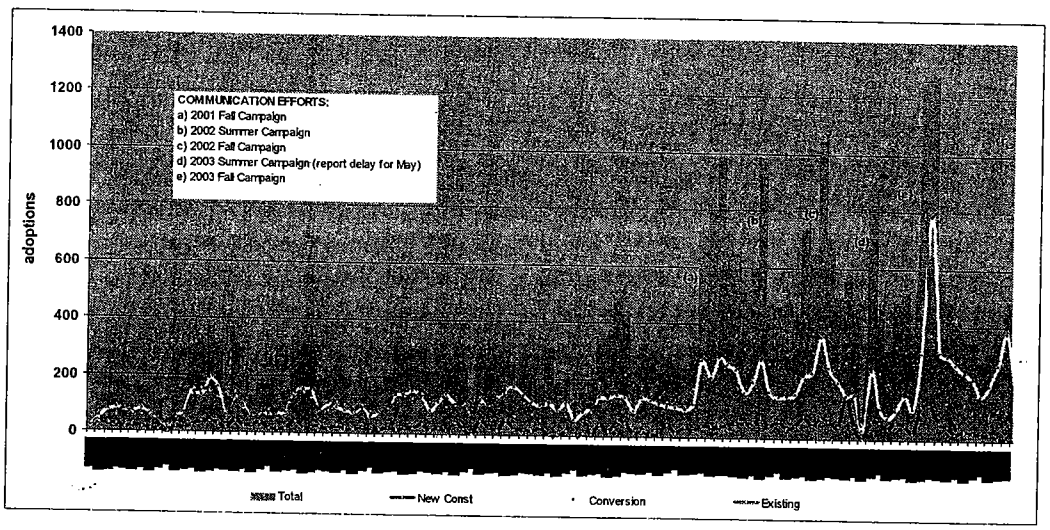
The final potential explanation for the shift away from Category C advertising is that NW Natural responded to the changing incentives provided by DMN. This explanation is made less plausible by the fact that the shift in resources began in 2001 and not in 2002, when DMN was approved by the Commission. However, both CEO Mark Dodson and Kim Heiting, Director of Consumer Information & Internet Services stated in interviews that NW Natural made the decision to behave *as though* they had DMN in 2001. This decision was made in part because it was "the right thing to do" and in part because it helped to address customers' needs in a time of rising prices.

This section demonstrates that NW Natural shifted marketing resources toward promoting conservation beginning in 2001. We do not have enough information to state definitively whether the primary motivation for this shift was a response to a change in the allowed recovery of advertising expenses, a desire to address customer concerns about rising natural gas prices, or a response to a change in incentives provided by DMN.[21]

4.4.2 High-Efficiency Furnace Program Performance

The high-efficiency furnace (HEF) program, which began in 1995, provides residential customers with incentives to adopt high-efficiency furnaces. Prior to DMN, NW Natural was compensated for HEF adoptions through a lost revenue adjustment (called the "Cost Resource Adjustment," in which NW Natural was compensated for lost margins on a case-by-case basis using estimated therm savings). NW Natural changed its approach for managing and promoting this program in October 2001, when it began coordinating more closely with HVAC distributors and packaged rate-funded rebates, distributor-funded rebates, and the Oregon Residential Energy Tax Credit. This approach dramatically increased HEF adoption rates. On October 1, 2003, the administration of the Public Purposes funded rebate program was transferred to the Energy Trust of Oregon. Figure 4-14 below shows monthly HEF adoptions from 1995 through 2004.

Figure 4-14: Monthly HEF Adoptions: 1995 through 2004



[21] Note that NW Natural does not differentiate its marketing in Oregon from its marketing in Washington (except with respect to specific incentives that are only offered in one state), despite the fact that NW Natural has DMN in Oregon, but no equivalent rate mechanism in Washington. In interviews with us, NW Natural stated that the reason for this is that Washington customers represent a small share of NW Natural's total customer base, so it would be more costly to tailor a marketing message to them than it is to endure lost margins from any conservation that is spurred by marketing that is intended for Oregon customers.

Figure 4-14 shows that HEF adoptions increased noticeably when NW Natural modified its approach in October 2001, and that HEF adoptions spike following targeted promotions.

Information from distributors reinforces this evidence of the success of the HEF program. We spoke with Mike Dawson, Northern Regional Manager at Gensco and Glen Bellshaw, Director of Marketing at Airefco. Mr. Dawson provided confidential data comparing the percentage increase in sales of high-efficiency furnaces between 2000 and 2001 (when NW Natural modified the HEF program) in Oregon to Seattle/Tacoma, Eastern Washington, and Montana/Idaho. The percentage increase in HEF sales in Oregon was more than twice the average increase across the other three regions. Mr. Dawson also indicated that according to tracking data from Trane (the primary manufacturer of high-efficiency furnaces sold by Gensco), Oregon has the highest share of HEF sales (as a percentage of total furnace sales) in the nation by a substantial margin. Mr. Dawson attributes this directly to NW Natural's efforts to promote the HEF program.

Mr. Bellshaw provided confidential data comparing the share of high-efficiency furnace sales as a percentage of total furnace sales in Washington and Oregon during 2003 and 2004. His data show that Oregon's share of high-efficiency furnaces is 3.75 times higher than the share in Washington. (The exact percentages by state are confidential.) Mr. Bellshaw attributes this difference to NW Natural's and the Energy Trust's efforts to promote the HEF program. In theory, this comparison could be tainted by the fact that Oregon offers a tax credit for high-efficiency furnaces, while Washington does not. However, Mr. Bellshaw reports that the HEF adoption rates in Cascade Natural and Avista service territories are much closer to the reported Washington share than the Oregon share (which is dominated by NW Natural results). Given this, he concludes that, by itself, the state-level tax credit does not explain the difference in HEF adoption rates between Washington and Oregon.

The increased success of the HEF program began in 2001, prior to the approval of DMN. NW Natural claims that they made a corporate decision to behave as though DMN was in place in 2001, in part because they were looking for ways to help customers who were facing increasing rates. In addition, we note that they were covered by a lost revenue adjustment, which would compensate them for improved program performance (except to the extent that the increased attention given to energy efficiency may have produced more general conservation efforts on the part of consumers).

Finally, we point out that despite the dramatic increase in HEF adoptions, the HEF program has had a modest effect on total residential therms consumed. According to NW Natural estimates, the cumulative HEF adoptions from 1996 through 2004 accounted for approximately a 1% reduction in 2004 residential consumption. The largest single-year effect occurred in 2002, in which 2002 HEF adoptions reduced that year's residential consumption by approximately 0.2%.

4.4.3 Comparison of New Connections to Existing Customers -

In approving DMN, the Commission forbade NW Natural from "gaming" the mechanism with respect to new connections. In theory NW Natural could derive short-term gains from DMN by connecting customers whose expected usage is below the baseline use per customer level. This is because NW Natural would receive revenues as though the customer used the baseline levels.

NW Natural provided data that compares existing customers to new connections in 2004, shown in Table 4-7 below. The data are an update of results presented on page AA-3 of NW Natural's 2004 Integrated Resource Plan, and they represent weather normalized annual use per customer for Portland customers.

Table 4-7: Comparison of Existing Customers to New Connections in 2003 (weather normalized annual therms per customer)

Category	Residential		Commercial	
	Annual Use	Share of Customers	Annual Use	Share of Customers
Existing Customers	749	97.9%	4,521	99.0%
New Construction	737	1.5%	7,276	0.6%
Conversions	582	0.6%	3,152	0.5%

The residential results indicate that new connections tend to have lower consumption rates than existing customers. These results should be interpreted with some caution, as factors such as changes in building materials, building codes, and appliance efficiency levels could contribute to the observed differences between existing and new connections customers. The evidence for commercial customers is mixed, with new construction usage rates far exceeding the usage rates of existing customers, but conversion usage rates well below usage rates of existing customers. The large differences in use per customer across the commercial categories is likely due to small sample sizes in the new construction and conversions categories combined with the fact that commercial use per customer can vary considerably depending upon the size of the establishment and nature of the business. (That is, when a small sample is taken from a population with high variance, the mean of the sample is not a very reliable indicator of the population mean.)

In addition to receiving the data shown in Table 4-7, we reviewed the methods that NW Natural uses to assess new connections customers and apply its main extension policy. These methods forecast usage for potential customers based on home characteristics and expected appliance conversions. Using this forecast, the expected profitability of the customers is determined using the standard tariff rates. The revenue effects of DMN are not considered in this calculation.

The data presented in this section present the possibility that NW Natural has discriminated in its new connections in the residential class. However, based on our review of NW Natural's methods for assessing new customer connections, and given the number of other factors that could be affecting the results shown in Table 4-7, it appears

to be unlikely that NW Natural has been gaming the DMN mechanism with respect to new connections.

4.4.4 Cultural and Organizational Effects

We have already discussed how DMN reduces NW Natural's disincentive to promote energy efficiency. This section addresses whether this incentive change affected NW Natural's compensation practices, organization (*i.e.*, staffing changes), public stance with regards to energy efficiency, or non-regulated business activities.

4.4.4.1 Compensation Practices

This section explores the extent to which NW Natural's compensation practices reveal whether NW Natural is committed to achieving the intended goals of DMN (*i.e.*, shifting away from promoting load growth and toward promoting conservation and energy efficiency, while providing high quality customer service).

Regarding customer service, employees at all levels of NW Natural are eligible for bonuses that are awarded based on several criteria. All employees receive the same percentage bonus. Among the criteria used to determine the level of the bonus is a measure of customer satisfaction.[22] In addition, each member of the management team in Utility Services has individual performance goals and measures related to customer satisfaction. This team includes Kim Heiting (Director of Communication Services), Tamy Linver (General Manager of Consumer Services), Susan Dodge (General Manager of Customer Field Services), Barry Stewart (Manager of Customer Account Services), and Chuck Muehleck (Manager of Customer Billing Services).

NW Natural also has individual employee incentives that are more directly related to DMN. In 2003 and 2004, these incentives were associated with developing and maintaining a relationship with the Energy Trust of Oregon. Employees that were affected by these incentives included Grant Yoshihara (who has overall responsibility of NW Natural's relationship with the Energy Trust), Kim Heiting (who is responsible for integrating Energy Trust messaging with NW Natural's information delivery), and Steve Bicker (who is responsible for contract negotiations and development of policies with the Energy Trust).

Because of an evolution of NW Natural's relationship with the Energy Trust that focused more on "tactical execution," the individual incentives changed somewhat in 2005. Several additional employees were given goals/measures that related to the Energy Trust, including Tamy Linver (who became responsible for the overall Energy Trust working relationship), Tim Abshire (Manager of Program Development), and three program managers responsible for working directly with Energy Trust staff to develop all of NW Natural's residential and commercial programs.

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[22] There is some dispute regarding the effectiveness of group incentives such as this. That is, the incentive for any one person to improve performance is diminished by the fact that the rewards generated from the increase in effort must be shared with everyone, even those who did not exert effort to improve performance).

The goal measurements associated with the incentives described above include a mix of quantitative and qualitative assessments. As an example, NW Natural tracks quantitative measures such as referrals to the Energy Trust, High-Efficiency Furnace adoptions, responses to a specific customer satisfaction survey question on "providing programs and incentives for high efficiency equipment," the number of programs, and the effectiveness of programs. The mix of these measures used for a specific employee depends on the employee's role. Employees with primarily management roles have more qualitative goals associated with building the relationship with the Energy Trust. Measurement of this is typically based on more anecdotal evidence (*i.e.*, receiving positive comments from Energy Trust leadership or Commission Staff).

An additional compensation policy that appears to have been affected by DMN is ending the use of commissions for Consumer Services conversion representatives, which had been used from the mid-nineties into 2004. Grant Yoshihara, NW Natural's Director of Utility Services, had the following comments on this policy:

> When we realized that the commission structure would potentially present the wrong incentives (promote added load), we began evaluating different options. We did not find anything in the traditional incentive pay category that seemed to work, so we moved toward using the performance goals and measures approach that applies to all of our other non-bargaining employees. In order to make this transition, we also needed to complete another major activity - consolidation of the residential and commercial call centers - that impacted the allocation of work between the call center staff and the conversion representatives. We completed this consolidation in the fall of 2004. Given the fact that the incentive compensation system for the conversion representatives had monthly targets and incentives for the calendar year, we decided to wait until the completion of the calendar year before changing the compensation structure for the conversion representatives.

The existence of the compensation practices described in this section indicates that NW Natural has made some efforts to create and maintain a successful relationship with the Energy Trust, and that it recognizes that DMN reduces the incentive to promote load growth.

4.4.4.2 Organizational Changes

In order to learn about how NW Natural's organization may have changed following the implementation of DMN, we submitted the following request to NW Natural: *"Please describe any organizational changes that took place after DMN was in place. These include position additions and subtractions; department expansions, contractions, or reassignments (in terms of reporting structure)."* We received the following response.

> Organizational restructuring and reassignment of work in sales and service functions began in 2002, just prior to the implementation of DMN. The primary objective of this realignment has been to better integrate and leverage resources in

the sales, customer assistance, and customer service areas. The utilization of resources in terms of O&M expense has shifted along with staffing adjustments and resolution of accounting allocations as was agreed to in the 2002 rate case settlement.

Significant organizational changes that have occurred between the beginning of 2002 and present include the consolidation of Customer Account Services Call Center capacity into two locations (initiated in 2001), consolidation of Consumer Services Call Center capacity (customer assistance) into one virtual network (initiated in late 2004), and shifting of Energy Efficiency program resources for transitioning services to the Energy Trust and supporting the Oregon Low Income Energy Efficiency Program (OLIEE) and the Oregon Low Income Gas Assistance Program (OLGA). Smaller adjustments include the consolidation of all research activities (customer service and satisfaction, market and benchmarking), and realignment of sale and service functions from three market segments (residential, commercial, and industrial) to two segments (mass market and major accounts).

During the three-year period from the beginning of 2002 to beginning of 2005, staffing generally declined in sales/marketing areas, and increased in customer assistance and customer service areas as the customer base grew by 10 percent. While some of this was due to adjustments in accounting practices that transferred staff and expense from sales/promotions to customer assistance, a total net reduction in sales/promotion and customer assistance of 17 FTEs occurred. Most recently, the overall management of sales and service activities was consolidated into a new division, Utility Services.

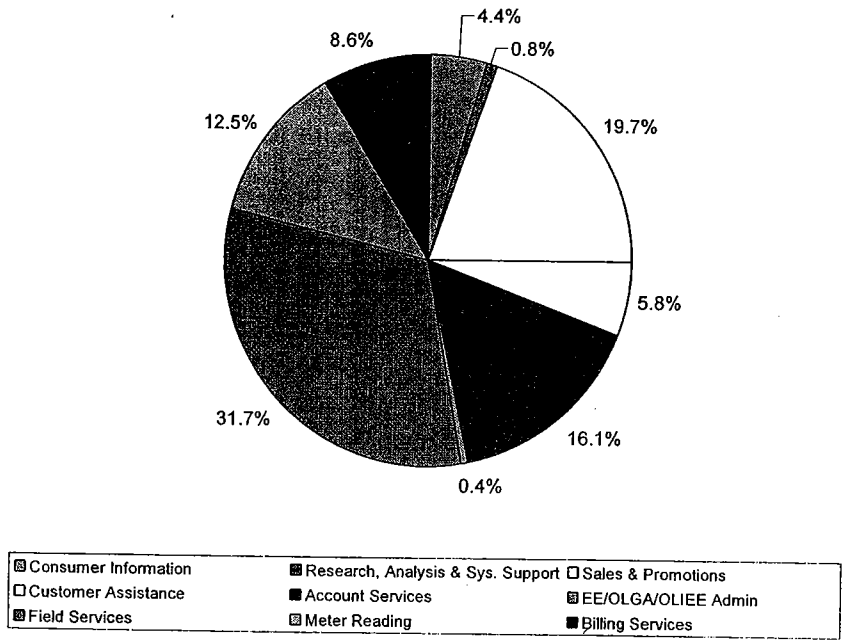
The table shown below identifies the allocation of resources in terms of full time equivalents (FTE's) by functional activity at the beginning of 2002 (actual) and beginning of 2005 (budgeted). A description of the change in staffing is shown for each activity. Also shown below in two charts are the distribution of O&M expense by activity for actual full year 2001 and budget 2005.

Staffing Resource Allocation by Functional Activity
2001 versus 2005

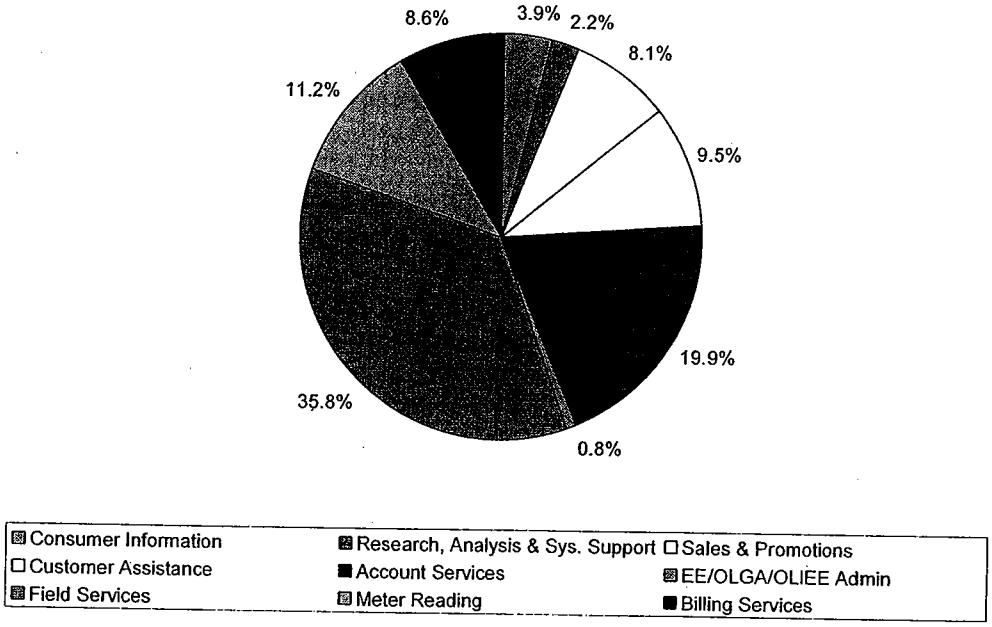
Department or Functional Activity	Description	2002 FTE's	2005 FTE's
Consumer Information & Internet Services	In 2001, staff focus was more concentrated on delivering product benefit and added load communication and advertising designed to help reduce the impact of consumption declines and support conversions. Although the staff level remains consistent, the 2005 work product and funding allocation has moved from a focus on added load and image advertising to a message concentration on energy efficiency, service and safety education.	1.5	1.5
Research, Analysis, & Systems Support	Research efforts were centralized and expanded to include a dedicated customer satisfaction analyst. Additional staffing was added to provide systems support and market analysis.	3.0	6.5
Sales and Promotions	Marketing, sales, and promotions staffing was reduced and reassigned following the 2002 rate case settlement. Accounting adjustments based on time tracking studies submitted as part of the rate case supported some reallocation of expense between sales/promotions and customer assistance. Program development activities for development of existing customer service programs were added in 2004.	67	20.5
Customer Assistance (Acquisition)	Customer assistance staffing (performing functions related to customer acquisition) were consolidated into two market segments for improved efficiency. Portland call centers were consolidated to provide first call resolution service for serving new customers.	18	44
Customer Account Services	Increased staffing is primarily attributable to call center staffing additions to meet increased customer call volumes related to customer growth and higher retail gas prices, consistent with approvals received in the 2002 rate case.	93	113
Energy Efficiency, Oregon Low Income Energy Efficiency, and Oregon Low Income Gas Assistance	Programs added as part of DMN and Public Purpose Funding settlement. Only administrative expenses are shown in the O&M expense distribution charts.	2	3

Department or Functional Activity	Description	2002 FTE's	2005 FTE's
Customer Field Services	Staffing increases to support field service activities has been primarily to handle growth in the customer base. Higher volumes of credit/non-payment customer calls due to higher gas prices has been absorbed through efficiency improvements.	145.5	151
Meter Reading	Despite significant customer growth, a decline in meter reading staffing requirements has resulted from improved route design and adjustments, and improvements in PGE-NWN joint meter reading performance.	74.5	71.5
Customer Billing Services	Staffing increases to support billing activities have been primarily to handle increased bill volume, more complex billing arrangements, and meet Sarbanes Oxley requirements. Mass market and major account billing activities were also consolidated for management and oversight purposes.	13	18.5

2001 Cost Distribution



2005 Cost Distribution



[End of NW Natural's response to CAEC's request. Note that the 2001 and 2005 cost distribution figures are most easily interpreted when viewed in color.]

The most notable changes between 2002 and 2005 are the reduction in full-time employees (FTEs) in sales and promotions, and the increase in FTEs in customer assistance and customer account services. According to Grant Yoshihara, NW Natural's Director of Utility Services, approximately 50% of this shift was an accounting shift based on the results of a time tracking study. (That is, the shift in resources was made to reflect the how time was already being spent by employees.) The remaining 50% of the shift in resources represented a change in focus away from sales and promotions and toward customer service. According to Mr. Yoshihara, this reallocation was part of a larger effort to get sales personnel to coordinate more closely with service personnel.

4.4.4.3 Nexus Home Analyzer

Recently, NW Natural paid approximately $250,000 to install the Nexus Home Analyzer on its website. It allows residential customers to answer a few simple questions about their home (*e.g.*, the number of rooms, the fuel used for space heating, etc.) and then provides information about the sources of energy usage and ways that customers can conserve energy. By raising awareness about how customers use energy, this is an effective tool in promoting general conservation. In the absence of the incentives provided by DMN, NW Natural would not likely have offered this service to its customers.

4.4.4.4 Public Stance on Energy Efficiency

There are several ways in which NW Natural has taken steps to publicly support energy efficiency and conservation. CEO Mark Dodson and others at NW Natural have presented their experiences under DMN, including the benefits of conservation and energy efficiency, at a number of conferences and forums. Mr. Dodson was quoted in a February 2005 *American Gas* article titled "It's Now Easier Being Green: Some natural gas utilities are working to separate their financial health and energy sales" as saying: "We think we have an obligation. Not only a moral obligation to conserve energy, but also a more basic obligation to each customer to try to keep their bills as low as possible." Further reinforcing his public stance in favor of conservation, Mr. Dodson serves as the co-chair of the Governor's Advisory Group on Global Warming in Oregon. The Oregon Department of Energy website lists the objective of this group as follows:

> The purpose of the advisory group is to develop a strategy to reduce Oregon's greenhouse gas emissions both in the short term and over the long term. The strategy will be coordinated with the West Coast Governors' Global Warming Initiative. The Governor requested the strategy by September 2004.
>
> The climate change strategy for Oregon will provide long-term sustainability for the environment, protect public health, consider social equity, create economic opportunity, and expand public awareness. The Advisory Group will make recommendations to Governor Kulongosk.

Based on actions such as these, Ralph Cavanagh of the NRDC called NW Natural the top energy efficiency advocate in the industry. In our interview with him, Mr. Dodson pointed out the difficulty that he would face should DMN be taken away. On the one hand, he has taken a public stance supporting the benefits of conservation. However, in the absence of some form of decoupling, NW Natural shareholders would be harmed by conservation. Mr. Dodson used this example to indicate the harm that can be caused by what he referred to as inconsistent regulation.

4.4.4.5 Non-Regulated Business Activities

According to NW Natural CFO David Anderson, non-regulated activities account for only about 3% of assets, and the risk reductions afforded by DMN and WARM did not affect non-regulated activities. Changes in non-regulated revenues in recent years are primarily related to the proposed (and abandoned) merger with PGE and Mist natural gas storage.

4.4.5 Third Party Views on NW Natural Behavior with DMN

We spoke with four people in order to get a different perspective on NW Natural's actions with DMN:

- Ralph Cavanagh of the Natural Resources Defense Council (NRDC);
- Margie Harris, Executive Director of the Energy Trust of Oregon;
- Mike Dawson, Northern Regional Manager of Gensco;

- Glen Bellshaw, Director of Marketing at Airefco;
- Bob Jenks, Executive Director of the Citizens' Utility Board;

The input that we received from these individuals consistently indicated that NW Natural is sincere in its commitment to promote conservation efforts, specifically in the form of high-efficiency furnaces. Mr. Cavanagh believes that through public presentations by CEO Mark Dodson,[23] NW Natural has demonstrated that it is the leading advocate of energy efficiency in the industry. Mr. Cavanagh reported to us that "I have never seen this level of public enthusiasm by a utility CEO on the conservation benefits of decoupling or the importance of expanded involvement in energy efficiency by natural gas utilities (at NW Natural or anywhere else)."

Ms. Harris described the Energy Trust's current relationship with NW Natural in very positive terms. She acknowledged that there were initial difficulties in forming a working relationship with NW Natural, in particular in the area of data transfers, which produced problems that took about one year to resolve. However, at this point Ms. Harris notes that NW Natural:

- is very responsive to the Energy Trust,
- has increased the number of "touch points" (*i.e.*, individuals that work with the Energy Trust), and
- has regular meetings with the Energy Trust.

In addition, as a customer of NW Natural's she has also noticed an increase in the inclusions of a conservation message in collateral advertising and bill inserts.

There are a couple of areas in which Ms. Harris believes that NW Natural could improve. First, she would like to see NW Natural be consistent in including the Energy Trust in its conservation-based messaging. This would reinforce the partnership that NW Natural and the Energy Trust have formed. Second, she believes that NW Natural could do a better job of diversifying its conservation efforts beyond the residential class. (While NW Natural and the Energy Trust have recently initiated a commercial energy efficiency program, Ms. Harris believes that programs could be expanded to industrial customers as well. However, doing so could present NW Natural with a financial concern, as DMN does not cover industrial customers.)

Section 4.4.2 above contains the information provided by Mr. Dawson and Mr. Bellshaw that indicates that NW Natural's efforts have increased HEF adoptions. Mr. Bellshaw said that NW Natural has changed its attitude about how they do business with contractors, creating a more open process. Mr. Dawson echoed this point, saying that NW Natural is more active in dealing directly with distributors, and that NW Natural has been effective in providing "warm" sales leads to his company.

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[23] Some examples of public presentations are: joint presentations by Mr. Dodson and Mr. Cavanagh to the National Association of Regulatory Utility Commissioners and to a joint workshop of the Washington and Oregon Commissions; and Mr. Dodson's keynote address at Bonneville Power Association's Fall 2004 Regional Energy Efficiency conference.

No one among Mr. Cavanagh, Ms. Harris, Mr. Dawson, and Mr. Bellshaw believed that there were any negative aspects of DMN with respect to its effect on NW Natural's actions, though Mr. Cavanagh commented that DMN could be improved by adopting NW Natural's original proposal for full decoupling, which Mr. Cavanagh believes would be less complex and more effective.

Bob Jenks, the Executive Director of the Citizens' Utility Board of Oregon, believes that DMN has been good for consumers. He provided the caveat that his support for DMN is due to the Public Purposes Funding rather than the incentives provided by DMN. That is, he has seen decoupling implemented in the past (for PGE and PacifiCorp) without a change in corporate commitment to conservation. The funding provided by the Public Purposes charges provides tangible support for energy efficiency programs and bill payment assistance. Aside from that caveat about decoupling, Mr. Jenks believes that NW Natural has been supportive and helpful to the Energy Trust in promoting energy efficiency programs.

Taken together, we believe that the views expressed to us indicate that NW Natural takes its commitment to promoting energy efficiency seriously. Mr. Cavanagh's statements show the extent to which NW Natural has linked its corporate image with energy efficiency through public presentations. Ms. Harris, representing an organization dedicated to promoting energy efficiency, believes that NW Natural has made significant efforts to work with her organization to further its goals. Finally, two representatives from appliance distributors provide a front-line account of the effect that NW Natural's (and, since October 2003, the Energy Trust's) efforts have had on high-efficiency furnace sales.

4.5 Financial Data

The Commission Staff requested that we provide information regarding financial effects of DMN on NW Natural. The Commission agreed with us that it would be difficult to attribute changes in financial outcomes specifically to DMN (given the large number of other factors that can affect stock prices, interest rates, etc.). Therefore, this section primarily contains data for various financial indicators over time (lines of credit, bond ratings, stock prices, etc.), but it does not include any formal analyses that attempt to assign changes in financial indicators to DMN or other potential causal factors.

4.5.1 Lines of Credit

NW Natural secures lines of credit in order to protect itself against variations in cash flow. This section describes how the terms of the lines of credit have changed from October 1998 through September 2004. Table 4-8 shows how the lines of credit have changed each year, including the total dollar amount of the credit lines and the average fees associated with them.

Table 4-8: NW Natural Lines of Credit: October 1998 through September 2004

Date	Total Amount of Credit Lines ($ millions)	Basis Point Fees
10/1998 to 9/1999	$100	8.18
10/1999 to 9/2000	$120	8.38
10/2000 to 9/2001	$120	7.50
10/2001 to 9/2002	$150	8.40
10/2002 to 9/2003	$150	10.63
10/2003 to 9/2004	$150	9.50

Beginning in October 2002, NW Natural began securing half of its credit line for a two-year commitment, and the other half for a one-year commitment. Prior to this date, all of its credit line was secured for one-year. Because two-year lines of credit are more costly, an increase in the basis point fees occurred at this time. According to David Anderson, NW Natural's current CFO, this change in strategy reflects an increase in NW Natural's risk management sophistication, bringing them in line with industry best practices. He reported that the change was not related to DMN.

4.5.2 Bond Ratings and Bond Issuances

There has been only one change in NW Natural's bond rating since 1995, which was an increase in the S&P bond rating from A to A+ in 2004. NW Natural has issued 15 long-term bonds since 1999. Table 4-9 below shows the year the bond was issued, the year the bond is due, and the interest rate paid by the bond.

Table 4-9: NW Natural Bond Issuances: 1999 through 2004

Year Issued	Year of Maturity	Interest Rate
1999	2001	6.62%
1999	2002	6.75%
1999	2019	7.63%
2000	2030	7.74%
2000	2025	7.72%
2000	2030	7.85%
2000	2010	7.45%
2001	2006	6.05%
2001	2011	6.665%
2002	2007	6.31%
2002	2012	7.13%
2003	2032	5.82%
2003	2033	5.66%
2004	2010	4.11%
2004	2023	5.62%

According to CFO David Anderson the presence of DMN and WARM contributed to NW Natural attaining a score of "1" on S&P's business risk profile (in which 1 = best risk profile and 10 = worst risk profile). This rating has two effects. First, it allows NW Natural the flexibility to carry a lower share of equity in its capital structure if it chooses. Second, a favorable business risk profile rating allows NW Natural the flexibility to maintain a lower debt-service coverage ratio if it chooses.

4.5.3 Stock Offerings

Table 4-10 shows the dollar amounts associated with stock offerings and repurchases from 1993 through 2004. These data are taken from NW Natural's annual 10-K filings to the SEC in the "financing activities" section of the consolidated statement of cash flows. Note that we have pooled redeemable preferred stock and redeemable preference stock retired in the "Preferred Stock Retired" column.

Table 4-10: NW Natural Stock Issues and Repurchases: 1993 to 2004 ($000)

Year	Common Stock Issued	Common Stock Repurchased	Preferred Stock Retired
1993	$5,720	$0	$11,177
1994	$5,847	$0	$1,091
1995	$39,569	$0	$1,163
1996	$5,690	$0	$1,091
1997	$6,465	$0	$1,320
1998	$52,384	$0	$930
1999	$5,356	$0	$935
2000	$4,826	$2,441	$814
2001	$5,157	$5,792	$750
2002	$6,872	$0	$25,750
2003	$8,349	$0	$8,428
2004	$48,153	$0	$0

4.5.4 Comparison of NW Natural Stock Prices to an Index of Utilities

All else equal, markets place a higher value on companies that have more stable profits. DMN has this effect in theory, as it reduces the variability of fixed cost recovery. Presumably because of this, the Commission expressed an interest in comparing NW Natural's stock price to an index based on a representative sample of utilities. The sample used here corresponds to the sample that was used to determine return on equity (ROE) in NW Natural's last rate case (UG-152). It consists of the following utilities (the stock ticker symbol is in parentheses):

1. AGL Resources (ATG)
2. Atmos Energy (ATO)
3. Cascade Natural Gas (CGC)
4. Energen (EGN)

5. Laclede Gas (LG)
6. Nicor (GAS)
7. NW Natural Gas (NWN)
8. Peoples Energy (PGL)
9. Piedmont Natural Gas (PNY)
10. SEMCO Energy (SEN)
11. Southwest Gas (SWX)
12. WGL Holdings (WGL)

Data were collected from Yahoo! Finance, which publishes historical monthly stock prices adjusted for dividends and splits. The stock price index was calculated as the average (unweighted) stock prices of the utilities in the sample (excluding NW Natural). Figure 4-15 shows the adjusted monthly stock prices for NW Natural and the index of utilities from January 1993 through January 2005. The two series track one another quite closely, which is surprising given that the stock prices of the utilities comprising the index vary substantially. Figure 4-16 shows the adjusted stock prices for all twelve utilities, with NW Natural's data in bold. (This figure must be viewed in color to be able to identify the individual utilities. The figure's legend identifies the data using each company's stock ticker symbol.)

Figure 4-15 shows that NW Natural's stock price increased relative to the index around the time that DMN was approved (in August 2002). Shortly thereafter, NW Natural's stock price reverted to a level closer to the index. During 2003 and early 2004, NW Natural's stock price once again increased relative to the index. This gain was largely maintained through January 2005.

These figures simply show the stock prices for NW Natural and a set of comparable utilities. A number of factors could have affected stock prices over this time period, and because of this we do not claim to provide explanations for changes in the stock prices over time. However, it does appear that NW Natural's stock price increased relative to the index around the times that DMN and WARM were approved.

Figure 4-15: Monthly Stock Prices for NW Natural and an Index of Utilities

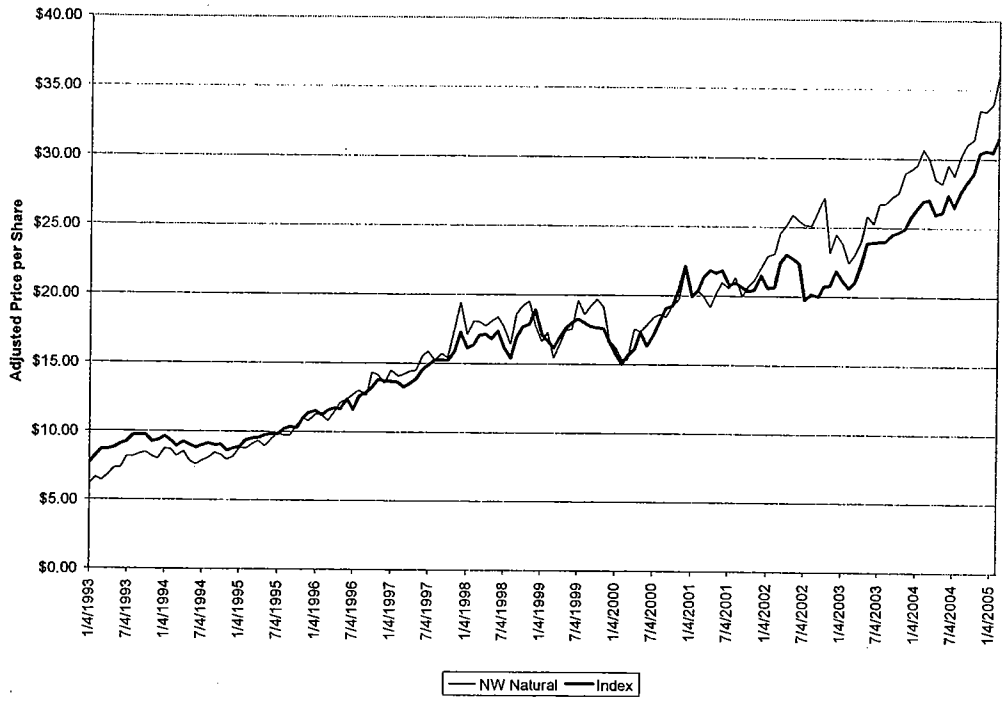
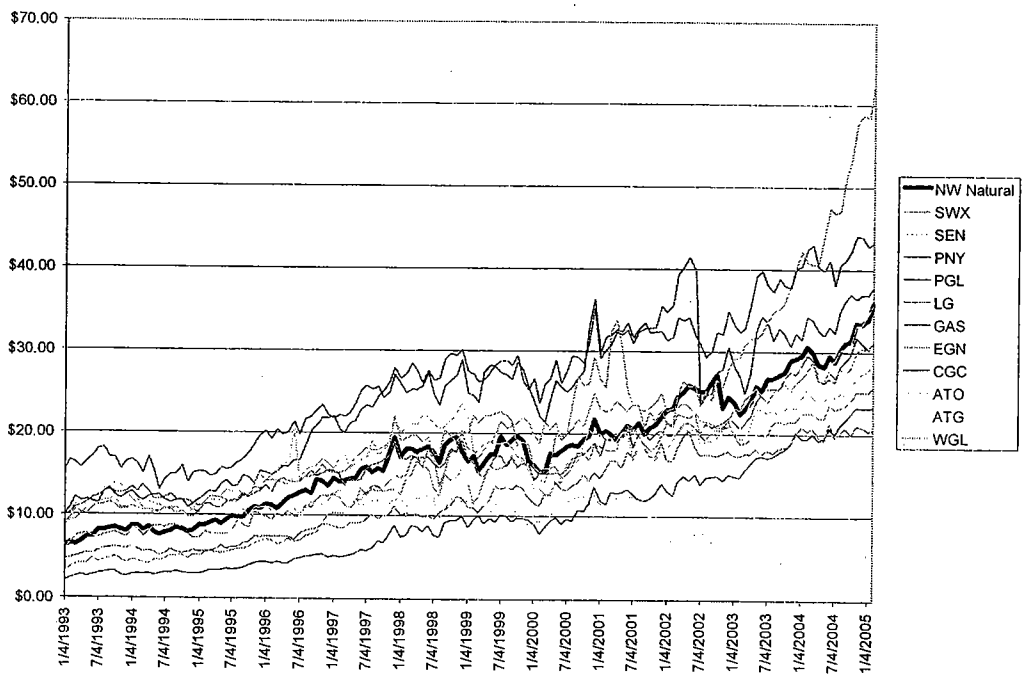


Figure 4-16: Monthly Stock Prices for Twelve Natural Gas Utilities



4.5.5 Reports to Rating Agencies

Commission Staff suggested that we examine NW Natural's reports to rating agencies to see how NW Natural portrays the benefits of DMN and WARM. These reports tend to contain the following elements:

- Tables of financial data;
- Bullet points containing financial highlights (not present prior to 2001); and
- The SEC 10-K annual filing.

To get an idea of how these reports treat DMN and WARM, it is useful to compare the financial highlights from 2003 to those of 2001. The following bulleted text is reproduced from NW Natural reports to rating agencies.

2003 Financial Highlights

- Earnings of $1.76 a share, vs. $1.62 a share in 2002
  - Oregon general rate case contributed $0.09 a share in additional revenues
  - Earnings of $0.17 a share from Gas Storage, vs. $0.14 in 2002
  - Earnings of $0.08 a share from Oregon decoupling mechanism, $0.05 a share from WARM, vs. $0.04 a share from decoupling in 2002
  - Earnings of $0.12 a share from gas commodity savings and off-system sales, vs. $0.28 in 2002
  - Electric generation market contributed no earnings in 2003, vs. $0.11 a share in 2002
  - Higher earnings for pension, health benefits and insurance reduced earnings in 2003 by $0.12 a share
  - Results in 2002 included charges equivalent to $0.33 a share for PGE transaction costs written off
- Cash from operations (before working capital changes) of $102 million, vs. $121 million in 2002
- Utility investments of $125 million, vs. $80 million in 2002
- Net increase in long-term debt of $35 million, vs. $49.5 million in 2002
- Net decrease in preferred and preference stock of $8 million, vs. decrease of $26 million in 2002

2001 Financial Highlights

- Diluted EPS from continuing operations of $1.88 a share compared to $1.79 in 2000
- Weather 3 percent colder than average, but 2 percent warmer than 2000; depressed consumption per degree day reduced earnings by $0.26 a share
- Margin revenues up 5 percent despite depressed consumption patterns
- Storage services added $0.08 a share to earnings
- Electric generation provided $0.11 a share
- Gas commodity savings provided $0.11 a share

These financial highlights show that the presence of DMN and WARM is included, along with their effects in terms of earnings per share. However, DMN and WARM do not appear to receive an unusual amount of attention in the reports. For example, in the 2003 Financial Highlights, the Oregon rate case is listed before DMN or WARM, and its effects on earnings per share are higher.

4.6 Service Quality Issues

4.6.1 Data on Frequency and Nature of Complaints

NW Natural did not report any customer complaints directed specifically at the DMN mechanism. This is likely because rate adjustments caused by DMN are not separately listed on customer's bills. NW Natural reported that there were some complaints generated by the Public Purposes Funding, but they did not provide details.

The Commission provided the "verbatim" complaints (text of letters, e-mails, or transcriptions of telephone calls) associated with UG-143. Twenty-six such complaints were lodged with the Commission between September 2002 and January 2003. The nature of the complaints was uniform, with customers questioning the appropriateness and/or legality of imposing Public Purposes Funding charges on their bills. The complaints were based on the customer's belief that the Public Purposes Funding is taxation without representation, a socialist/communist redistribution of income, and/or forced charitable giving. None of the complaints specifically mention rate adjustments due to the DMN mechanism. (Again, we would not expect them to, as the adjustments are not separately listed on bills.) These negative comments are counter-balanced by the positive comments that we received regarding the value of the funding from the Citizens' Utility Board and community action and planning (CAP) agencies, which indicated the high value of OLIEE and OLGA funding generated by the Public Purposes charges to their organizations.[24] We do not attempt to evaluate the relative importance of the twenty-six complaints (which Deborah Garcia of Commission Staff regards as a significant number of complaints relative to the number of complaints received on other issues) and the benefits derived by the recipients of OLGA and OLIEE funds.

4.6.2 Frequency and Duration of Outages

The Commission Staff raised the possibility that DMN could reduce NW Natural's incentive to address customer outages. That is, if a customer service outage occurs, the DMN deferral mechanism will compensate NW Natural for any lost margins due to a reduction in sales. We requested that NW Natural provide information on the frequency and duration of outages before and after DMN. We received the following response:

> The requested information is unavailable. It is exceptionally rare for NW Natural to experience service interruptions to its customers. In the

[24] The CAP agency representatives that indicated the high value of the Public Purposes funding were: Judy Schilling, Energy & Emergency Assistance Coordinator for Washington County; Karrie Durie of the Community Action Team; Jacque Meier, Weatherization Manager for Clackamas County; Terry Weygandt of the Community Services Consortium; Margaret Davis of the Mid Columbia Community Action Council; and Joan Ellen Jones, Weatherization Manager for Washington County.

highly unlikely event of a service outage, NW Natural has an Incident Command System (ICS) in place to provide a coordinated response ensuring public safety and restoration of service at the earliest possible moment. In almost every circumstance, NW Natural is able to restore service the same day, if not sooner.

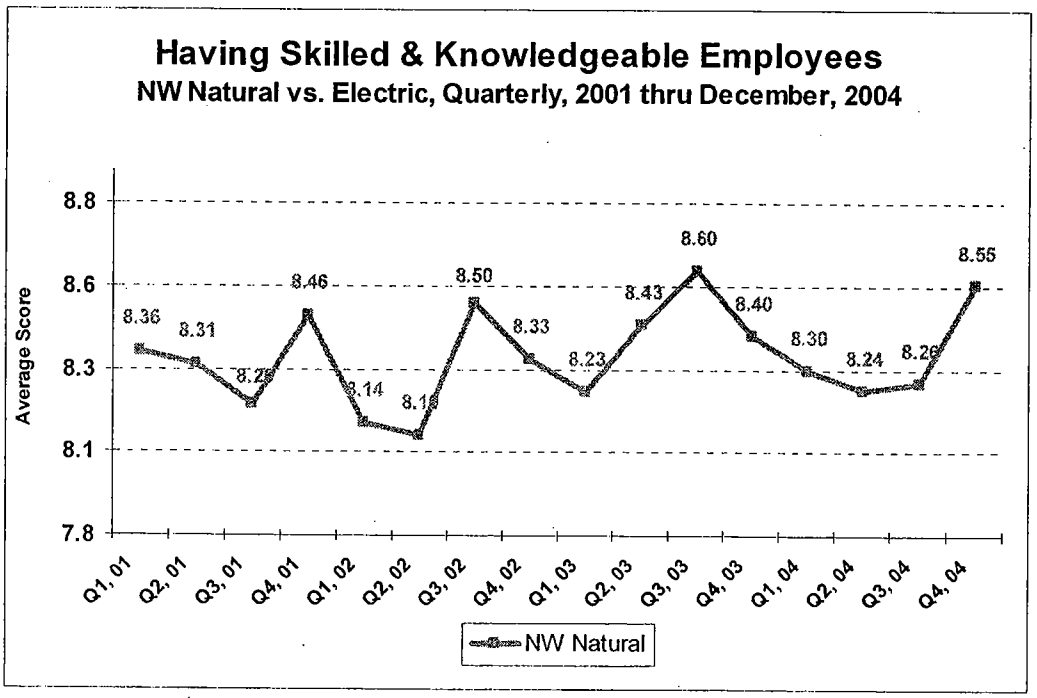
While we do not have direct data to verify the fact that service interruptions have not changed with the introduction of DMN, the customer service ratings data described in the next section indicates that it is unlikely that a problem has arisen in this area. In addition, it is intuitively implausible to us that the small financial incentive associated with delaying repair of an outage would outweigh the customer service costs and the risk of litigation from allowing unsafe circumstances to persist.

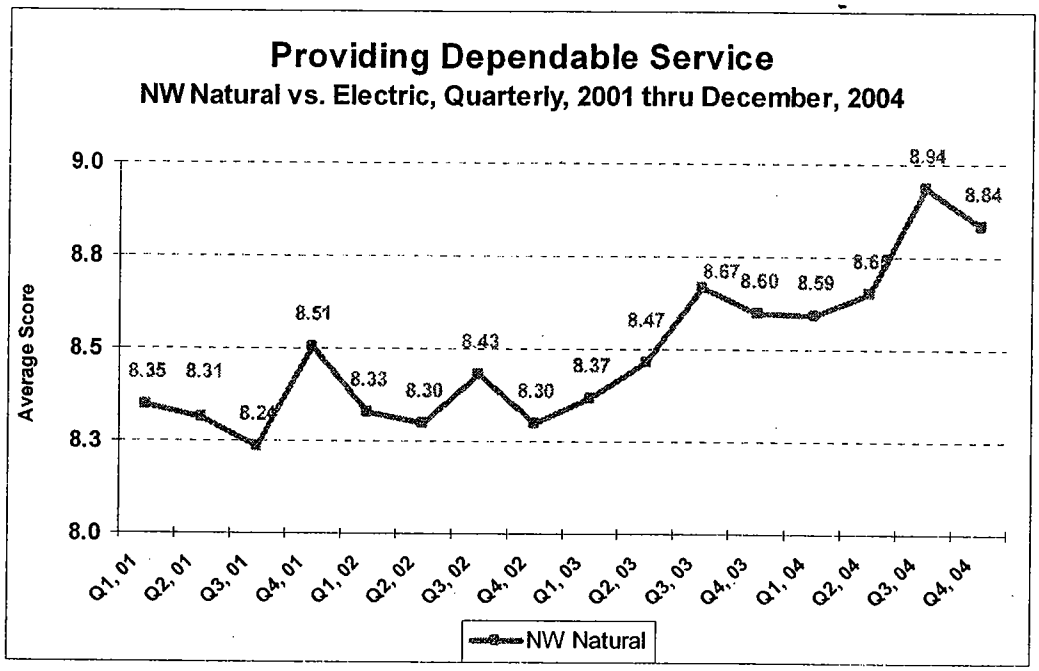
4.6.3 Customer Service Ratings

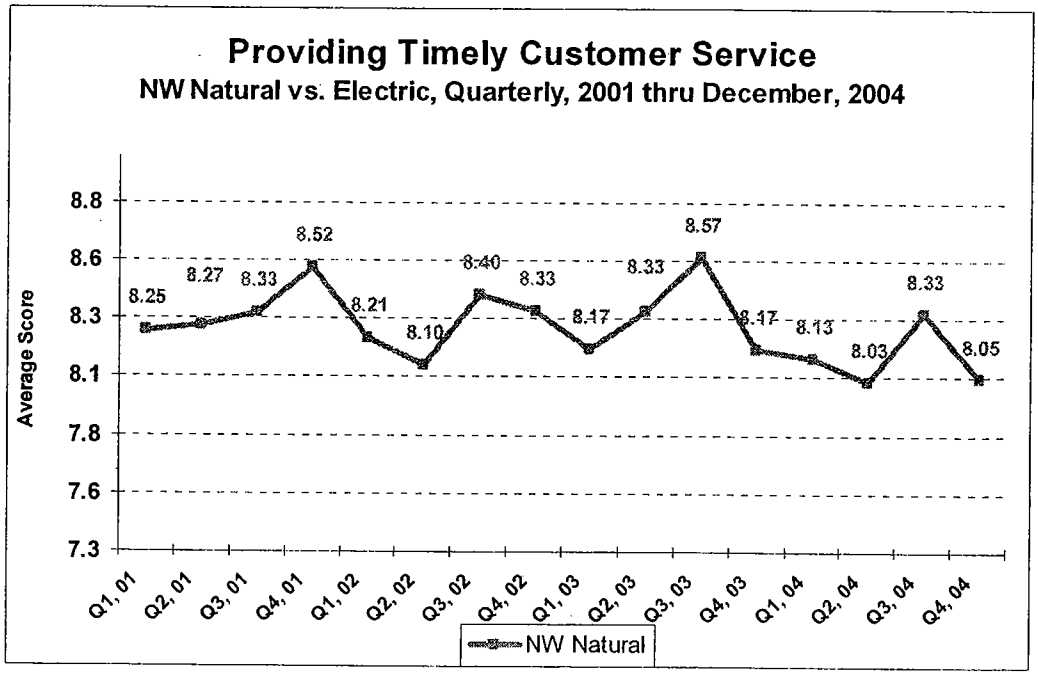
NW Natural conducts a monthly survey of customer satisfaction, with the sample consisting of customers that have contacted the company. Customers are asked to rate NW Natural in three areas on a scale from one (poor) through ten (excellent). The questions are as follows: *How well does your gas utility perform on...*

1. *Having skilled and knowledgeable employees.*
2. *Providing dependable service.*
3. *Providing timely customer service.*

The three figures below show NW Natural's ratings for each of these areas from 2001 through 2004.




Providing Dependable Service
NW Natural vs. Electric, Quarterly, 2001 thru December, 2004
Average Score
9.0
8.8
8.5
8.3
8.0
8.35
8.31
8.24
8.51
8.33
8.30
8.43
8.30
8.37
8.47
8.67
8.60
8.59
8.66
8.94
8.84
Q1, 01
Q2, 01
Q3, 01
Q4, 01
Q1, 02
Q2, 02
Q3, 02
Q4, 02
Q1, 03
Q2, 03
Q3, 03
Q4, 03
Q1, 04
Q2, 04
Q3, 04
Q4, 04
NW Natural


Providing Timely Customer Service
NW Natural vs. Electric, Quarterly, 2001 thru December, 2004
Average Score
8.8
8.6
8.3
8.1
7.8
7.6
7.3
8.25
8.27
8.33
8.52
8.21
8.10
8.40
8.33
8.17
8.33
8.57
8.17
8.13
8.03
8.33
8.05
Q1, 01
Q2, 01
Q3, 01
Q4, 01
Q1, 02
Q2, 02
Q3, 02
Q4, 02
Q1, 03
Q2, 03
Q3, 03
Q4, 03
Q1, 04
Q2, 04
Q3, 04
Q4, 04
NW Natural

Since 2001, the "skilled employee" and "dependable service" ratings have increased, while the "timely service" rating has declined. However, note that the scale used in these figures is somewhat "tight," so that only the increases in the "dependable service" rating seems to represent a significant change since DMN went into effect in the fourth quarter of 2002.

NW Natural has recently subscribed to the J.D. Power and Associates Customer Satisfaction Survey. This information is confidential, and therefore we will only describe the qualitative results for NW Natural with respect to responses to two questions and two indexes, which are compiled across a number of questions. The questions for which we describe the results are as follows.

1. *How would you rate the ability of your natural gas utility to help you reduce your monthly bill? Scale is from one (unacceptable) to ten (outstanding).*
2. *How familiar are you with education or rebate programs from your local natural gas utility to help you with ways to use less gas? Scale is from one (not at all familiar) to ten (very familiar).*

Regarding the first question, NW Natural was ranked 26th out of 55 companies in 2003. In 2004, this ranking improved to 14th out of 55 companies. For the second question, NW Natural ranked 6th out of 55 companies in both 2003 and 2004.

J.D. Power and Associates produces two indexes of interest: an Overall Customer Satisfaction Index and a Customer Service Index.

The Overall Customer Satisfaction Index includes the following factors:

- Price and value
- Company image
- Field service
- Customer service
- Billing and payment

Using this index, NW Natural was ranked 10th out of 55 in 2003 and 9th out of 55 in 2004.

The Customer Service Index includes the following factors:

- Courteous and friendly employees
- Answering questions first time final
- Length of time to answer questions/resolve problem
- Promptness in speaking to CSR
- Employees having sufficient knowledge

Using this index, NW Natural was ranked 4th out of 55 in 2003 and 5th out of 55 in 2004.

The information presented in this section indicates that NW Natural has not allowed its level of customer service to decline since DMN was implemented. According to both internal and national surveys, it appears that the level of customer service provided by NW Natural is very good overall.

4.6.4 Call Center Performance Data

In order to provide another measure of customer service quality, we obtained data on NW Natural call center volumes and average speed of answer (ASA, or the number of seconds that it takes for a caller to receive service) from 1994 through 2004. Figure 4-17 below displays this information.

Figure 4-17: Annual Call Center Volumes and Average Speed of Answer in Seconds: 1994 through 2004

This figure shows that ASA tends to follow call volumes. That is, as call volumes increase (in part because of price increases), it takes longer for a caller to speak to a customer service representative. The decrease that occurs in 2003 and 2004 is likely due to the fact that the Commission approved an increase in the number of NW Natural customer service personnel. We do not see a reason to directly attribute this change to DMN. Overall, we interpret this figure as showing that DMN did not negatively affect call center performance.

4.7 Uncollectible Accounts

As noted in Section 2 above, we do not believe that DMN affects NW Natural's incentives to pursue uncollectible accounts. That is, the DMN deferrals are calculated

using (weather-adjusted) sendout volumes, the actual number of customers, and a pre-established margin per therm. Revenues that are not collected from customers do not flow back into the DMN deferrals.

Nevertheless, the Commission Staff expressed a desire to see data regarding uncollectible revenues before and after DMN was approved. Tables 4-11 and 4-12 contain NW Natural's annual uncollectible accruals and write-offs, respectively. Uncollectible revenues tend to increase as rates increase. The best example of this is seen in the change in residential uncollectible revenues between 2000 and 2001, in which a 20 percent increase in prices led to a 32 percent increase in uncollectible revenues. The effect of higher prices seems to stabilize, however, as uncollectible revenues decreased in 2002 and 2003 despite the presence of slightly higher prices than in 2001.

Table 4-11 provides evidence that DMN does not affect NW Natural's incentives to pursue uncollectible accounts, as uncollectible write-offs declined dramatically from 2002 to 2003, a period in which DMN was in effect.

Table 4-11: Annual Uncollectible Accrual by Rate Class

	Residential			Commercial		
Year	Uncollectible Revenue	Percent Change	Avg. Rev.	Uncollectible Revenue	Percent Change	Avg. Rev.
1999	$1,997,062		68.8	$278,718		55.2
2000	$1,873,153	-6.2%	78.7	$428,010	53.6%	63.8
2001	$2,477,666	32.3%	94.2	$377,925	-11.7%	78.5
2002	$2,098,109	-15.3%	99.3	$411,942	9.0%	83.9
2003	$1,381,340	-34.2%	95.6	$297,173	-27.9%	78.0
2004	$2,684,187	94.3%		$396,493	33.4%	

Table 4-12: Annual Uncollectible Net Write-offs by Rate Class

	Residential			Commercial		
Year	Uncollectible Revenue	Percent Change	Avg. Rev.	Uncollectible Revenue	Percent Change	Avg. Rev.
1999	$1,946,308		68.8	$280,529		55.2
2000	$1,509,603	-22.4%	78.7	$433,056	54.4%	63.8
2001	$2,268,892	50.3%	94.2	$389,204	-10.1%	78.5
2002	$2,369,467	4.4%	99.3	$428,877	10.2%	83.9
2003	$1,582,589	-33.2%	95.6	$296,442	-30.9%	78.0
2004	$2,139,123	35.2%		$376,229	26.9%	

4.8 OLGA and OLIEE

As part of Order 02-634 establishing DMN, the Commission approved Public Purposes Funding to support the Oregon Low-Income Energy Efficiency Program (OLIEE), the Oregon Low-Income Gas Assistance Program (OLGA), and enhanced energy efficiency

programs. Section 4.4.2 discusses the performance of the most prominent enhanced energy efficiency program, the residential HEF program. This section discusses OLIEE and OLGA program performance. Note that NW Natural has retained Quantec to conduct an independent review of OLIEE. According to the 2003-2004 OLIEE Annual Report, Quantec's evaluation will address the following questions (among others):

- Do the current program structure, funding and practices provide optimal delivery?
- What are the bottlenecks in the program that impede complete implementation?
- Are there other channels for program delivery?
- Are there "best practices" from other states and programs that can be applied to this program?
- How are the funds expended? Is fund matching creating a bottleneck?

Because this evaluation is already in progress, we do not attempt to provide a complete evaluation of OLIEE. In addition, because the areas of inquiry established in the Commission's Order do not focus on OLIEE and OLGA program performance, we limit our examination of OLIEE and OLGA to the following:

1. To what extent do the CAP agencies value the OLIEE and OLGA funding provided by the Public Purposes charges?
2. What do the CAP agencies report with respect to NW Natural's efforts in administering the OLIEE and OLGA programs?

In order to address these issues, we contacted Jim Abrahamson, Oregon Energy Partnership Coordinator at Community Action Directors of Oregon, who then facilitated contact with the relevant staff members at the CAP agencies. We received feedback from four individuals regarding OLGA: Judy Schilling, Energy & Emergency Assistance Coordinator for Washington County; Karrie Durie of the Community Action Team; Terry Weygandt of the Community Services Consortium; and Margaret Davis of the Mid Columbia Community Action Council (MCCAC). We received feedback from two individuals regarding OLIEE: Jacque Meier, Weatherization Manager for Clackamas County and Joan Ellen Jones, Weatherization Manager for Washington County.

4.8.1 OLGA

The respondents were consistent in reporting the high value that their organizations place on the funding provided by OLGA. Judy Schilling's comments to us provide an example of this:

> As you probably know, the economy in Oregon is very depressed, energy costs are rising, and here in Washington County we have experienced a large growth in population in the past few years. I have been with the energy program for more than 20 years and I have never seen the demand for assistance as high as it is now. In the past, requests for help usually began declining after the coldest winter months. Now, the demand for assistance is high throughout the year. We find that many people end up turning off their gas altogether after the main heating season because they simply cannot afford to keep it on. They usually leave large arrearages

> which need to be paid in order to turn the gas back on in the fall. We often use OLGA for these situations, since our LIEAP funding is usually not available to us until December. We reply upon OLGA heavily in the months of September, October and November, just to get peoples' heat turned back on. If this program did not exist, many people would be completely without heat until December or January. Having OLGA as a year-round program helps in the summer, also, when all the LIEAP funding has been exhausted. Typically, we have no LIEAP dollars after April, so OLGA fills the gap between April/May and December. It is critical.

In addition, Margaret Davis and Karrie Durie reported that OLGA has allowed them to assist approximately 200 households each year.

Regarding their experiences in working with NW Natural, we received mostly positive feedback, along with some suggestions. Karrie Durie reported very positive experiences with NW Natural, noting that NW Natural has been prompt in responding to them, easy to work with (and easier to work with than other utilities), and that NW Natural's reporting requirements are not severe. She singled out Lois Douglass as being "great to work with". Her only recommendation was changing the OLGA calendar to a fiscal year that matches that of the state.

Judy Schilling was less positive regarding her interactions with NW Natural. She does not feel that NW Natural has been effective in communicating with the agencies in the planning and implementation of the program. In particular, she believes that using the state's existing energy assistance database instead of NW Natural's spreadsheets for tracking and reporting would eliminate extra work for the agency. In addition, she would like NW Natural to be more flexible with respect to changes in commitments (apparently no changes are allowed once the initial notification is posted to an account) and she would like to eliminate the $800 cap on the total benefits that a household can receive (including LIEAP funds).

Margaret Davis commented that the staff members that she has worked with at NW Natural have been "quick to respond, helpful, and always patient." She mentioned Lois Douglass, Gail Kamara and Angela Warren as being particularly helpful.

Terry Weygandt had the following comment in response to our question "In what ways has NW Natural been particularly helpful or unhelpful in assisting CAP agencies to maximize the performance of the OLIEE and OLGA programs? How could the relationship between NW Natural and CAP agencies be improved?"

> Since last September, many of the CAP agencies have been requesting a joint meeting with NW Natural to discuss this very topic. Our idea was to discuss what is working and what may not be working as well as we both would like. Unfortunately, we have not been successful in finding a date that would accommodate both NW Natural and the CAP providers. We understand NW Natural does not hold any admin funds from the OLGA

program and their staff is limited to the amount of time they can spend on OLGA issues.

At a minimum, I feel NW Natural and the OLGA providers should hold semi-annual meetings to discuss and facilitate change that would increase the effectiveness of OLGA and improve the relationship between NW Natural and the providing agencies. It is my understanding that the CAP providers are willing to travel to Portland if that would facilitate a meeting date.

Based on the feedback that we received, it appears that CAP agencies place a very high value on OLGA funding, that NW Natural has been helpful to them in many circumstances, but that there is room for improvement in the oversight of this program.

4.8.2 OLIEE

Both Jacque Meier and Joan Ellen Jones commented on the high value of the OLIEE program. Ms. Jones cited an example of the benefits that can come from this program:

The homes we work with are generally older and often under maintained. The heating systems are often, especially in the case of gas heated homes, not working or running in an inefficient, and/or unsafe manner. The families often use space heaters or in some cases cooking appliances to heat their homes. Without this assistance these households would continue to use space heaters, or perhaps install electric baseboard heat. These situations may be complicated by closed accounts and/or arrearages. Weatherization works with the energy assistance program for service reconnection, then completes repairs and in some cases replaces heating systems.

When there is no reported need for heating system service, weatherization requests are processed by a prioritization system based on points given for households with an elderly or disabled member, a child under six, or farm worker status. Though at a gas audit last week, the CO readings for the furnace were at such high levels that the test was immediately aborted and a service technician called. Without our intervention, the family would wonder why they were often sick, had headaches or perhaps worse. Their young pre-school children used the garage, where the furnace is located, as a play area.

Regarding her experience in working with NW Natural, Ms. Jones noted that she has a good working relationship with Ellen Prouty. She also had some suggestions for improving the program, including moving from reimbursement to up-front funding, that NW Natural acknowledge and assist with the safety and repair issues with gas heated homes, and help with the installation of 80% furnaces. Jacque Meier echoed the latter comment, based on the example that an 80% furnace is more efficient than the 70% furnace running at 50% efficiency (and producing carbon monoxide) it would likely

replace. Therefore NW Natural should provide an incentive for the 80% furnace, which is more practical for these customers than a 90% high-efficiency furnace.

As with the OLGA program, the feedback that we received indicates that the CAP agencies place a high value on OLIEE funding and the agencies have had positive interactions with NW Natural staff, but that there are ways that they believe the program could be improved.

5. EVALUATION OF ALTERNATIVE RATE AND REGULATION OPTIONS

The DMN mechanism approved by the Commission is not the only way to address concerns about margin recovery and conservation. Indeed, NW Natural initially proposed a "full" decoupling mechanism that would allow for full fixed-cost recovery regardless of the source of usage changes (*i.e.*, that would not adjust actual usage for weather and would not include a 10% reduction in deferrals), while the Commission Staff has expressed a preference for a combination of price elasticity adjustments to adjust margin recovery for expected usage changes in response to price changes and lost revenue adjustments to compensate NW Natural for the adverse revenue effects associated with promoting energy efficiency. This section provides observations and analyses of some of the alternatives that have been proposed.

5.1 Fixed/Variable Rate Design

It is important to recognize that the original source of the problem of uncertain fixed-cost recovery due to usage variability, and thus the need for some form of decoupling, is the typical design of standard retail gas tariffs. That is, because a large percentage of fixed costs are recovered through volumetric (variable) rates, fixed cost recovery, and thus profits, depend on the level of sales. This design of recovering fixed costs primarily through variable energy prices has a number of implications, including the following:

1. The recovery of fixed costs through a volumetric rate creates weather-induced fixed-cost recovery risk for both the utility and its customers. For example, an unusually cold winter will cause customers to overpay for fixed costs, resulting in the utility over-recovering its fixed costs, while an unusually warm winter will cause the opposite result. This is a risk that can be "swapped" (*i.e.*, reduced or eliminated for both parties) by changing the method of fixed cost recovery.
2. The recovery of fixed costs through volumetric rates creates a disincentive for the utility to promote conservation that will reduce sales below the baseline level agreed upon in the most recent rate case for recovering allowed fixed costs.
3. The high variable price, which exceeds the market cost of natural gas, is appealing to environmentalists, as it provides a greater incentive for customers to engage in conservation efforts. The environmentalists justify this outcome based on the notion that a pure energy price that reflects private market costs does not account for the public externalities associated with energy consumption (*e.g.*, pollution). However, there is no direct link between the actual estimated externality cost associated with natural gas consumption and the fixed-cost margin by which the energy price exceeds the private marginal cost of natural gas. Furthermore, maintaining a retail energy price in excess of market costs invites

competition, such as from other fuel types, other states, or, where allowed, other suppliers.

4. The high variable price potentially offers customers a form of economic insurance. That is, if customers who fall on hard times reduce their usage, then the reduction in their bill will be larger than if the energy price covered only variable costs. That is, they would pay both reduced energy costs and a lower share of fixed costs. The cost of this insurance, however, is that for any increase in usage beyond their normal level, consumers pay for both additional energy and additional fixed costs.

A number of alternative rate structures have been considered that have the potential to alleviate one or more of the effects listed above. For example, a fixed/variable rate design, in which fixed costs are recovered primarily through fixed charges (*e.g.*, monthly customer charges and/or demand charges) and variable costs (*e.g.*, fuel costs) are recovered primarily through volumetric rates, eliminates all but the third concern listed above.[25] That is, with a fixed/variable rate design, fixed cost recovery is not sensitive to weather conditions. Secondly, because a fixed/variable rate design essentially ensures that fixed costs are recovered, the utility's disincentive to promote conservation is reduced or eliminated. Finally, it eliminates the possible economic insurance present in the variable pricing tariff, as customers who reduce their usage in response to declining incomes will receive bill reductions only for the reduction in fuel and other variable costs, but not a reduction in their contribution to fixed costs.

From an economic efficiency standpoint, fixed/variable pricing represents the most appropriate pricing method, as long as rates are set correctly to reflect fixed and variable costs, potentially including the addition of an explicit environmental externality component to the variable price. For this reason, we present this alternative to the current rate structure first, even though it has not been proposed recently by either NW Natural or the Commission. Two prominent objections have been raised that limit the use of fixed/variable pricing in Oregon's natural gas markets. These objections are the following:

1. *Equity concerns*. To the extent that natural gas use is correlated with income, increasing fixed charges relative to volumetric rates will adversely affect low income customers. We note that this concern can be largely alleviated by incorporating a demand charge in the fixed component of the rate, which would produce fixed charges that vary by customer size.
2. *Environmental concerns*. As noted above, reducing the volumetric price decreases customers' incentives to engage in conservation activities. This argument has some basis in theory to the extent that natural gas use imposes costs on the economy or environment that are not included in the price of energy.

[25] There are a number of examples of this form of pricing in both regulated and non-regulated industries, including local telephone service, cable television, health clubs, and some retail merchants such as Sam's Club. It is beyond the scope of this study to assess the industry or firm characteristics that increase the feasibility and/or use of fixed/variable pricing. However, we have considered that non-regulated merchants would likely trade off the benefits of a less variable revenue stream with the costs of restricting walk-in business when considering whether to adopt fixed/variable pricing.

However, this problem can be addressed directly by estimating the magnitude of externality costs and adding that amount to the retail energy price rather than allowing the average fixed cost to serve as the default estimate.

Because of the above concerns, fixed/variable rates have not received widespread support as a means of stabilizing cost recovery or reducing disincentives to promote energy efficiency.

5.2 Full Decoupling

NW Natural's original proposal to the Commission was for a full decoupling mechanism. The total revenue effects of this proposal are quite close to those of DMN and WARM in combination, but the mechanism is mathematically less complex. Equation 4 shows how full decoupling revenue adjustments are calculated.

Equation 4: Margin Adjustment = $M * C * (QPC^B - QPC^A)$

In this equation, M is the dollar per therm margin from the standard tariff; C is the number of customers to which the program applies; QPC^B is baseline use per customer; and QPC^A is actual use per customer. The key differences between this mechanism and the combination of DMN and WARM are as follows:

1. Actual use per customer is not adjusted for weather conditions. This results in an incorporation of a WARM-style adjustment into the decoupling mechanism.
2. Baseline quantities are not adjusted for prices.
3. The 90% factor used to reduce the amount of revenue variation covered by the DMN program is not included.
4. Weather-induced changes in revenue recovery accumulate in a deferral account instead of flowing to bills in the same month (as it works in WARM).
5. Because the DMN and WARM adjustments are combined in full decoupling, there is no need to set the price elasticity or define normal weather. Once the utility and the Commission agree on the allowed margin rate per customer, both parties have the incentive to select the "correct" value of baseline use per customer in order to minimize deferrals.

Because full decoupling is most appropriately compared to the combination of DMN and WARM (and not DMN alone) and we have yet to perform a detailed analysis of WARM outcomes, we must provide a caveat regarding the discussion that follows. That is, some of what we express here is an expectation that may or may not be supported by subsequent WARM data analyses.

Our belief is that full decoupling is easier to comprehend and communicate than the combination of DMN and WARM. This could reduce customer service costs associated with confusion about bills.[26] In addition, full decoupling eliminates disputes over setting

[26] Simplifying the mechanism would not reduce disputes about *whether* the bills should be adjusted, which will be reduced only to the extent that decoupling deferrals may be more difficult to detect than WARM bill adjustments.

parameter values about which reasonable people can disagree: the price elasticity and normal weather (heating degree days).

Full decoupling has a potential disadvantage with respect to the combination of DMN and WARM: under full decoupling, weather-induced revenue adjustments are deferred until the following year, while WARM adjustments affect current bills. To the extent that customers want to reduce the "cash flow" risk associated with weather-induced fluctuations in monthly bills, WARM provides superior benefits (that may be improved through modifications to the program). In fact, full decoupling could increase customers' weather risk. For example, if a mild winter is followed by an unusually cold winter, the surcharges caused by the mild winter could increase customer bills at exactly the wrong time. In short, full decoupling is not as effective as WARM in reducing customer's weather-induced bill risk. However, note that the *total* effect over time on customer bills is largely the same with full decoupling as it would be under the DMN + WARM mechanism, so customer's weather-induced *wealth* risk is nearly identical under the two mechanisms.

We have not yet performed an in-depth analysis of WARM data. Doing so may alter some of the preliminary conclusions presented in this section.

5.3 Elasticity and Lost Revenue Adjustments

In our discussions with them, Commission Staff proposed an alternative to DMN, which is to maintain the price elasticity adjustment, but replace the deferral component with lost revenue adjustments. We consider this proposal in four parts: the effects of removing the deferral component of DMN, the efficacy of lost revenue adjustments, the implications of removing NW Natural from energy efficiency promotions, and the effects associated with the potential elimination of Public Purposes Funding.

5.3.1 Elasticity Adjustment without Deferral Component

As noted earlier, there are two components to DMN. The first component adjusts margins for price changes using an assumed price elasticity value (*e.g.*, -0.172 for residential customers). For example, if the residential price increases by 10%, DMN assumes that residential use per customer will decline by 1.72% (which is derived by multiplying 10% by -0.172). The margin rate is then adjusted (increased in this example) so that the product of baseline use per customer and the margin is left unchanged. We will refer to this as the "elasticity adjustment." The second component of DMN, which we refer to as the "deferral component," provides for surcharges or refunds to customers based on 90% of the total margins associated with the difference between weather-normalized actual usage and price-adjusted baseline usage.

Provided that the assumed elasticity value is correct, the elasticity adjustment compensates NW Natural for lost margins associated with conservation efforts undertaken by customers (or, in the case of declining prices, load growth) outside of formal programs. The deferral component compensates NW Natural for lost margins associated with other non-weather effects, including the effects of NW Natural's and the Energy Trust's energy efficiency programs on use per customer. This component can

also provide for recovery of lost margins caused by the use of an incorrect elasticity value in the calculation of the elasticity adjustment. (Of course, all margin recovery or refunds that occur through the deferral component are subject to a 10% reduction.)

Currently the deferral component serves several purposes:

1. It removes NW Natural's disincentive to promote energy efficiency.
2. It corrects 90% of the errors associated with an inaccurate elasticity adjustment.
3. When combined with WARM, it corrects 90% of the errors associated with the use of an incorrect normal weather measure.

The mechanics associated with the second and third purposes can be found in our overviews of DMN and WARM in Sections 2 and 3, respectively. For purposes of this section, it is sufficient to point out that eliminating the deferral component of DMN could lead an increase in disputes between the Commission and NW Natural over the price elasticity values and measures of normal weather. In short, removing the deferral mechanism increases the parties' incentives to "game" the elasticity adjustment and WARM parameters.

5.3.2 Lost Revenue Adjustments

An alternative to decoupling in general (and DMN in particular) is to compensate the utility for conservation efforts through lost revenue adjustments. For example, lost revenue adjustments as applied to the high-efficiency appliance program would compensate NW Natural for lost margins based on estimated therm reductions for each HEF adoption. This compensation occurs on a case-by-case basis and is not reconciled to actual therm reductions at any point.

There are a number of disadvantages associated with this approach to promoting conservation.[27]

1. It is administratively burdensome, requiring that energy efficient appliance adoptions be verified, and the energy-saving effects of each adoption estimated through costly program evaluations.
2. It addresses only those programs that *can* be verified or are associated with relatively easily counted adoptions. That is, lost revenue adjustments can be applied to high-efficiency furnace programs, but it would be difficult to use this mechanism for a program such as the Energy Trust's Efficient Facility Operations Program, in which a diverse set of actions may be taken to improve energy efficiency.
3. Lost revenue adjustments encourage programs that look good on paper, but do not actually deliver therm reductions.
4. With only lost revenue adjustments, the utility is discouraged from backing more general conservation efforts, such as pleas from the Governor to reduce consumption during an energy crisis, or proposals to improve energy efficiency

[27] Some of the disadvantages listed below are taken from "Breaking the Consumption Habit: Ratemaking for Efficient Resource Decisions" by Sheryl Carter, which appeared in the Electricity Journal in December 2001.

standards embedded in building codes. In addition, to the extent that specific energy efficiency messages (*e.g.*, promoting the HEF program) can spur more general conservation efforts, the utility program is left uncompensated by lost revenue adjustments.

5. Lost revenue adjustments do not protect the utility from margin loss due to independent conservation efforts (*i.e.*, conservation efforts undertaken by customers outside of formal programs with the intent of lower their bill). In times of increasing prices, this can require the utility to file rate cases more frequently, which imposes costs on the regulator and customers (indirectly, to the extent that rate case expenses can be recovered through rates). Conversely, in times of declining prices, lost revenue adjustments do nothing to prevent over-recovery on the part of the utility. (In principle, the elasticity adjustment accounts for this effect. However, its effectiveness is affected by the accuracy of the elasticity parameter, which can be difficult to estimate.)

The principle advantage of lost revenue adjustments relative to decoupling mechanisms is that they limit revenue adjustments to conservation efforts, while decoupling may compensate the utility for consumption declines due to economic or other factors. Our findings in Section 4.3 above, which analyzed the factors that affect residential and commercial use per customer for NW Natural's Oregon customers, indicates that this potential advantage is not relevant in NW Natural's case. That is, we found that the Oregon unemployment rate is not related to use per customer, and that retail prices and heating degree days explain the vast majority of variations in use per customer. Given this, it is unlikely that a significant share of DMN revenue flows can be attributed to customer responses to changing economic conditions.

Taking all of the above into account, our belief is that lost revenue adjustments will not be as effective as decoupling is in changing utility attitudes and actions with respect to promoting energy efficiency and other conservation efforts.

5.3.3 Effects of Removing NW Natural from Energy Efficiency Promotions

Because of the change in NW Natural's incentives that are associated with removing the deferral component, our expectation (shared by Marc Hellman of the Commission Staff in our meeting on January 28, 2005) is that NW Natural would revert to promoting load growth and shift resources away from promoting energy efficiency. The task of promoting energy efficiency would then shift entirely to the Energy Trust of Oregon (assuming that the Public Purposes Funding that supports this activity is maintained, which would likely be a contentious issue).

Based on our interviews with Margie Harris, Executive Director of the Energy Trust, and two distributors of high-efficiency furnaces,[28] removing NW Natural from the promotion of energy efficient appliances would harm program performance. Each of these people indicated that NW Natural's connections with distributors and customers enhance HEF program performance. Ms. Harris commented on replacing DMN with a lost revenue adjustment. Her belief is that DMN allows NW Natural to market energy efficiency

[28] The individuals interviewed were Mike Dawson of Gensco and Glen Bellshaw of Airefco.

more freely and have a more open and comprehensive approach to promoting energy efficiency. If NW Natural were to cease its promotion of energy efficiency, Ms. Harris believes that the Energy Trust would have to work hard to build the connections to vendors and customers that NW Natural currently provides. Given that she sees no disadvantages associated with DMN and has had (overall) a positive experience in partnering with NW Natural in promoting energy efficiency, she supports the continuation of DMN.

The distributors with whom we spoke concurred with Ms. Harris' opinion. From their perspective, DMN has produced uniformly positive outcomes and they would support its renewal.

Some evidence of NW Natural's effectiveness in helping to promote Energy Trust initiatives is provided by Energy Trust call center tracking data. Two types of information are available on a monthly basis beginning in October 2004: the share of referrals for total call center intake by source, and the share of Home Energy Savings Program routings by source. These are presented in Tables 5-1 and 5-2 below.

Table 5-1: Share of Total Call Center Referrals by Source

Source	October 2004	November 2004	December 2004	January 2005
PGE	6	7	7	10
PacifiCorp	5	5	5	5
NW Natural	11	11	14	14
Other	78	77	74	71

Table 5-2: Share of Home Energy Savings Routings by Source

Source	October 2004	November 2004	December 2004	January 2005
PGE	8	10	9	13
PacifiCorp	6	6	7	7
NW Natural	16	16	21	19
Other	70	68	63	61

These tables show that NW Natural, which accounts for a small share of Energy Trust funding relative to PGE and PacifiCorp (about $6 million for NW Natural, versus about $45 million for PGE and PacifiCorp), accounts for a comparatively high percentage of referrals to the Energy Trust call center.

5.3.4 Effects of Eliminating Public Purposes Funding

As a part of its decoupling proposal, NW Natural included provisions for Public Purposes Funding for three purposes: low-income bill payment assistance, low-income weatherization assistance, and enhanced energy efficiency programs.

According to budgeted 2004 figures, the low-income bill payment assistance (OLGA) fund collected about $1.44 million in 2004, the low-income weatherization assistance

(OLIEE) fund collected about $1.35 million in 2004 and the energy efficiency fund collected about $6.75 million ins 2004. In an initial meeting regarding this study, Steve Weiss of the Northwest Energy Coalition asserted that the benefits associated with these funds should be included in the benefits of DMN to the extent that NW Natural will remove their support for Public Purposes Funding if decoupling is eliminated. In addition, Bob Jenks of the Citizens' Utility Board of Oregon supports DMN solely because of the presence of the Public Purposes Funding. Finally, the feedback we received from CAP agencies (presented in Section 4.8) indicates that they place a high value on the OLGA and OLIEE programs.

5.4 Conclusions Regarding Rate Structures

Both full decoupling and the combination of DMN and WARM, in conjunction with recovery of fixed costs through variable energy prices, have the following effects relative to standard rates and regulatory mechanisms:

1. They reduce or eliminate the utility's disincentive to promote energy efficiency.
2. They maintain an added incentive for individual consumers to undertake conservation efforts, through retail prices that exceed market costs of energy.
3. They reduce utilities' variability of fixed-cost recovery.

These two mechanisms are the only alternatives discussed here that have these three characteristics. A fixed/variable rate design would reduce variability in fixed-cost recovery, but does not maintain the high volumetric price. Replacing the deferral mechanism with lost revenue adjustments does not effectively reduce the utility's disincentive to promote energy efficiency (and, importantly, reinstates an incentive to promote load growth relative to decoupling mechanisms).

Given that our research on recent historical changes in prices, economic factors and energy consumption indicates that neither DMN nor full decoupling is likely to cause a shift of economic risk from NW Natural to its customers, we believe that full decoupling or DMN are the approaches that are likely to both:

- Meet the desired goals of allowing NW Natural to promote energy efficiency without harming its shareholders, while stabilizing fixed cost recovery; and
- Alleviate concerns about maintaining incentives to consumers to privately undertake conservation efforts and avoid potentially harmful distributional effects (that could be caused by higher fixed customer charges in a fixed/variable rate design).

A determination of whether full decoupling or a combination of DMN and WARM is a superior approach primarily depends on the effects that the two methods have on individual customer bills when weather deviates from normal conditions. An in-depth analysis of this topic is outside the scope of this report, but will be completed as part of a follow-up review that focuses on the effectiveness of WARM.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Responses to Commission Questions

In Order 02-634 establishing DMN, the Commission required that this independent study address a number of questions. As part of the review process, Commission Staff added several issues to this list. As an initial step in providing conclusions and recommendations, we provide direct answers to those questions.[29] The questions appear in italics, and our responses appear as standard text.

1. *a. Did the mechanics of DMN accurately carry out the intentions of the Specified Parties and the Commission as expressed in this Agreement?* In August and September of 2004, an independent consultant named Gary Hill reviewed and audited the calculations performed for DMN. NW Natural commissioned this review as a precaution against the more strict accounting standards imposed by the Sarbanes-Oxley Act of 2002. Appendix 2 contains a letter from Mr. Hill to Alex Miller of NW Natural certifying the accuracy of the DMN calculations. In the interest of cost efficiency, we did not perform a separate audit of the DMN calculations. However, based on Mr. Hill's report, it appears that the DMN calculations as executed by NW Natural accurately reflect the intentions in the Agreement.

   b. To the extent lost margins have been recovered through DMN, what percentage of the margins recovered were due to conservation, economic activity, and price changes? We are unable to determine the exact percentages of recovered margins associated with these three factors. However, our analysis of factors that have affected recent historical changes in residential and commercial use per customer (in Section 4.3) indicates that the vast majority of DMN margin adjustments can be attributed to the effect of price changes. That is, economic activity (represented by the Oregon unemployment rate) and NW Natural-sponsored conservation efforts (the residential HEF program) have not had a statistically significant effect on use per customer. We provide one caveat to this conclusion, to the effect that to some extent, consumers' usage changes in response to price changes overlap with "conservation," in that the price elasticity effect occurs through a combination of short- and long-run changes in customer behavior. These can include actions such as turning the thermostat down, as well as adding insulation or purchasing higher efficiency equipment. To the extent that NW Natural's promotion of specific energy efficiency programs has general conservation effects (through increased awareness), price effects overlap with conservation effects.

2. *Did DMN effectively remove the relationship between the utility's sales and profits?* Our analysis of the DMN mechanism indicates that it is effective in reducing, but not completely removing, the link between utility sales and profits. Through simulations (described in Section 4.1), we estimate that DMN reduces the variability of residential margins per customer by 30 percent and reduces the variability of commercial margins per customer by 42 percent.

[29] We have eliminated some WARM-specific issues that will be addressed in a separate report.

There are two reasons that DMN does not remove the relationship entirely. First, it excludes weather effects (which are subsequently accounted for through the WARM mechanism). Second, a 90% factor is applied to the deferral component. Still, according to CFO David Anderson, DMN has been effective in reducing the link between NW Natural's sales and its profits. Our simulation of DMN revenue effects (in Section 4.1) indicated the possibility that the assumed price elasticity values may be too low (in absolute value), which exposes a larger share of the revenue adjustments to the 90% factor in the deferral calculations. Updating the elasticities and/or removing the 90% factor could further reduce the link between sales and profits.

3. *Did DMN effectively mitigate the utility's disincentives to promote energy efficiency?* An examination of the theoretical effects of DMN leads us to conclude that it is an effective means of reducing NW Natural's disincentive to promote energy efficiency. This conclusion is reinforced by NW Natural's actions under DMN, which include effectively partnering with the Energy Trust of Oregon, improving HEF program performance, and shifting marketing resources towards energy efficiency promotions. (It is possible that the shift in marketing resources can be attributed in part to Order 99-697, in which the Commission disallowed recovery of image advertising expenses.)

4. *Did DMN improve the utility's ability to recover its fixed costs?* This question is closely related to Question #2 above, in that reducing the link between sales and profits will produce more stable recovery of fixed costs. Therefore, for the reasons stated above, we conclude that DMN has improved NW Natural's ability to recover fixed costs.

5. *a. Did DMN reduce business and other financial risks?* Yes, by reducing revenue fluctuations DMN has reduced NW Natural's risk.

   b. If yes, describe the risks and estimate the reduced costs to the Company associated with the business and financial risks that were impacted. As described in Section 4.5, CFO David Anderson believes that DMN and WARM were contributing factors to NW Natural obtaining the best rating in the Standard & Poor's (S&P) business risk profile (scoring a 1 on a scale of 1 to 10). Similarly, he believes that DMN and WARM contributed to the upgrade in NW Natural's S&P bond rating from A to A+. An improved risk profile has several beneficial effects. It allows NW Natural to maintain smaller lines of credit, reduce the share of equity in its capital structure, and maintain a lower coverage ratio. However, it is difficult to quantify these effects for two reasons. First, given that a number of events occurred that are unrelated to DMN and WARM (most prominently, the completion of general rate case UG-152), it is difficult to attribute changes in risk profiles or finances to any one cause. Second, given the changes in financial markets over time, we cannot simply attribute changes in interest rates to changes in NW Natural's risk profile. That is, interest rates fluctuate throughout the economy, so a reduction in interest rates may be due entirely to effects that are independent of NW Natural's circumstances.

   c. If yes, did the Company increase its efforts and activity on non-regulated activities? According the CFO David Anderson, non-regulated activities account for

only about 3% of assets, and the risk reductions afforded by DMN and WARM did not affect non-regulated activities.

d. What was the level of impact and effects on operations? In addition to the potential effects on financial measures described above, DMN contributed to organization changes that are described in Section 4.4 and in response to question 7b below.

e. Were the reduced risks shifted away from the Company to customers or a third party or eliminated? In Section 2.2, we describe how DMN affects risk for NW Natural and its customers. Four sources of uncertainty were considered: weather, natural gas prices, economic conditions, and other random factors. We summarize the effect of DMN on the risk produced by each of these sources of uncertainty below.

Weather risk is not affected by DMN because of the weather normalization of usage that is incorporated in the deferral mechanism. Uncertainty in the price of natural gas affects the amount of natural gas that customers will use. The risk that NW Natural faces with respect to gas prices is that when prices rise, customer usage levels decrease, reducing fixed cost recovery. At the same time, the price increase causes customers' bills to increase (as long as any reductions in usage are not offset by the increase in the gas price). By reducing or eliminating the risk to NW Natural associated with uncertain gas prices, this risk to customers is increased. However, the element of DMN that shifts this risk is the elasticity adjustment, over which there appears to be no dispute with respect to its appropriateness. That is, various parties' views regarding the efficacy of DMN seem to hinge on their opinion of the decoupling mechanism, not the elasticity adjustment.

In theory, DMN could shift economic risk from the utility to customers. For example, if the regional unemployment rate increases, residential customers might lower their thermostat settings in an attempt to reduce their bills. DMN insures NW Natural against lost margins associated with reduced sales from this type of action. However, our findings from an analysis of recent historical data indicate that NW Natural's residential and commercial use per customer do not appear to be sensitive to such economic conditions. Therefore, we conclude that a shift of economic risk from NW Natural to its customers does not occur in NW Natural's service territory.

f. What impact did DMN and WARM have on the need for, or cost, of new security issuances or lines of credit? As described in Section 4.5, NW Natural CFO David Anderson believes that the presence of DMN and WARM have allowed NW Natural to retain smaller lines of credit and have a lower share of equity (*i.e.*, reduced the need for new security issuances).

h. What incremental impacts have DMN and WARM had on NW Natural's bond ratings? NW Natural CFO David Anderson believes that the risk mitigating effects of DMN and WARM contributed to an increase in NW Natural's Standard & Poor's bond rating from A to A+.

i. How does NW Natural's revenue variability compare to a representative sample of LDCs before and after DMN and WARM? This issue is addressed in Section 4.2, which shows that NW Natural's revenue variability is lower than the average utility

in the representative sample used. Because relatively little time has passed since DMN was put in place, we did not compare the revenue variability both before and after DMN was implemented.

6. *Did DMN affect, positively or negatively, levels of service quality or the company's incentives to provide excellent service quality?* As shown in Section 4.6, DMN does not appear to have adversely affected NW Natural's level of service quality. This is consistent with our analysis of the incentive effects associated with DMN, which indicate that DMN does not alter NW Natural's incentives to provide high quality customer service.

7. *a. What changes in company culture or operating practices resulted from the implementation of DMN?* This issue is discussed in Section 4.4. The changes that may be attributed to DMN are a shift in marketing efforts (though this may also be due to a change in Commission policy with respect to allowed costs), taking a public stance that strongly supports energy efficiency, and shifting compensation policies (by adopting specific individual incentives and moving away from commission).

   b. What organizational changes and/or Company communications to NW Natural employees resulted from the changes to company culture or operating practices? As described in Section 4.4, a number of organizational changes occurred following the implementation of DMN. While it is difficult to quantify the extent to which these changes were brought about directly by DMN, Grant Yoshihara of NW Natural estimated that about 50% of the shift of personnel from sales and promotions (which decreased from 67 FTEs in 2002 to 20.5 FTEs in 2005) to customer service (which increased from 18 FTEs in 2002 to 44 FTEs in 2005) was due to a change in philosophy that is consistent with the incentives provided by DMN.

   c. What impact, if any, did DMN and WARM have on uncollectibles, new hookups, NW Natural's line extension policy and actions specific to natural gas customers? As discussed in Section 4.7, DMN had no effect on NW Natural's pursuit of uncollectible accounts. A discussion of new connections customers and NW Natural's line extension policy is contained in Section 4.4 and in response to question 8 below.

8. *How do usage and revenues associated with new connects compare to the base usage and revenues assumed in DMN?* Section 4.4 presents the limited information that we have to answer this question. We have seen mixed evidence, indicating that residential new connections and commercial conversion customers tend to have lower usage levels than existing customers, while commercial new construction customers have higher usage than existing customers. However, a number of other factors could be affecting this analysis (*e.g.*, small sample size for commercial new connections; and changes in building codes, building materials, and appliance efficiency levels in residential housing). In addition, our review of NW Natural's methods for evaluating new connections and conversion customers revealed that DMN revenue adjustments are not included. Based on this, we conclude that NW Natural has not "gamed" the DMN mechanism with respect to new connections customers.

9. *What impacts has DMN had on customers?* As shown in Section 4.1, the first year of DMN produced almost $15 million in surcharges to customers, or about 3 percent of

total residential and commercial revenues. This relatively high amount was due to the fact that baseline usage was set at a time when prices were substantially lower, thus requiring a large first-year DMN adjustment. In its second full year, DMN produced a much lower surcharge of about $578,000, or about 0.1% of total residential and commercial revenues. Customer complaint data show that negative views of DMN were limited to objections regarding the appropriateness and/or legality of imposing Public Purposes Funding charges on customer bills. The absence of complaints regarding the DMN mechanism could be due to a low awareness of the program, which (if true) could be caused by the fact that DMN adjustments are not separately listed on customer bills.

Public Purposes Funding approved in combination with DMN has provided about $1.4 million per year in low-income bill payment assistance, $1.3 million per year in low income weatherization funds, and $6.75 million per year for energy efficiency programs (*i.e.*, Energy Trust funding). (The values listed here are based on 2004 budgeted amounts.)

6.2 Recommendations

Based on the information and input that we have received and reviewed, we recommend that some form of revenue decoupling be retained. It has been effective in reducing the variability of distribution revenues and in altering NW Natural's incentives to promote energy efficiency. While DMN does not provide an *incentive* for NW Natural to promote energy efficiency, it does remove most of the *disincentive* that exists with the standard rates.

We have been impressed by the breadth of support that DMN has received. The Energy Trust of Oregon reports that NW Natural has been successful in creating a good working relationship with the Energy Trust, and that NW Natural's efforts to promote energy efficiency effectively complement their own efforts. HVAC distributors believe that NW Natural's marketing efforts, in conjunction with its relationships with consumers, distributors, and the Energy Trust have helped increase sales of high-efficiency furnaces to the point where Oregon has the highest share of high-efficiency furnaces in the nation (as a percentage of new furnace sales). The Citizens' Utility Board of Oregon, the Northwest Energy Coalition and a number of CAP agencies believe that the Public Purposes Funding established in conjunction with DMN is beneficial for consumers. The Natural Resources Defense Council and American Gas Association released a joint statement regarding the positive environmental effects of decoupling, specifically citing NW Natural's experience as an example of the positive outcomes that decoupling can yield. The negative feedback that we have received is limited to twenty-six customer complaints that questioned the appropriateness and/or legality of the Public Purposes Funding.

In our discussions with the Commission Staff, they expressed several concerns about DMN. We summarize the concerns and our evaluation of them below.

- *Concern that DMN might shift economic risk from NW Natural to customers.* In theory, DMN could shift economic risk from NW Natural to customers. That is,

if use per customer declines during economic downturns, the DMN deferral mechanism would produce a surcharge that would offset some of the bill reductions that customers would otherwise experience. We found that this concern, while valid in theory, is not likely to be relevant in practice in NW Natural's Oregon service territory. We conducted a time series analysis of residential and commercial use per customer that indicated that use per customer is strongly affected by weather and changes in energy prices, but not significantly affected by economic conditions. Therefore, we do not believe that a significant portion of deferrals can be attributed to changes in economic conditions.

- *The deferral mechanism would be unnecessary if very little of it is caused by NW Natural sponsored conservation efforts.* It is true that a very small percentage of the deferral revenues can be attributed to NW Natural sponsored conservation efforts (specifically, the residential HEF program). However, NW Natural and the Energy Trust of Oregon agree that the DMN deferral mechanism gives NW Natural the freedom to be more aggressive in its promotion of energy efficiency.

  In addition, the deferral mechanism allows for the determination of the price elasticity values to be less contentious. In DMN's current form, when an error is made in setting the price elasticity, the deferral mechanism will correct 90% of the error. Given the range of short- and long-term responses that customers can make to price changes (*e.g.*, temporarily turn down the thermostat or permanently change appliances and/or fuel sources), price elasticity values are difficult to estimate and apply with precision.

  Finally, both the Commission Staff and NW Natural agree that NW Natural should be compensated for lost margins due to energy efficiency programs. The Commission Staff has proposed replacing the deferral mechanism with a lost revenue adjustment. Section 5.3.2 contains a discussion of the reasons that lost revenue adjustments are likely to be inferior to deferral mechanisms (*i.e.*, lost revenue adjustments are administratively burdensome, produce incentives to create programs that look good on paper but perform poorly in reality, and do not compensate the utility for general conservation efforts). The deferral mechanism expands the range of conservation programs and policies that NW Natural can support without harming its shareholders. Examples programs or policies that would be less tenable with lost revenue adjustments are conservation programs that are difficult to track (such as the Energy Trust's Efficient Facility Operations Program), supporting more energy efficient building standards, or supporting pleas for conservation during an energy crisis. In addition, to the extent that successful energy efficiency campaigns spur conservation efforts outside of the program, lost revenue adjustments do not adjust for the reduction in distribution revenues while DMN will.

- *It is appropriate for NW Natural to have an incentive to grow and to fully transfer the promotion of energy efficiency promotion to the Energy Trust of Oregon.* This view is contradicted by the views of the Energy Trust and HVAC distributors,

who believe that NW Natural's involvement in the promotion of energy efficiency has improved program performance. By eliminating the deferral mechanism, NW Natural's incentives would oppose those of the Energy Trust, which would endanger the relationship that they have developed.

There is one negative incentive effect that DMN provides with respect to conservation: it reduces NW Natural's incentive to promote natural gas water heater conversions for current customers because each conversion would produce a short-term revenue loss through the deferral mechanism. In addition, DMN provides a short-term incentive to bias new customer connections policies toward smaller customers. On balance, however, it appears that the combination of Public Purposes Funding and NW Natural's improvements in HEF program performance outweigh these concerns.

We believe that the positive effects of DMN outweigh the negative effects. However, there are several ways in which DMN might be improved.

1. Eliminate the 90% factor applied to the deferral adjustments. This factor introduces incentives to manipulate parameter values, reduces the positive incentive effects of DMN, and can reduce refunds to customers as well as surcharges. There do not appear to be any positive incentive effects of this factor with respect to the performance of DMN, therefore it should be removed.
2. Re-evaluate the price elasticity values agreed to in the Order. Our research indicates that the values currently used may be too low (in absolute value). The use of price elasticity values that are too low will tend to increase the amount of revenues that flow through the deferral mechanism rather than the elasticity adjustment. This delays price-related revenue adjustments until the following year and, because of the 90% factor currently used, reduces the amount of revenue that is adjusted for price changes.
3. Re-evaluate the weather sensitivity parameter (β) used in WARM and DMN. In particular, it appears that the residential class value may be too high. Based on the information that we have seen, the methods used to initially estimate β values appear to be sound, so it may be that only the data used in the estimation needs to be updated. In addition, consideration should be given to estimating a weather sensitivity parameter expressed in units of *percentage* changes in use per HDD rather than *levels* of use, or customer-specific parameters.
4. Consider adopting full decoupling. Because of its simplicity, full decoupling would be easier for customers to understand than the combination of DMN and WARM. In addition, full decoupling does not have some of the gaming incentives present in DMN (which could also be eliminated by removing the 90% factor applied to deferral calculations). However, because full decoupling encompasses the effects of both DMN and WARM (because full decoupling does not weather normalize usage), a decision on this matter should be delayed until a more complete analysis of WARM has been conducted. In particular, customers may prefer the fact that WARM provides adjustments to current bills, whereas

weather-related revenue adjustments are deferred until the following year under full decoupling.

Appendix Table A1
Revenue Variability Data for the Comparison Sample of Utilities

		Residential			Commercial					
Utility	Year	# Accounts	Sales	Revenues ($000)	# Accounts	Sales	Revenues ($000)	HDD	# Accounts	Sales Units
AGL	1993	1,182,700	100,140	658,200	95,700	47,850	268,100	2,852	Avg	MDth
AGL	1994	1,215,200	100,310	700,700	98,000	47,890	285,800	2,565	Avg	MDth
AGL	1995	1,250,400	91,680	610,600	100,000	45,400	243,200	2,121	Avg	MDth
AGL	1996	1,289,400	116,540	708,800	102,500	53,820	288,800	3,191	Avg	MDth
AGL	1997	1,319,000	98,610	728,500	104,500	45,550	290,900	2,402	Avg	MDth
Atmos	1993	789,360	74,818	372,770	86,124	36,307	165,611	4,080	Yr end	MMcf
Atmos	1994	825,310	72,561	375,450	93,250	35,250	165,883	3,855	Yr end	MMcf
Atmos	1995	834,376	69,666	337,768	90,093	34,921	150,949	3,706	Yr end	MMcf
Atmos	1996	860,229	77,001	409,039	91,960	38,247	186,032	4,043	Yr end	MMcf
Atmos	1997	870,747	75,215	452,864	92,703	37,382	193,302	3,909	Yr end	MMcf
Atmos	1998	889,074	73,472	410,538	94,302	36,083	184,046	3,799	Yr end	MMcf
Atmos	1999	919,012	67,128	349,691	98,268	31,457	144,836	3,374	Yr end	MMcf
Atmos	2000	970,873	63,285	405,552	140,019	30,707	176,712	2,096	Yr end	MMcf
Atmos	2001	1,243,625	79,000	788,902	122,274	36,922	342,945	4,124	Yr end	MMcf
Atmos	2002	1,247,247	77,386	535,981	122,156	35,796	221,728	3,368	Yr end	MMcf
Atmos	2003	1,498,586	97,953	873,375	151,008	45,611	367,961	3,473	Yr end	MMcf
Atmos	2004	1,506,777	92,208	923,773	151,381	44,226	400,704	3,271	Yr end	MMcf
Cascade	1994	112,533	8,391	47,011	21,835	9,570	50,116	5,301	Yr end	MDth
Cascade	1995	120,096	9,352	56,816	22,797	10,115	58,145	5,607	Yr end	MDth
Cascade	1996	127,794	10,178	62,076	23,827	10,343	59,402	5,620	Yr end	MDth
Cascade	1997	135,126	11,014	65,324	24,591	10,731	55,132	5,525	Yr end	MDth
Cascade	1998	142,645	10,645	65,926	25,415	9,988	52,735	5,031	Yr end	MDth
Cascade	1999	150,296	11,991	77,925	26,305	10,696	59,548	5,535	Yr end	MDth
Cascade	2000	157,443	12,185	85,728	27,151	10,672	65,294	5,372	Yr end	MDth
Cascade	2001	162,568	12,678	115,974	27,491	11,182	92,099	5,793	Yr end	MDth
Cascade	2002	169,476	12,921	130,582	28,098	10,728	98,195	5,455	Yr end	MDth
Cascade	2003	176,986	12,262	121,026	28,615	10,019	89,136	5,042	Yr end	MDth
Cascade	2004	184,315	13,127	130,727	29,009	10,649	95,629	5,212	Yr end	MDth
Energen	1997	423,130	29,008	243,876	34,432	12,976	91,517		Avg	MMcf
Energen	1998	423,758	27,925	224,934	34,719	12,664	82,520		Avg	MMcf
Energen	1999	427,159	26,001	218,638	35,137	12,049	80,802		Avg	MMcf
Energen	2000	430,069	27,369	256,591	35,586	12,629	99,356		Avg	MMcf
Energen	2001	427,584	28,962	353,358	35,778	12,909	139,046		Avg	MMcf
Energen	2002	425,630	26,358	277,088	35,601	11,838	104,247		Avg	MMcf
Energen	2003	427,413	27,248	320,938	35,463	12,564	126,638		Avg	MMcf
Laclede	1993	555,467	61,906	348,494	36,514	29,321	136,462	4,838	Yr end	MDth
Laclede	1994	559,225	61,086	363,058	36,684	28,917	142,042	4,694	Yr end	MDth
Laclede	1995	566,421	54,178	302,770	37,409	25,691	109,270	4,005	Yr end	MDth
Laclede	1996	569,818	64,237	376,818	37,735	30,948	145,466	4,880	Yr end	MDth
Laclede	1997	572,794	60,633	395,250	37,985	29,622	152,222	4,953	Yr end	MDth
Laclede	1998	577,224	56,073	365,768	38,519	25,921	132,504	4,404	Yr end	MDth
Laclede	1999	582,719	53,092	324,115	39,041	24,514	112,890	4,140	Yr end	MDth
Laclede	2000	586,783	49,549	346,159	39,419	22,831	123,578	3,933	Yr end	MDth
Laclede	2001	584,269	60,784	619,090	39,264	28,044	250,741	5,102	Yr end	MDth
Laclede	2002	588,630	50,216	387,594	39,842	24,053	142,259	3,959	Yr end	MDth
Laclede	2003	590,785	57,719	502,071	40,166	25,653	188,688	4,803	Yr end	MDth
Laclede	2004	591,547	52,490	543,996	40,417	22,914	202,183	4,102	Yr end	MDth
Nicor	1997	1,710,000	233,200	1,126,000	161,700	65,200	314,800	6,254	Yr end	MMcf
Nicor	1998	1,737,600	192,400	813,600	163,800	44,300	189,400	4,834	Yr end	MMcf
Nicor	1999	1,769,200	209,000	899,800	166,100	39,800	172,300	5,272	Yr end	MMcf
Nicor	2000	1,799,100	219,000	1,353,900	167,600	38,400	236,000	5,717	Yr end	MMcf
Nicor	2001	1,824,600	201,500	1,486,400	168,700	37,200	274,600	5,422	Yr end	MMcf
Nicor	2002	1,860,400	212,900	1,057,400	171,300	41,600	209,400	5,779	Yr end	MMcf
Nicor	2003	1,890,300	214,900	1,611,900	172,800	46,700	351,700	6,068	Yr end	MMcf
NW Natural	1993	329,157	26,782	168,217	42,657	20,964	103,476	4,452	Yr end	MDth
NW Natural	1994	346,950	26,022	176,510	44,078	20,193	108,452	4,020	Yr end	MDth

Appendix Table A1

Revenue Variability Data for the Comparison Sample of Utilities

NW Natural	1995	363,903	25,646	165,662	45,402	19,672	99,079	3,779	Yr end	MDth
NW Natural	1996	385,213	30,631	183,802	47,309	22,512	104,582	4,427	Yr end	MDth
NW Natural	1997	407,061	30,636	177,835	50,315	22,525	100,677	4,092	Yr end	MDth
NW Natural	1998	425,606	31,569	205,388	51,159	22,912	117,889	4,011	Yr end	MDth
NW Natural	1999	447,659	35,297	242,952	52,870	25,238	139,425	4,256	Yr end	MDth
NW Natural	2000	468,087	35,638	280,642	54,684	25,038	159,660	4,418	Yr end	MDth
NW Natural	2001	485,207	35,007	329,905	55,096	24,229	190,236	4,325	Yr end	MDth
NW Natural	2002	503,402	35,709	354,735	56,087	24,016	201,475	4,232	Yr end	MDth
NW Natural	2003	519,427	34,353	328,464	57,969	22,626	176,385	3,952	Yr end	MDth
Peoples	1993	904,316	144,199	929,407	50,736	26,185	156,377	6,679	Avg	MDth
Peoples	1994	905,461	142,876	951,037	50,955	26,206	160,912	6,701	Avg	MDth
Peoples	1995	906,881	130,571	752,796	50,872	22,079	116,113	5,897	Avg	MDth
Peoples	1996	910,236	154,128	883,100	50,719	27,390	141,594	7,080	Avg	MDth
Peoples	1997	910,657	142,837	941,557	50,914	24,994	146,412	6,806	Avg	MDth
Peoples	1998	908,025	119,206	780,188	46,639	19,501	112,166	5,564	Avg	MDth
Peoples	1999	911,782	117,840	727,095	44,382	17,411	95,530	5,646	Avg	MDth
Peoples	2000	919,196	117,814	836,761	48,540	18,974	122,350	5,650	Avg	MDth
Peoples	2001	931,151	127,536	1,439,364	46,160	19,350	204,629	6,713	Avg	MDth
Peoples	2002		113,322	794,865		17,345	109,307	5,639		MDth
Peoples	2003		128,521	1,155,927		21,555	178,845	6,684		MDth
Peoples	2004		116,939	1,148,499		20,303	184,756	6,091		MDth
Piedmont	1993	396,394	34,277	221,632	54,451	28,179	154,894	3,659	Avg	MDth
Piedmont	1994	420,861	36,093	240,314	56,147	28,931	165,805	3,567	Avg	MDth
Piedmont	1995	446,118	33,513	229,546	57,803	22,867	135,933	3,144	Avg	MDth
Piedmont	1996	468,803	43,357	292,010	59,905	31,040	180,415	3,993	Avg	MDth
Piedmont	1997	495,739	38,339	319,722	62,258	28,476	195,862	3,471	Avg	MDth
Piedmont	1998	522,451	41,142	323,777	63,878	28,528	189,341	3,339	Avg	MDth
Piedmont	1999	549,610	38,111	295,108	66,409	26,668	168,731	3,124	Avg	MDth
Piedmont	2000	577,314	40,520	343,476	68,879	29,315	207,087	3,097	Avg	MDth
Piedmont	2001	601,682	47,869	525,650	71,069	31,002	299,672	3,821	Avg	MDth
Piedmont	2002	620,642	40,047	358,027	72,323	25,892	191,988	3,004	Avg	MDth
Piedmont	2003	657,965	52,603	524,933	75,924	33,648	299,281	3,643	Avg	MDth
Piedmont	2004	771,037	54,412	624,487	90,328	35,483	360,355	3,331	Avg	MDth
SEMCO	1993		23,302	122,216		12,608	61,379	7,053		MMcf
SEMCO	1994		23,437	121,066		12,469	59,413	6,861		MMcf
SEMCO	1995		24,676	115,242		12,738	54,763	7,158		MMcf
SEMCO	1996		26,703	138,644		13,670	65,509	7,099		MMcf
SEMCO	1997		25,968	139,538		13,483	66,577	6,838		MMcf
SEMCO	1998		21,946	118,220		8,840	42,041	5,566		MMcf
SEMCO	1999		28,583	137,407		8,882	38,451	6,650		MMcf
SEMCO	2000		41,397	190,221		14,591	62,354	7,293		MMcf
SEMCO	2001		41,529	201,754		16,032	73,831	7,038		MMcf
SEMCO	2002		42,671	227,086		16,970	84,480	7,394		MMcf
Southwestern	1999		55,451			26,603		1,928		MDth
Southwestern	2000		57,138			27,267		1,938		MDth
Southwestern	2001		58,994			27,997		1,963		MDth
Southwestern	2002		58,822			28,027		1,912		MDth
Southwestern	2003		59,305			27,915		1,772		MDth
WGL	1995		59,650			40,318		3,660		MDth
WGL	1996	711,837	73,960	551,943	59,603	47,365	303,011	4,570	Yr end	MDth
WGL	1997	736,513	66,545	574,590	61,400	42,683	307,769	3,876	Yr end	MDth
WGL	1998	756,682	61,579	514,713	62,210	34,581	245,572	3,662	Yr end	MDth
WGL	1999	782,648	60,416	487,869	62,919	28,535	195,592	3,652	Yr end	MDth
WGL	2000	810,855	55,783	477,185	64,169	24,024	181,674	3,637	Yr end	MDth
WGL	2001	837,993	63,495	756,709	65,031	25,855	272,849	4,314	Yr end	MDth
WGL	2002	872,362	50,924	517,798	66,168	19,392	163,235	3,304	Yr end	MDth
WGL	2003	892,382	64,881	737,264	66,804	23,963	239,907	4,550	Yr end	MDth
WGL	2004	921,767	62,973	792,999	67,564	22,641	245,242	4,024	Yr end	MDth

Appendix 2: Summary of the Review of the Decoupling Methodology by Gary C. Hill

September 14, 2004

Mr. Alex Miller
NW Natural
220 NW Second Avenue
Portland, Oregon 97209

Dear Alex

Subject: Review of NW Natural Decoupling Methodology

I have completed my review of the methodology for determining NW Natural's decoupling adjustment which provides for residential and commercial margins based on a baseline amount of volume. I have reviewed the overall methodology as well as the model, which is the basis for determining the baseline usage that is required for the monthly decoupling journal entry

To complete the review of the overall methodology, Company documents were reviewed that summarized the process employed for calculating the adjustment. These included the following summaries: NW Natural Decoupling Methodology, NW Natural Decoupling Mechanism – Development of Commercial Baseline Usage and Development of Residential Baseline Usage. Supporting documents were reviewed to provide background and validate that the actual model corresponded to the decoupling methodology as described. These documents included the Oregon PUC Order No. 02-634, Monthly JV 35, rate schedules 190 and 195 plus the derivation of margin change due to elasticity. The reclassification of customers from residential to commercial, and between commercial and industrial increased the complexity of the calculations of the baseline usage. Testing components of the baseline model provided a comprehensive understanding of the implications of customer reclassificat ion, adjustments for UG 152 volumes, weather normalization and elasticity. I believe that the overall approach employed to implement the decoupling mechanism is accomplishing what was intended.

The second portion of the review focused on testing the model, assuring the formulas were correct and that the appropriate documentation was included. The attached addendum provides a summary of the components of the model that were tested and some areas including source data that I did not validate. Overall, the model tested fine and tracked with the described methodology in the Company's documentation.

Sincerely,

Gary C. Hill
Consultant