**SECTION 6**

**AVOIDED COSTS**

**Overview**

As part of the IRP process, Cascade calculates a 20‐year forecast and 45 years of avoided costs. Cascade provides a 45-year avoided cost because some of the insulation measures exceed 30-year lives – thus the 45-year timeframe to account for the full measure life. The avoided cost is the estimated cost to serve the next unit of demand with a supply side resource option at a point in time. This incremental cost to serve represents the cost that could be avoided through energy conservation. The avoided cost forecast can be used as a guideline for comparing energy conservation with the cost of acquiring and transporting natural gas to meet demand. Cascade evaluates the impact that a range of environmental externalities, including CO2 emission prices, would have on the avoided costs in terms of cost adders and supply costs. The Company produces an avoided cost case based on the expected scenario.

**Key Points**

* Avoided cost forecasting serves as a guideline for determining energy conser-vation targets.
* Cascade incorporates nine factors in its avoided cost calculation.
* A short-run coefficient factor of -0.10 and a long-run factor of -0.12 with ranges of plus or minus 0.07 is used for price elasticity purposes.
* The Company has included a 10% carbon adder in its 2016 IRP.
* The total avoided cost ranges between $0.5041 and $0.6659/therm over the 20-year planning horizon.

As discussed in Section 7, Demand Side Management, when calculating the avoided cost figures, the Company includes an incremental cost advantage for conservation resources to recognize the non-quantifiable benefits associated with conservation such as price certainty and a hedge value against future carbon costs.

**Costs Incorporated**

The following costs are included in the avoided cost calculation:

* The long-term gas price forecast compiled from multiple consultants’ gas price forecasts (which is the majority of the cost);
* A price for carbon included in the gas price forecast, which has been provided by a consultant;
* Gas storage variable and fixed costs;
* Upstream variable and fixed transmission costs;
* Peak related on‐system transmission costs; and
* A 10% adder for environmental benefits, as recommended by the Northwest Power and Conservation Council (NPCC).

The following parameters are also used in the calculation of the avoided cost:

* The most recent load forecast (9/8/2016);
* The inflation rate used is 1% (from EIA); and
* The discount rate used is 3.52% (30-year mortgage rate at the time of calculation).

**Price Elasticity**

Price elasticity is an economic concept which recognizes that customer consumption changes as prices rise or fall. The amount of this change (or “elasticity”) is a function of other available products (i.e., substitutes) or the ability for customers to go without or use less with no meaningful impact on their personal life or in commerce.[[1]](#footnote-1),[[2]](#footnote-2) “Price signals” is a term used to describe how customers see or expect future pricing to affect them.[[3]](#footnote-3)

Price elasticity is expressed mathematically as a coefficient describing the amount of change in consumption per change in price. For example, a price elasticity factor of -0.10 means a consumer will reduce usage by 1% if the price increases by 10%. Conversely, a 0.10 coefficient factor for a 10% price decrease would predict customers would increase consumption by 1%. For products with high substitutability, the coefficient factors are high (e.g., greater than 0.50) and vice versa.

Price elasticity can be highly temporal. Consumers may not be able to make changes with short-term price increases or decreases. Yet, several years out, that same customer may replace equipment or make behavioral changes to use significantly less or more of a product depending on whether, over the long term, the product is more or less expensive.

The importance of price elasticity to natural gas integrated resource planning lies in the 20-year period over which the demand forecasts are estimated. This forecast (or range of forecasts under scenario planning) is a key determinant of the avoided cost. Low price elasticity in a rising natural gas price environment would suggest forecasted higher load would not change customer behavior and more natural gas would need to be acquired with corresponding delivery infrastructure. However, if usage materially decreases with higher prices, then less purchases and capital investment by an LDC would be necessary. Therefore, price elasticity has some effect on the avoided cost.

Because avoided costs are integral to conservation planning, among other components, the impact of price elasticity on consumer consumption is of interest to all stakeholders in the planning process.

Several attributes of the regulated utility environment cause price elasticity calculations to be difficult to calculate with precision. Within customer classes, the type of customer usage varies:

* Residential—heating and non-heating
* Commercial—heating and processing

Additionally, regulatory protocols may reduce direct signals because the annual purchased gas adjustment (PGA) may result in price increases or decreases of unknown magnitude. Further, customers assume general rate cases and price changes will occur annual or biannually. As a result, customers are more likely to be uncertain of future pricing than to have the preconception that prices will rise.

Several items reduce load growth over time, regardless of price elasticity and price signals. Changes in economic conditions, added conservation, revised building codes and appliance standards, and advances in technology can lead to historical data that includes reduction in usage irrespective of pricing. This causes difficulty for customers to receive meaningful price signals and difficulty for utilities to isolate primary factors for long-supply term price elasticity calculations (other than inflation). Regardless, customers may not return (or rebound) to historic usage after experiencing higher or lower price excursions.

A review of price elasticity leads to the following findings relevant to Cascade’s current IRP process:

* Price elasticity exists, yet determining specific coefficient factors for linear modeling is inexact;
* A range of coefficient factors should be used to test sensitivities of the factors and impacts to the forecasts;
* Given Cascade’s diverse geographical territory, statistical significance of price elasticity coefficients is uncertain;
* Several complicating factors call into question the accuracy and application of price elasticities. These include:
	+ Regulatory mechanisms (e.g., PGAs and general rate cases) which dampen price signals or information to customers about future pricing;
	+ Historical data (embedded with effects of conservation, technology advances, and changing economic conditions) renders reliance on this data imperfect for precise price elasticity determination;
* The retail price of the most “substitutable” fuel—electricity—moves with the cost of natural gas, thereby lessening the economic value of alternative fuels to customers; and
* Evolution of modeling suggests that future IRP modeling should incorporate iterative quantitative equations to allow built-in price elasticity effects.

Regardless, the Company believes price elasticity must be taken into account. For Cascade’s 2016 IRP, a short-run coefficient factor of -0.10 and a long-run factor of -0.12 with ranges of plus or minus 0.07 is justifiable, given regional studies and other utilities’ modeling efforts.

Several price elasticity inquiries are traditionally referenced in regional price elasticity discussions. These include:

* The American Gas Association (AGA) released a study in 2007 identifying the short-run price elasticity coefficients for the Pacific and Mountain regions to each be -0.07 with a low and high range of -0.03 and -0.13 respectively. The long-run estimates were -0.12 (Pacific) and -0.10 (Mountain), with the range being between -0.01 and -0.29.
* The geographic area of a utility’s service territory can result in the statistical significance of price becoming more uncertain. This suggests that for Cascade—with its customers spread over two states in smaller sections—relatively precise price elasticity coefficient factors would either not be available or would be costly to determine with lesser benefits of doing so.[[4]](#footnote-4)
* Use per customer has been decreasing over the past thirty years prompted by multiple factors, including systemic items such as conservation, building codes and appliance standards and behavioral influences such as the 2008 recession.
* In its 2014 Natural Gas IRP, Avista stated it “continues to study how to incorporate a price elastic response to demand given the complex cross commodity relationships, regulatory pricing mechanisms, flat forward price curve and changing technologies in energy efficiency that make discerning how much demand response to expect over the long term. An action item from Avista’s 2014 Natural Gas IRP was to explore the possibility of a regional elasticity study facilitated by Avista in conjunction with a third-party such as the NWGA [Northwest Gas Association] or the AGA. Avista approached the NWGA and they are willing to assess regional interest and facilitate the process. Avista is developing the scope, assessing who is best to conduct a study, and determining the associated costs. Avista will assess the interest level of regional stakeholders before deciding to proceed with the study.”[[5]](#footnote-5) Upon further discussion, this initiative did not proceed.

A review of these studies and inquiries of price elasticity in the natural gas industry indicates no regional precise calculations are available specific to a utility. A short-run coefficient factor of -0.10 and a long-run factor of -0.12 recognizes the temperature differentials of its service territory, east and west of the Cascade Mountains with low and high ranges at plus or minus 0.07.

**Incorporation of Carbon Adder**

Federal, Washington, and Oregon agencies are proposing a series of regulations and policies to address greenhouse gas (GHG) emissions to regulate carbon dioxide CO2 emissions. While focused on the Pacific Northwest electric industry, the NPCC exhaustively examines CO2 in the 7th Plan released in May 2016. This Plan builds on the Council’s previous work and has become the recognized standard for carbon analyses. Cascade’s IRP is best informed by the Council’s survey of approaches, sensitivity analyses, and scenarios with attention to Cascade’s customers regarding cost-effectiveness and the results of other LDCs. Cascade is addressing CO2 in its energy efficiency programs, encouragement of the direct use of natural gas and methane capturing as well as leak prevention. Regarding expectations, customers have a smaller carbon footprint from their natural gas usage than from their electric usage.

Regardless, there is a high level of uncertainty about the impact that carbon legislation will have on natural gas prices, and in turn, on the avoided cost. Therefore, the Company has included a 10% carbon adder in its 2016 IRP’s 20-year price forecast as a carbon adder proxy.

More in-depth discussion regarding the impacts of carbon legislation can be found in Section 5, Environmental Considerations.

**Application**

The 2016 IRP makes several changes in calculating and applying the avoided costs. With the 2016 IRP, Cascade now calculates an avoided cost for each of the three Washington conservation zones. Section 7, Demand Side Management, has habitually operated as a stand-alone process wherein the Company reduces consumption in the near term through the existing programs, and the conservation team then forecasts its savings potential into the 20-year horizon at a state level. Once the savings potential forecasts are available at a statewide level, the savings forecasts are provided to the Resource Planning Group in the final stages of the load forecast, where they are treated as a must take supply resource, reducing the load demand that must be met by more costly supply resources. Since the Company now forecasts avoided costs by conservation zone, this provides another level of granularity to assist the Conservation Group in determining the cost-effectiveness of various programs.

**Results**

Table 6-1 displays the avoided cost by each conservation zone over the 20-year IRP horizon. For the 2016 IRP the system avoided costs ranges between $0.5041/therm and $0.6659/therm over the 20-year planning horizon.

As mentioned earlier, the avoided cost is based on the 20-year expected scenario. Overall, avoided costs for the 2016 IRP are lower than recent IRPs. Other than the fixed cost increases due to the inclusion of several alternative resources selected as part of the expected case portfolio, commodity costs—the biggest driver of avoided costs—are down. The 45-year avoided costs that are referenced in Section 7, Demand Side Management and other detailed tables of avoided costs, including various carbon scenarios, are found in the Excel version of Appendix H, Avoided Cost Calculations, specifically in tab “Appendix H P 1” in rows 8-15.

**Table 6-1: Avoided Costs by Conservation Zone (Cost per Therm)**



1. An example of substitutes for a commodity is transportation fuels. As gasoline prices rise, commuters may carpool more or use public transportation. Conversely, in a low-cost gasoline environment, people may take longer driving vacations rather than fly or stay closer to home. In the long-term, higher gasoline prices could steer customers to changing out their choice of their automobiles toward electric vehicles or compressed natural gas (CNG) vehicles, thereby reducing to zero their gasoline consumption. Conversely, some drivers such as taxi cab owners may have no near-term choices regarding amount of miles driven; rather, they pass the higher cost of gasoline to their customers. [↑](#footnote-ref-1)
2. An example of going without or using less is movies at a cinema. Many entertainment alternatives are present, including waiting until a certain film is released to DVD or Blu-ray. [↑](#footnote-ref-2)
3. “A price signal is information conveyed to consumers and producers, via the price charged for a product or service, which provides a signal to increase/decrease supply and/or that the demand for the priced item has increased/decreased.” – Wikipedia. [↑](#footnote-ref-3)
4. Bernstein, Mark A, and James Griffin. Regional Differences in the Price-Elasticity of Demand for Energy – RAND Corporation, 2005. [↑](#footnote-ref-4)
5. Avista 2014 Natural Gas IRP at page 41. [↑](#footnote-ref-5)