Electric and Natural Gas Company Rate Impacts to Meet 2020 Greenhouse Gas Emission Reduction Goals

Report to the Legislative Assembly

Presented to:

Senate Environment and Natural Resources Committee

Prepared by:

Public Utility Commission of Oregon

November 1, 2010

Executive Summary

Senate Bill (SB) 101, enacted in the 2009 Legislative session, requires the Public Utility Commission of Oregon to report to the Legislature before November 1 of each even-numbered year on the estimated rate impacts of Oregon's regulated electric and natural gas companies meeting specific greenhouse gas emission reduction goals by 2020. The goals are:

- Reduce greenhouse gas emissions 10 percent below 1990 levels by 2020
- Reduce greenhouse gas emissions 15 percent below 2005 levels by 2020

Electric Company Reductions and Rate Impacts

Greenhouse gases are emitted from the burning of fossil fuels (coal and natural gas) to generate electricity to supply the Oregon customers of Portland General Electric Company (PGE), PacifiCorp and Idaho Power Company (Idaho Power).

PGE, PacifiCorp and Idaho Power, for the purposes of this report, each identified actions they could take to achieve the greenhouse gas emissions reduction goals set forth in SB 101.

To meet the goal to reduce greenhouse gas emissions 10 percent below 1990 levels by 2020:

- PGE would have to reduce its greenhouse gas emissions in 2020 by 54 percent from the level projected in its current Integrated Resource Plan (IRP). To reduce emissions, PGE assumes that it would have to shut down both of its coal fired power plants and replace the associated generation with renewable resources, among other actions. Following this course of action, PGE's estimated electricity rates in 2020 would be 38 percent higher than current rates.

- PacifiCorp would have to reduce its greenhouse gas emissions in 2020 by 31 percent from the level projected in its most recent IRP. PacifiCorp assumes that it would have to reduce generation from its coal fired plants and add significant amounts of renewable resources, natural gas fired resources, energy conservation, and demand response resources. PacifiCorp's estimated electricity rates in 2020 would be 20 percent higher than current rates.

- Idaho Power would have to reduce its greenhouse gas emissions in 2020 by 16 percent from the level projected in its current IRP. Idaho Power assumes that it would meet that emissions goal by curtailing coal fired generation. Idaho Power's estimated electricity rates in 2020 would be about 3 percent higher than current rates.

To meet the goal to reduce greenhouse gas emissions 15 percent below 2005 levels by 2020:

- PGE would have to reduce its greenhouse gas emissions in 2020 by 20 percent from the projected IRP level. PGE assumes it would achieve this goal by shutting down both of its coal fired power plants and replacing the associated generation with a mix of natural gas and renewable resources, among other actions. PGE's electricity rates would be an estimated 11 to 16 percent higher than current rates.

- PacifiCorp would have to reduce its greenhouse gas emissions in 2020 by 21percent from its projected IRP level. PacifiCorp assumes that it would reduce generation from its coal fired plants and add natural gas fired resources, energy conservation, and some renewable resources. PacifiCorp's electricity rates in 2020 would be 11 percent higher than current rates.

Natural Gas Company Reductions and Rate Impacts

The greenhouse gas emissions attributable to Oregon's natural gas companies – Northwest Natural Gas Company (NW Natural), Avista Utilities (Avista), and Cascade Natural Gas Corporation (Cascade) – stem largely from distribution system and gas equipment methane leaks, but also include company facility energy usage and operation of company fleet vehicles. These emissions do not include the emissions from burning natural gas directly in homes and businesses, and are small in comparison to the emissions from direct burning of natural gas.

NW Natural estimated the reductions and cost of meeting the greenhouse gas emissions reduction goals through improvements to its company operations and facilities, and through purchase of greenhouse gas emissions offsets. Operation and facility improvements include those related to natural gas and electricity usage for space and water heating and for pipeline compressor operations, fugitive methane emissions from operations, and the operation of fleet vehicles to service customers. The NW Natural analysis was applied proportionately to Avista and Cascade to arrive at a combined estimate for the three Oregon natural gas companies. Greenhouse gas emissions from the three Oregon natural gas companies would have to be reduced by 10 to 15 percent from their projected levels in 2020 to achieve the SB 101 goals. On average, the estimated natural gas rates in 2020 would be about 1 percent higher than current rates.

Electric and Natural Gas Company Rate Impacts to Meet 2020 Greenhouse Gas Emission Reduction Goals

1. Introduction

    a. Background

    Senate Bill (SB) 101, enacted in the 2009 Legislative session, requires the Public Utility Commission of Oregon to report to the Legislature before November 1 of each even-numbered year on the estimated rate impacts of Oregon's regulated electric and natural gas companies meeting greenhouse gas emission reduction goals in 2020. The emission reduction goals are the following:

    - Reduce greenhouse gas emissions 10 percent below 1990 levels by 2020
    - Reduce greenhouse gas emissions 15 percent below 2005 levels by 2020

    b. Basics

    To get the most from this report there are several basics that need to be understood. These basics are discussed below.

    The term "greenhouse gas" is defined in ORS 468A.210 as meaning any gas that contributes to anthropogenic (human caused) global warming including, but not limited to, carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride. As a result, carbon dioxide is just one of a number of greenhouse gases. Direct comparison of gaseous emissions other than carbon dioxide is provided by translating those emissions into carbon dioxide equivalents using "global warming potentials". Global warming potentials are published by the Intergovernmental Panel on Climate Change. For the purposes of this report the terms "carbon", "greenhouse gas", "carbon dioxide", and "carbon dioxide equivalent" are used synonymously.

    The January 2009 Oregon Global Warming Commission Report to the Legislature, Appendix B, presented estimated greenhouse gas emissions (carbon dioxide only) from electricity consumption in Oregon during 1990 to be 16.70 million metric tons (million tonnes carbon). The estimate for 2005 is 23.86 million tonnes carbon. ORS 757.600 defines "electric company" as an entity engaged in the business of distributing electricity to retail electricity consumers in this state, but does not include a consumer-owned utility. This definition leaves "electric company" to include only the investor-owned electric utilities. The Public Utility Commission (PUC) developed an estimate of the portion of total greenhouse gas emissions from electricity consumption in Oregon attributable to electric companies utilizing data provided by the electric companies. That estimate is 16.22 and 22.33 million tonnes carbon emitted in 1990 and 2005, respectively.

    The Global Warming Commission also reported estimated greenhouse gas emissions from natural gas and oil systems (transmission system chronic leaks, compressor fugitives, compressor exhaust, vents, and pneumatic devices; and

distribution system chronic leaks, meters, regulators, and mishaps) in Oregon. These estimates include emissions from the natural gas transmission system in the state, which is not the responsibility of the natural gas companies. Also, the estimates are based on national data which includes systems that are older, and as a result emit more greenhouse gasses, than the natural gas systems in Oregon. Because the Global Warming Commission estimates include more sources of emissions than just those the gas companies are responsible for, they are not used in this report. Instead, greenhouse gas emissions estimates provided by the natural gas companies are used.

c. Assumptions

The greenhouse gas reduction goals in SB 101 are assumed in this rate impact estimate to be uniformly applied as a percent across the electric companies and natural gas companies. Because the cost per ton of greenhouse gas emission reduction may not be uniform between the companies this assumption may not be the most economical for the ratepayers as a whole. This approach may be revised for future reports.

Related to natural gas companies, the SB 101 greenhouse gas emissions reduction goals are interpreted as applying to greenhouse gas emissions from their operations and facilities. Because Northwest Natural Gas Company (NW Natural) represents approximately 81 percent of natural gas sales in Oregon, the PUC elected to apply their analysis and results to Avista Utilities (Avista) and Cascade Natural Gas Corporation (Cascade). This approach may be revised for future reports.

This report was prepared by the PUC. However, the electric and natural gas companies regulated by the PUC were integrally involved in the process. Specifically, Portland General Electric Company (PGE), PacifiCorp, and Idaho Power Company (Idaho Power) provided the following information to support preparation of this report:[1]

- Integrated Resource Plan base case and compliance case resource portfolios comprised of generating technologies that are commercially and financially viable.
- Estimated greenhouse gas emissions for 1990, 2005 and for the 2020 base case.
- Cumulative and year-by-year rate impacts to customers associated with reaching the 2020 emissions reduction goals.

Further they were requested to utilize the following assumptions in their work:

- Base the analysis on attaining the greenhouse gas emission reduction goals by January 1, 2020.

[1] Cascade provided greenhouse gas emission information but was not in a position to provide rate impact information.

- For rate impact estimation compare the portfolio which meets the greenhouse gas emission reduction goal (compliance portfolio) to the integrated resource plan (IRP) preferred portfolio.

  Calculate the rate impacts as a percent change in a manner similar to: (Compliance NPVRR-Preferred NPVRR)/Current NPVRR. NPVRR is net present value of revenue requirements, including all generation, distribution, transmission, customer service, sales, and administrative and general costs.

- For electricity supplied through net market purchases, standard offer sales, and electricity service suppliers, utilize 900 pounds carbon dioxide per megawatt-hour (loosely based on USEPA AP-42 for natural gas combustion), unless a different source and environmental impact can be demonstrated.

- Use the price per ton of CO2 emissions assumed in preparation of their IRP.

- Use current resource costs, including the various incentives.

The information received from the electric and natural gas companies was reviewed by the PUC for consistency and reasonableness. The information was then summarized and incorporated into this report. The information received from the companies is included in Appendix A.

Lastly, the electric and natural gas companies were provided an opportunity to review draft and preliminary versions of this report and to participate in an informal workshop on October 6, 2010 with PUC staff to discuss the preliminary report. Public comment on the draft final report was received at a PUC public hearing on October 26, 2010.

2. Portland General Electric (PGE)

Any forecast of rate impacts to reach a given policy goal by 2020 is contingent on many assumptions, as well as uncertainties about future power supply options and costs. Accordingly, it is important to recognize that the potential range of variability associated with such forecasts can be significant. In addition, it is important to recognize that accomplishment of the SB 101 greenhouse gas emissions reduction goals will require a significant change to the electric system. Large changes to the electric system may cause significant unforeseen operational issues requiring significant additional capital expenditures thereby significantly increasing the impact to customer rates.

To meet the SB 101 greenhouse gas emissions reduction goals, PGE assumes all their coal fired plants (Boardman and Colstrip) are shut down on December 31, 2019. For modeling purposes, any residual fixed revenue requirement is discounted back and recovered in 2019. Generating resources to replace Boardman and Colstrip are added on January 1, 2020. PGE modeled three alternate replacement portfolios:

For the 1990 less 10 Percent Goal:

- Coal is replaced with 2,362 MW of Pacific Northwest wind power and 557 MW of additional natural gas fired simple cycle combustion turbine (SCCT) power.

For the 2005 less 15 Percent Goal:

- Coal fired generation is replaced with 716 MW of natural gas fired combined cycle combustion turbine (CCCT) power.

- Coal fired generation is replaced with 441 MW of CCCT power, 566 MW of wind power, and 207 MW of SCCT power.

These replacement portfolios rely on existing technology. However, technical and financial implementation of these resource strategies could prove challenging because of the magnitude and type of the investments involved.

In the analysis performed to support this report, maintaining compliance with the greenhouse gas emissions reduction goals beyond 2020 presents a significant challenge. For example, assuming a portfolio meets the 2020 goal, then after 2020 all new load growth (net of energy efficiency) will have to be met with non-emitting renewable resources. Thus, while it will be challenging to meet the 2020 goals, maintaining the goals will also be difficult.

a. Analysis Methodology

PGE's approach for the estimation of rate impacts was to develop IRP resource portfolios that result in the required reductions in greenhouse gas emissions. Once developed, these portfolios were run through PGE's IRP model to calculate total emissions, as well as portfolio costs for the calculation of rate impact measures. For the base portfolio to which the emission target portfolios are compared, PGE used their 2009 IRP Preferred Portfolio No. 18, BART III.

Specific modeling assumptions include:

- The PGE 2009 IRP preferred portfolio assumes that the Boardman plant runs through December 31, 2020. It also assumes that the Colstrip plant is fully depreciated by 2024, but continues to operate.

- All predictable costs/impacts related to the assumed replacement portfolio (including accruals for eventual decommissioning costs) are included. Cost assumptions are based on the 2009 IRP.

- Modeling of the replacement portfolios was performed during the IRP preparation process.

- CO2 emissions prices are assumed to be $30/ton in real levelized 2009 dollars, starting in 2013. See the 2009 IRP, Chapter 6 for more detail.

- Resource costs use assumptions specified in Chapter 7 of the 2009 IRP

- The rate impact calculation for a given year, to be consistent with presenting yearly rate impacts, is as follows:

  (Goal Portfolio Revenue Requirement in that year - Preferred Portfolio Revenue Requirement in that year) / Current Revenue Requirement with Load Growth to that year.

There are numerous other assumptions and factors considered by PGE in their analysis. These are discussed in their October 20, 2010 letter included in the Appendix.

b. Greenhouse Gas Emissions

PGE estimates their greenhouse gas emissions for 1990 and 2005 were 4.20 million tonnes carbon and 7.72 million tonnes carbon, respectively. PGE estimates their greenhouse gas emissions in 2020 would be 8.16 million tonnes carbon for their Preferred Portfolio (BART III).

Applying the SB 101 greenhouse gas emissions reduction goals for 2020 results in allowable greenhouse gas emissions for PGE of 3.78 million tonnes carbon to meet the 10 percent below 1990 goal and 6.56 million tonnes carbon to meet the 15 percent below 2005 goal. Reaching the 1990 less 10 percent goal requires a 54 percent reduction in emissions from the Preferred Portfolio (BART III) while achieving the 2005 less 15 percent goal requires a 20 percent reduction.

The modeled replacement portfolios all meet the 2005 less 15 percent emission reduction goals in 2020, while only the “all-wind” portfolio meets the 1990 less 10 percent goal. The 1990 less 10 percent “all-wind” portfolio is estimated to provide emissions of 3.77 million tonnes carbon, a 10 percent reduction in greenhouse gas emissions. The 2005 less 15 percent “gas” portfolio is estimated to result in emissions of 6.11 million tonnes carbon, a 21 percent reduction of greenhouse gas emissions. Lastly, the 2005 less 15 percent “gas and wind” portfolio is estimated to produce emissions of 5.55 million tonnes carbon, for a 28 percent reduction. These percent reductions are based on 1990 CO2 emissions of 4.20 million tonnes carbon (4,633,222 tons) and 2005 CO2 emissions of 7.72 million tonnes carbon (8,506,794 tons).

c. Estimated Rate Impacts

Incremental rate impacts were computed relative to a base revenue requirement approximating PGE's UE-215 rate case for 2011, with assumed load growth thereafter. Further, rate impact estimates are relative to PGE's BART III proposal for the Boardman coal fired plant. Note that the incremental resource actions occur over

the 2019-2020 period. As a result, there are very minimal or no incremental rate impacts estimated prior to 2019.

In PGE's case, the 2005 less 15 percent goal is clearly more actionable than a 1990 less 10 percent goal. Nonetheless, the total rate impact to customers is not fully reflected in their analysis. Estimated incremental rate increases to customers resulting from the actions assumed in this report must also be considered in the broader context of other complementary actions to reduce greenhouse gas emissions, as well as general business increases needed to enable PGE to continue to reliably meet customer load. It is important to note that these are incremental increases due solely to actions taken to reach the 2020 greenhouse gas emissions reduction goals that are above and beyond complimentary actions underway or planned, the costs for which could properly be attributed to reaching the goals.

The estimated rate impact on PGE's customers of achieving the 1990 less 10 percent greenhouse gas emissions reduction goal is a 38 percent increase. The estimated rate impact of attaining the 2005 less 15 percent goal assuming the "gas" replacement portfolio is an 11 percent rate increase. The estimated rate impact of attaining this goal assuming the "gas and wind" replacement portfolio is a 16 percent increase.

3. PacifiCorp

To reach the goal of reducing 2020 greenhouse gas emissions to 10 percent less than they were in 1990 or 15 percent less than the 2005 emissions, PacifiCorp assumes reducing generation from coal fired plants on a system-wide basis and adding natural gas, demand-side management programs, and renewable resources to meet load requirements and capacity planning needs.

As loads continue to grow beyond 2020, PacifiCorp would have to add renewable resources to maintain its coal fired generation strategy, and to comply with the 2050 greenhouse gas emissions reduction goal. As a result, customer rates would likely receive upward pressure beyond 2020. The resulting increase in rates beyond 2020 have not been quantified in this report.

a. Analysis Methodology

PacifiCorp's overall approach for the estimation of rate impacts was to use their IRP models to develop resource portfolios that result in the targeted reductions in greenhouse gas emissions. In addition to specifying the resource portfolios, System Optimizer© determined portfolio costs that were fed into a full revenue requirements model for calculation of the rate impacts. For the base portfolio to which the emission goal portfolios are compared, PacifiCorp used the Preferred Portfolio from the Company's 2008 Integrated Resource Plan Update. To account for up-to-date market price and load forecasts used for the study, System Optimizer© was allowed to optimize firm market purchases for this base portfolio.

To meet the 10 percent below1990 greenhouse gas emissions reduction goal an incremental 1,212 MW of natural gas fired resources are assumed to be added.

To meet the 15 percent below 2005 greenhouse gas emissions reduction goal an incremental 1,393 MW of natural gas fired resources are added to company's resource mix. A significant quantity of the additional natural gas fired resources is assumed to be SCCTs that serve as replacements for market transactions during summer months. Also, a significant amount of wind power is included to meet the 10 percent below 1990 greenhouse gas emissions reduction goal, totaling 1,340 MW by 2020.

Critical assumptions for this rate impact study are as follows:

- Greenhouse gas emission goals and resource portfolio costs are modeled on a PacifiCorp system-wide basis with costs allocated to Oregon based on the current Multi-state Protocol;

- Energy and demand growth is offset by new natural gas fired generation as well as energy efficiency and load control programs;

- Oregon or some other state will allow incremental natural gas generation to be built even though such incremental generation may increase greenhouse gas emissions in that state;,

- The option to reduce greenhouse gas emissions during the study period by purchasing zero or low-emissions energy in the wholesale market is not available because any such energy will be needed by the owner/contracting party to reduce their own emissions;

- PacifiCorp will not be able to make wholesale sales from thermal generation since potential buyers must also reduce emissions, and PacifiCorp's natural gas fired generation would be used to offset reduced coal fired generation; and

- PacifiCorp must continue to meet its current 12 percent capacity planning reserve margin target.

PacifiCorp does not anticipate early coal fired plant retirements during the 10-year period covered by this study, or acquisition of resources that are not currently commercially or financially available.

b. Greenhouse Gas Emissions

PacifiCorp estimates their greenhouse gas emissions for 1990 and 2005 were 11.69 million tonnes carbon and 14.27 million tonnes carbon, respectively. These estimates are based on system-wide CO2 emissions and 25.82 percent allocation to Oregon (allocation calculated using energy sales data in the 2009 Oregon Utility Statistics published by the PUC). PacifiCorp estimates their greenhouse gas emissions in 2020 would be approximately 15.36 million tonnes carbon for their

Preferred Portfolio (this estimate includes an adjustment applied by the PUC to account for emissions from energy purchases).

Applying the SB 101 greenhouse gas emissions reduction goals for 2020 results in allowable greenhouse gas emissions for PacifiCorp of 10.51 million tonnes carbon to meet the 10 percent off 1990 goal and 12.13 million tonnes carbon to meet the 15 percent off 2005 goal. Reaching the 1990 less 10 percent goal requires a 31 percent reduction in emissions from the Preferred Portfolio while achieving the 2005 less 15 percent goal requires a 21percent reduction.

As mentioned above, PacifiCorp assumes reducing generation from coal fired plants on a system-wide basis and adding natural gas fired resources, demand-side management programs, and renewable resources to meet load requirements and capacity planning needs. This strategy is anticipated to meet both the 1990 less 10 percent and the 2005 less 15 percent greenhouse gas emission reduction goals in 2020. The 1990 less 10 percent portfolio is estimated to provide emissions of 10.51 million tonnes carbon. The 2005 less 15 percent portfolio is estimated to result in emissions of 12.13 million tonnes carbon. These estimates are based on system-wide 1990 CO2 emissions of approximately 45.27 million tonnes carbon (49,900,000 tons), 2005 CO2 emissions of approximately 55.25 million tonnes carbon (60,900,000 tons), and 25.82 percent allocation to Oregon (allocation calculated using energy sales data in the 2009 Oregon Utility Statistics published by the PUC).

c. Estimated Rate Impacts

The estimated rate impacts for the two greenhouse gas emissions reduction scenarios: Scenario 1 (10 percent less than 1990 goal); and Scenario 2 (15 percent less than 2005 goal) utilize the full revenue requirements in the latest baseline forecast prepared for the Multistate Process (MSP). The estimated rate impacts also include the Oregon system generation factors from the MSP analysis.

The estimated rate impact on PacifiCorp's rate payers for achieving the SB 101 greenhouse gas emissions reduction goals is a 20 percent increase to achieve the 1990 less 10 percent goal, and an 11 percent increase to attain the 2005 less 15 percent goal.

4. Idaho Power Company (Idaho Power)

Idaho Power's preferred portfolio of resources identified in the 2009 IRP combined with a coal fired plant curtailment operational strategy is expected to result in reduced greenhouse gas emissions as compared to 1990 levels. The same strategy is expected to result in reduced emissions compared to 2005 levels.

Idaho Power projects it would be able to achieve the required emissions reductions under a "Coal Curtailment" scenario by curtailing coal fired generation primarily in the spring and fall months when the company typically has surplus generation capacity. However, this approach would not avoid the need for additional resources in the long-run. As loads continue to grow beyond 2020, Idaho Power would have to add resources in the form of additional

transmission capacity and wind and gas-fired generation. Therefore, customer rates would likely receive upward pressure beyond 2020 as Idaho Power makes additional investments to maintain the SB 101 emissions reduction goals. The resulting increase in rates beyond 2020 have not been quantified in this report.

a. Analysis Methodology

To support an estimate of the rate impact for meeting the SB 101 goals Idaho Power's 2009 IRP Preferred Portfolio was used as the starting point. They then analyzed a "With Coal Curtailment" and a "No Coal Curtailment" scenario to represent "with SB 101 goals" and "without SB 101 goals" cases. Through 2020 the generation resource build out is the same under both scenarios. However, the "With Coal Curtailment" scenario includes an operational strategy that would curtail the usage of the company's coal fired resources to attain the greenhouse gas emissions reduction goals. Under the "No Coal Curtailment" scenario, the company would continue to operate its coal fired resources to their full production capabilities.

b. Greenhouse Gas Emissions

Idaho Power estimates their greenhouse gas emissions for 1990 and 2005 were 0.33 million tonnes carbon and 0.35 million tonnes carbon, respectively. Idaho Power estimates their greenhouse gas emissions in 2020 would be 0.36 million tonnes carbon for their "No Coal Curtailment" scenario. These estimates are based on system-wide CO2 emissions and a 4.82 percent allocation to Oregon.

Applying the SB 101 greenhouse gas emissions reduction goals for 2020 results in allowable greenhouse gas emissions for Idaho Power of 0.30 million tonnes carbon to meet the 10 percent below 1990 goal and 0.30 million tonnes carbon to meet the 15 percent below 2005 goal. Reaching either the 1990 less 10 percent goal or 2005 less 15 percent goal requires a 16 percent reduction in emissions from the "No Coal Curtailment" scenario.

The company's planned resource build out and operational strategy detailed in the 2009 IRP is estimated to meet both the 1990 less 10 percent and 2005 less 15 percent emission reduction goals in 2020. The estimated greenhouse gas emissions are 0.27 million tonnes carbon, for a 17 percent reduction form 1990 and 22 percent reduction from 2005. These estimates are based on system-wide CO2 emissions and a 4.82 percent allocation to Oregon.

c. Estimated Rate Impacts

To develop an estimate of the rate impact for meeting the SB 101 goals Idaho Power prepared an analysis that presents the cost difference between its "With Coal Curtailment" and a "No Coal Curtailment" scenarios to represent "with SB 101 goals" and "without SB 101 goals" cases. The generation resource build out is the same under both scenarios with cost deviations occurring only in power supply expense (assuming the CO2 emissions price is $0 per ton of CO2 rather than $43 per ton as assumed in the IRP).

As stated above, the variance in costs between the "With Coal Curtailment" and the "No Coal Curtailment" scenarios is created by differences in power supply expenses

and CO2 tax related costs. The annual power supply expenses for each scenario through 2020 were developed using the company's IRP model. The "No Coal Curtailment" scenario was assigned a CO2 emissions price of $0 per ton of CO2 emitted and modeled within the IRP model to simulate a base case where there are no greenhouse gas emissions reduction goals. Due to the estimated load growth percent between 1990 and 2005, the difference in power supply cost for meeting the 10 percent off 1990 emissions goal and 15 percent off 2005 emissions goal is the same.

The estimated customer rate impact of the Company's "With Coal Curtailment" scenario is an increase of 3 percent for both the 1990 less 10 percent and 2005 less 15 percent goals.

5. Natural Gas Companies

As discussed above, the SB 101 greenhouse gas emissions reduction goals are interpreted as applying to greenhouse gas emissions from the natural gas company operations and facilities. The greenhouse gas emissions attributable to Oregon's natural gas companies stem largely from distribution system and gas equipment methane leaks, but also include company facility energy usage and operation of company fleet vehicles. These emissions do not include the emissions from burning natural gas directly in homes and businesses, and are small in comparison to the emissions from direct burning of natural gas.

The IRP process for natural gas companies does not directly or specifically evaluate operations and facilities as they relate to greenhouse gas emissions. As a result, the rate impact analysis in this report for natural gas companies does not utilize IRP modeling but rather analysis prepared specifically for this report. Because NW Natural represents approximately 81 percent of natural gas sales in Oregon, the PUC elected to use its analysis and results to augment information provided by Avista and Cascade.

Maintaining compliance with the 2020 goals in SB 101 and attaining the 2050 greenhouse gas emissions goals would require the natural gas companies to annually purchase greenhouse gas emissions offsets (permits) to cover the increment of emissions that could not be reduced through improvements, and to cover any new emissions reductions associated with either customer or company growth. The estimated rate impact associated with this on-going purchase of offsets is estimated to be small.

a. Analysis Methodology

Greenhouse gas emissions from company operations and facilities includes those resulting from natural gas and electricity usage for space and water heating, natural gas and electric power usage for operations including compressors, fugitive methane emissions from operations, and the operation of fleet vehicles to service customers.

Reductions in greenhouse gas emissions are available through improving the efficiency of facility energy use and converting fleet vehicles to run on compressed natural gas (CNG). Fugitive methane emissions associated with line losses can be reduced by replacing and improving distribution pipelines. Since NW Natural has replaced most of its steel pipe and is among the nation's leaders in reducing "unaccounted for gas," limited opportunity remains to reduce its emissions associated with pipeline losses.

NW Natural preliminarily evaluated these sources of greenhouse gas emissions to identify potential operations and facility improvements that could result in emissions reductions. The improvements were then evaluated for feasibility and estimated emissions reductions before progressing to the rate impact estimation process.

b. Greenhouse Gas Emissions

Oregon's natural gas companies take seriously their responsibility to reduce their impact on local and global environments. An example of this came in 2007 when NW Natural became its own first Smart Energy™ customer. Smart Energy™ is a program allowing customers to purchase greenhouse gas offsets as a way of helping to fund greenhouse gas reducing projects. NW Natural committed to offsetting 100 percent of the CO2 associated with its natural gas heating use for the first five years of the Smart Energy™ program. NW Natural estimates its Smart Energy™ participation will reduce greenhouse gas emissions by the equivalent of 0.0056 million tonnes carbon (6,160 tons of CO2).

Greenhouse gas emissions from company operations and facilities includes those resulting from distribution system chronic leaks, meters, regulators, and mishaps; natural gas combustion and electricity usage for space conditioning, lighting, water heating, and company equipment/appliances; and natural gas usage for back-up electricity generation. However, natural gas companies have few opportunities for reducing their company operation and facility emissions because distribution systems are efficient with few line losses, leaving only reductions through fleet and facility changes. Because of this, compliance with the 2020 goals is expected to require a combination of operations and facility improvements, and the purchase of greenhouse gas emission offsets.

NW Natural and Cascade developed estimates of their emissions from operations and facilities. The PUC developed the emissions estimate for Avista proportionately from that developed by and for NW Natural. NW Natural has a reasonable estimate of current greenhouse gas emissions associated with its operations, facilities and fleet use. However, the Company does not have historical data to develop a 1990 baseline or even a historic trend. NW Natural's current emissions are therefore used as its 1990 baseline, and growth is assumed to be flat. Similarly, Cascade has no way of determining 1990 base levels of greenhouse gas emissions because it does not have historical energy consumption records dating back to this period. For the purposes of this study Cascade assumed that its current emissions are its 1990 baseline and that these emissions will remain static through 2020. As a result of the above, greenhouse gas emissions for 1990, 2005, and 2020 for the three natural gas companies are estimated to be 0.03 million tonnes carbon. This total is comprised of 0.0311, 0.0015 and 0.0009 million tonnes carbon for NW Natural, Avista and Cascade respectively .

Based on the emissions reduction goals in SB 101, and the discussion above, the allowable greenhouse gas emissions in 2020 for the three natural gas companies is 0.03 (0.0300) million tonnes carbon for the 1990 less 10 percent goal and 0.03 (0.0283) million tonnes carbon for the 2005 less 15 percent goal. Achieving the 1990 less 10 percent goal requires a 10 percent reduction in emissions from the

"business as usual" operating scenario while achieving the 2005 less 15 percent goal requires a 15 percent reduction.

Estimated greenhouse gas emission reductions from the feasible operation and facility improvements total 4.5 percent. The reductions from feasible operation and facility improvements are estimated to fall short of compliance with the SB 101 greenhouse emissions reduction goals. As a result, compliance is estimated to also require the purchase of greenhouse gas emission offsets.

c. Estimated Rate Impacts

To develop an estimate of the rate impact for meeting the SB 101 emissions reduction goals NW Natural prepared a conceptual level cost estimate for the feasible operation and facility improvements identified. The estimated cost of improvements to meet the 10 percent off 1990 goal is $3,009,804 and to meet the 15 percent off 2005 goal is $3,047,142. These estimates include the cost of purchasing greenhouse gas emissions offsets at $24 per ton.[2] The estimates differ only in the amount of offsets purchased, and are considered in this report so close as to be the same. The rate impacts derived using NW Natural's current revenue requirement of $320 million are approximately 1 percent. NW Natural provided these estimated costs with the understanding that the analyses on which these estimates are based incorporate numerous assumptions about uncertain future events, any of which may prove inaccurate. The PUC applied the same 1 percent rate impact to Avista and Cascade of reaching the SB 101 emissions reduction goals in 2020.

[2] Carbon offsets prices are based on the carbon adder included in NW Natural's 2011 Integrated Resource Plan (IRP), which is forecast to begin 2014 at $15 per ton and to escalate at a compound annual growth rate of 7.8%.

Appendix

Portland General Electric Company – October 20, 2010 Cover Letter and enclosure

Portland General Electric Company – October 26, 2010 Preferred Portfolio Emissions email

PacifiCorp - September 27, 2010 Rate Impacts of Meeting Oregon SB 101 Carbon Dioxide Emission Goals

PacifiCorp – October 27, 2010 SB 101 Rate Impact email

Idaho Power Company - September 19, 2010 Draft Report and Power Supply Comparison

Idaho Power Company – October 26, 2010 SB 101 Rate Impact email

Northwest Natural Gas Company - October 11, 2010 NWN CO2 Emissions Reductions

Northwest Natural Gas Company – October 26, 2010 SB 101 Rate Impact email

Cascade Natural Gas Corporation – October 15, 2010 Data Response for "Electric and Natural Gas Company Rate Impacts to Meet 2020 Greenhouse Gas Emission Reduction Goals