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REPORT NAME: NW Natural's 2016 Greenhouse Gas (GHG) Compliance Report

COMPANY NAME: NW Natural

DOES REPORT CONTAIN CONFIDENTIAL INFORMATION? No Yes

If yes, please submit only the cover letter electronically. Submit confidential information as directed in OAR 860-001-0070 or the terms of an applicable protective order.

If known, please select designation: RE (Electric) RG (Gas) RW (Water) RO (Other)

Report is required by: OAR 860-085-0050(1)

Statute

Order

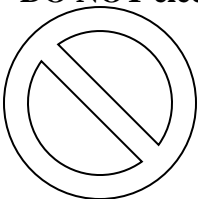
Other

Is this report associated with a specific docket/case? No Yes

If yes, enter docket number: RG 46

List applicable Key Words for this report to facilitate electronic search:
2016, Greenhouse Gas, GHG, Carbon, NW Natural

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June 30, 2016

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Attn: Filing Center

Re: RG-46, OAR 860-085-0050(1) Greenhouse Gas (GHG) Compliance Report

Northwest Natural Gas Company, dba NW Natural (NW Natural or Company), submits this letter in compliance with OAR 860-085-0050(1), which requires natural gas utilities to report the greenhouse gas (GHG) emissions it expects to have from Company operations in 2020 and the costs it may incur to reduce 2020 GHG emissions to a level that is 10% lower than its 1990 emissions and 15% lower than its 2005 emissions. This information will inform Staff's report to the legislature, required per OAR 860-085-0050(7) that will include the estimated rate impacts for reducing utilities' GHG emissions by State's established targets.

NW Natural identified its sources of GHG emissions as: 1) its operations and facilities, 2) its natural gas usage for operations including compressors, 3) its operation of fleet vehicles to service customers; and 4) natural gas leaks commonly referred to as fugitive emission. Fugitive emissions were first added to the Company's 2014 GHG Compliance Report.

Since the goal of this effort is to determine the emissions reduction required to achieve the goals of being 10% below 1990 emissions and 15% below 2005 emissions in 2020, the Company began its analysis by establishing its 1990 and 2005 emissions. NW Natural does not have historical energy consumption data necessary for determining its 1990 or 2005 GHG emissions. For this report, NW Natural uses the average emissions for 2008 and 2009 as the proxy for both 1990 and 2005. The Company believes this is a reasonable assumption because, in spite of serving more customers, the Company is more efficient, has a tighter system, and has fewer employees now than it had in 1990. Column A in Table I below shows the average emissions for 2008-2009 as they were reported to the Commission in 2012, including a value for fugitive emissions using the estimation process established by the Environmental Protection Agency (EPA) in 40 Code of Federal Regulations (CFR) part 98 subpart W, also known as the Greenhouse Gas Reporting Program.

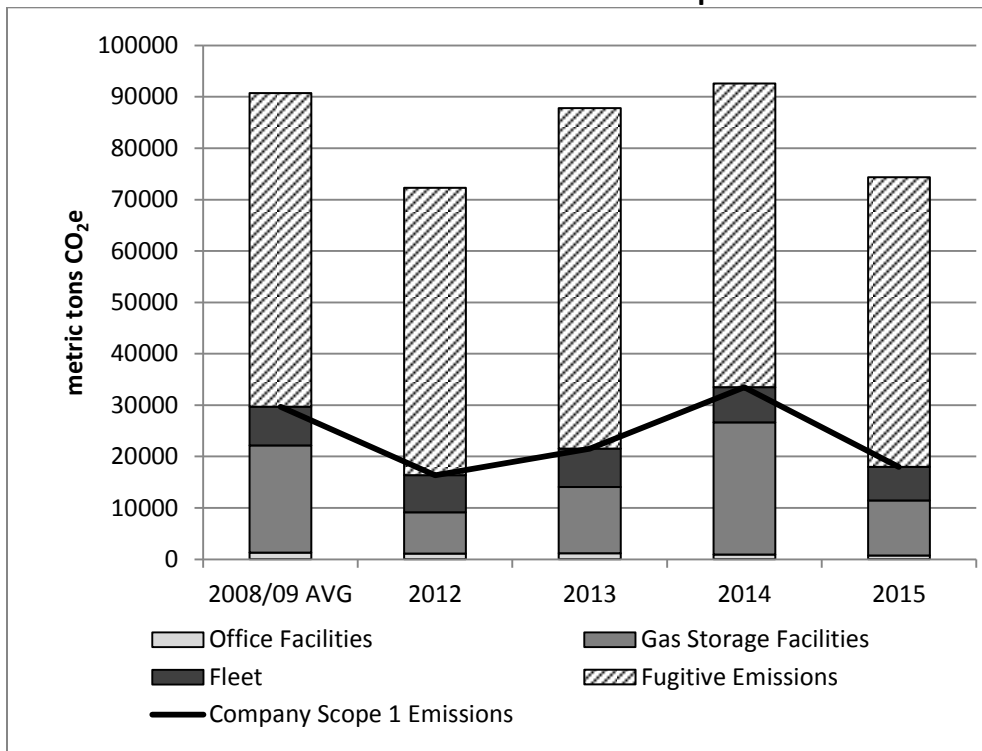
Table I – NW Natural's Operational GHG Emissions

	A	B	C	D	E
NW Natural Scope 1 Emissions	<u>2008-2009</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>
Office Facilities	1,275	1,067	1,169	910	738
Gas Storage Compression	20,845	8,038	12,905	25,747	10,710
Fleet	7,533	7,255	7,219	6,790	6,543
Fugitive Emissions	61,068	55,915	66,220	59,112	56,310
Total CO₂e Footprint	90,721	72,275	87,513	92,558	74,301
*Proxy for 1990 and 2005 emissions levels submitted in prior reports					

Table I also provides the Company's 2015 emissions, which are the proxy for 2020. The Company assumes that its emissions related to its fleet and office facilities will remain steady through 2020. The Company does not foresee significant long-term changes in these areas, and, as mentioned, the Company is mindful to ensure that it makes energy efficient equipment purchases, building retrofits, and new fleet choices. Presumably gained efficiencies could offset the impact of increased operations, were that to occur. But, as noted previously, the Company's operations have reduced in size in spite of serving more customers.

Figure I below provides a graphical illustration of the source and amount of the Company's GHG emissions over the past four years as compared to the proxy baseline.

**Figure I- NW Natural GHT emissions by source
 NW Natural GHG Footprint**



Fugitive emissions may be the Company's largest source of GHG emissions. In consideration of this, it is interesting to note that NW Natural has one of the tightest systems in the country as it has completed both cast iron and bare steel replacement programs on its system. The Company further notes that the measurement of fugitive gas is an *estimated value* based on assumptions established by the EPA for pipe composition and system characteristics. It is the Company's expectation that the measurement of fugitive emissions will become better refined over time.

Recent research coordinated by the Environmental Defense Fund and conducted by research institutions has resulted in more accurate measures of natural gas emissions by sector. NW Natural participated in a study of 13 natural gas utilities around the country. The results of that study, *Direct Measurements Show Decreasing Methane Emissions from Natural Gas Local Distribution Systems in the United States*¹, published in the Journal of Environmental Science and Technology, indicated that the EPA emission factors for distribution pipelines within the Greenhouse Gas reporting program overstated the emissions of the distribution sector significantly.

The studies confirmed that NW Natural's system is low emitting. Empirical data collected on NW Natural's system indicated that the company's emissions were approximately 90% lower than EPA's factors. This study further supports proactive measures to replace cast iron and bare steel mains and services as these pipeline types were shown in the study to be the most leak prone. Because NW Natural completed a system-wide cast iron replacement program in 2000 and completed the removal of all known bare steel mains and services in 2015, the leak prone pipeline material is not contributing to fugitive emissions from the NW Natural system. The EPA has adopted the outcomes of this research to improve and update emission factors for increased accuracy in the Greenhouse Gas Reporting Program. These changes will be enacted starting in 2016.

Another major factor in the Company's level of GHG emissions is its use of compressors to move gas in and out of storage. Two factors impact how frequently gas storage facilities are operated. Firstly, when gas prices are volatile, storage gas is used more as a least cost supply-side resource. With the continued high availability of low cost domestic gas on the market, gas prices continue to be lower and less volatile. Secondly, when cold weather events result in high gas send-outs, gas storage is utilized to meet customer demand. This results in increased operation of compressors as natural gas that is moved out of storage for the weather event is replaced. When gas storage usage is up, the Company has more GHG emissions. The second scenario related to cold weather events is reflected in the significant increase to company operations emissions in 2014.

Table II below provides a breakdown of the Company's GHG emissions assumptions and the two 2020 emissions targets for both a typical year, characterized by 2015 emissions and a high storage year using 2014 as representative.

¹ Lamb, B., PhD. (2015, March 31). Direct Measurements Show Decreasing Methane Emissions from Natural Gas Local Distribution Systems in the United States. Journal of Environmental Science and Technology, 49(8), 5161-5169. doi:DOI: 10.1021/es505116p

Table II (emissions expressed in MT CO₂e)

10% below 1990		15% below 2005	
Assumed 2020 emissions at 2015 level	74,301	Assumed 2020 emissions at 2015 level	74,301
Assumed 2020 emissions at 2014 level	92,558	Assumed 2020 emissions at 2014 level	92,558
1990 emissions	90,721	2005 emissions	90,721
10% reduction below 1990	9,072	15% reduction below 2005	13,608
2020 emissions target ¹	81,649	2020 emissions target ¹	77,113
Reduction required from assumed 2020 emissions level at 2015 emission rate	none	Reduction required from assumed 2020 emissions level at 2015 emission rate	none
Estimated Cost for Offsets ²	\$0.00	Estimated Cost for Offsets ²	\$0.00
Reduction required from assumed 2020 emissions level at 2014 emission levels	10,909	Reduction required from assumed 2020 emissions level at 2014 emission levels	15,445
Estimated Cost for Offsets ²	\$136,908	Estimated Cost for Offsets ²	\$193,835

¹2020 Footprint is assumed to be equal to 2015

² Using the cost of carbon in the Base Case of the 2016 draft IRP, starting in 2021 at .07/therm or \$12.55/MT CO₂e

In 2015, the Company's GHG emissions were 18% lower than the 1990 and 2005 levels. If the Company's 2015 GHG emissions are unchanged through 2020, the reduction goals will be met. However, if significant weather events or change to gas availability and cost occur, some additional actions may be necessary to achieve the reduction goals. For example, a large cold weather event in the winter months of 2013 depleted natural gas storage. Operating the compressors to refill those stores in 2014 resulted in a significant increase in emissions. The emissions in 2014 were 2% higher than the 1990 baseline.

Because reduction activities and their costs cannot yet be known, it would be likely that NW Natural would have to purchase offsets to meet the standard in a year like 2014. The Company assumes the cost of offsets needed to achieve the goal of 10% below 1990 levels would be \$136,908. The offsets needed to achieve the goal of 15% below 2005 levels have an estimated cost of \$193,835. These values are based on the Base Case carbon price forecast from the draft NW Natural 2016 Integrated Resource Plan².

NW Natural provides this information with the understanding that this analysis incorporates numerous assumptions about uncertain future events, any of which may prove inaccurate.

Please contact me at (503)226-4211, extension 5865, if you have questions.

² See Chapter 4 in NW Natural's 2016 IRP, draft filed in Docket No. LC 64. The values use the cost of carbon in the Base Case of the 2016 draft IRP, starting in 2021 at .07/therm or \$12.55/MT CO₂e.

Sincerely,

/s/ Gail Hammer

Gail Hammer