August 28, 2017

The following summary was prepared by the Duke University Facilities Management Department's Utilities & Engineering team and was provided to the Public Staff and then by the Public Staff to the entities and individuals who participated in the August 25, 2017 stakeholders' meeting related to Docket No. G-9, Sub 698.

With an annual natural gas consumption of 1.6-1.8 billion cubic feet (BCF), Duke University is consistently one of the largest non-utility-sector natural gas consumers in the state of North Carolina. We view a supply of renewable natural gas, up to an additional 1.6 BCF annually, as a key component of the Duke University Climate Action Plan. We offer the below information regarding the ability of the University to accept lower-heat-content gas, such as that derived from landfill and agricultural methane-capture systems. Such information is relevant to the topics being discussed at the stakeholders' meetings (for Docket No. G-9, Sub 698) being convened and facilitated by the Public Staff. Please note that we are not providing any information or opinion regarding the chemical constituent threshold values and testing requirements as proposed by Piedmont Natural Gas in its North Carolina Service Regulations, Appendix F, either in the originally-filed state at the opening of this docket, or in the most recent revision provided to all parties on 28 July 2017.

Duke University operates two large steam generation plants on its Durham campus, supplying a district heating system that provides space heating and humidification control, hot water for both domestic and process uses, and supports critical research- and health care-related processes (sterilization, high-temperature laundering, waste processing, etc.). On any given day, Duke University serves between 35,000 to 50,000 citizens of North Carolina and other visitors to Durham. These steam generation facilities house industrial-type boilers of varying ages and from varying manufacturers, with combustion and fuel train delivery control systems common to those found in other district energy and industrial settings. In short, reliable, efficient steam generation is essential to the success of Duke University and Duke University Health System. After an evaluation by the Facilities Management Department's Utilities & Engineering team and in consultation with our combustion equipment manufacturers, we find that our end-use equipment and the gas delivery systems can accept pipeline gas with a heat content of 960 British thermal units per cubic foot (Btu/scf) with no impact to safety and reliability of the campus.

There are two main factors that influence our conclusion, which are factors that regular and prudent engineering practices would take into account during evaluation of similar equipment at a peer facility. First, we note that reasonably modern combustion equipment control devices can be retuned at minimal cost to accept pipeline gas at 960 Btu/scf, and in some cases, even lower heat content. This re-tuning adjusts the fuel-to-air ratio for ideal or stoichiometric combustion and emission control, and optimization of energy output, whether in the form of steam or hot water for boilers, or for electric power production in the case of combustion turbines and reciprocating engines turning generators.

We also offer that the cost of retuning can be minimized by performing the work in coordination with annual or biennial boiler testing as required by the EPA's Maximum Achievable Control Technology (MACT) rules for boilers classified as major source emitters of air pollutants, and at required intervals for boilers classified as area source emitters complying with Generally Available Control Technology (GACT) rules. And, as the Public Staff, Utilities Commission, and other parties to this docket will know, combustion equipment classified as Electric Generating Units will have more frequent opportunities for coordination of re-tuning.

Secondly, it is the opinion of our experienced professional operations staff, and that of consulting engineers serving the university, that the engineering design community does not consider a heat content of 1030 Btu/scf to be the "typical" condition for pipeline natural gas in North Carolina. Rather, a heat content of 1015 Btu/scf has been the nominal value used in design calculations for specifying equipment, based both on historical averages for delivered North Carolina gas and on conservative practice of allowing a factor of safety for fluctuating heat content, as there is no minimum heat content guarantee provided by PSNC (our LDC gas utility) or suppliers upstream. Thus, this value of 1015 Btu/scf is used for calculating carrying capacity of pipes; for calculating equipment input, output, and efficiency rates; and performing other tasks associated with the design, operation, and maintenance of combustion equipment.

The differential between the nominal design condition of our pipeline natural gas and an operating condition of 100% renewable natural gas at 960 Btu/scf is only 55 Btu/scf, or 5.42%. We have determined that this boundary limit condition would be acceptable to Duke University with minimal to no change in existing equipment and operation. Should lower heat content gas be blended down with geologic natural gas at any proportion, this heat content differential would be even less, again requiring minimal to no change to equipment and operations.

Reliable energy sources play a large part in the continuous evaluation of our campus environment and the level of risk we will tolerate in service to our community. We note that lower heat content natural gas would not impact normal, safe, and responsible operation of the systems and equipment requiring pipeline-delivered natural gas as an energy source, nor would it impact Duke University or Duke University Health Systems ability to continue to provide uninterrupted and critical services to Durham, to North Carolina, and to all others who rely on the University.
