NATIONAL PROPANE GAS ASSOCIATION

December 20, 2013

Honorable Gina McCarthy
Administrator
Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Submitted via: carbonpollutioninput@epa.gov

Re: Standards of Performance for Greenhouse Gas Emissions From Existing Sources: Electric Utility Generating Units

Dear Ms. McCarthy:

The National Propane Gas Association (NPGA) appreciates this opportunity to offer its thoughts as to how the propane industry can play a role in meeting the objectives of the President's Climate Action Plan. As we will discuss below, NPGA urges EPA to include propane applications as compliance avenues in the guidance that it will issue to the states under Clean Air Act Section 111(d).

National Propane Gas Association

NPGA is the national voice for the propane gas industry. NPGA's 3,000 member companies—the majority of which are small family-owned businesses—fuel homes, businesses, and vehicles in all fifty states and employ approximately 40,000 industry employees nationwide. Propane is a non-toxic gas produced from natural gas processing and crude oil refining. Today approximately seventy percent of propane in the United States comes from the natural gas stream. The growth in American natural gas production over the last several years has brought with it an associated growth in propane supply. In fact, as recently as 2010, the U.S. was a net importer of propane. Today, America is a net exporter of propane. This surplus in clean American energy can, and should, be relied upon to advance America's energy security and environmental goals.

An Overview of Propane

Propane is a naturally occurring hydrocarbon commonly found in the production stream of oil and gas wells. With the chemical formula C_3H_8, it is one of the least complex hydrocarbons (technically an alkane). It is closely related to methane (natural gas), which, with the chemical formula CH_4, is the least complex of the hydrocarbons. Chemically, only ethane (C_2H_6) separates natural gas and propane. More complex hydrocarbons include butane, pentane, hexane, and octane. The molecular proximity of propane to methane has important real-world consequences, as we will discuss below.

Like natural gas, propane is colorless, odorless, and tasteless. (For both products the smell that people associate with them is artificially added at the retail level.) Both are gaseous at normal temperatures and pressures. As a result, both are readily usable as fuels in a number of applications. While natural gas liquefies at -162 Centigrade, propane liquefies at -42 Centigrade. With pressure, propane becomes a liquid at somewhat higher temperatures—hence "liquefied petroleum gas" (LPG), another name for propane. An important consequence of the difference in the temperatures at which the two compounds liquefy is that propane can be stored and transported in relatively lightweight containers and with much greater ease and economy than natural gas (in either a gaseous or liquefied state). While large volumes of propane are transported by petroleum products pipelines, it is also commercially feasible to transport it by rail, truck, ship, and barge. Technically those modes are possible for natural gas, but they are not generally economically feasible—on a retail basis—because natural gas, whether compressed or liquefied, requires much heavier storage containers and higher pressure or lower temperature. At ordinary temperatures and pressures natural gas is lighter than air, while propane is heavier than air.

Propane is produced (as with other more complex hydrocarbons) through two processes. First, it can be extracted from natural gas streams in natural gas processing plants. Second, it can be produced by refiners as part of the crude oil cracking process. Today the former method of production accounts for more than seventy percent of domestic supply. North American supplies of propane are adequate to meet the entire U.S. demand. Unlike customers of gasoline, diesel fuel, and heating oil, propane customers are not dependent upon supplies from foreign nations. (Although some propane is imported, the volume is less than the volume of exports.) Propane is in essence a byproduct, and, from a commercial perspective, production varies not so much with the demand for propane as the demand for the products of which it is a byproduct (natural gas and refinery products).

The nation is in the midst of a boom in natural gas production, largely involving the production of natural gas from shale formations. Because natural gas liquids draw higher prices in the market than natural gas on a British thermal unit (Btu) basis, producers are aggressively seeking shale gas that is rich in hydrocarbon liquids. As a result, domestic supplies of propane will be plentiful for the indefinite future. This overhang of supply is also likely to bring propane prices down over time, but this is by no means certain.

Propane has applications in residential and commercial markets for heating (furnaces, boilers, and gas logs), water heating, cooking, and clothes drying. It is well known across America, even among those who do not use it as a primary home fuel, as a fuel source for barbecues, outdoor stoves, heaters, and the like. More than 14 million American families use propane for these various applications. Approximately 10 million households heat with propane. Similarly, propane has wide usage as a cooking fuel in recreational vehicles and boats. Additionally, propane commands a significant market as a transportation fuel, for forklifts, buses, vans, trucks, and cars. Indeed, there are more propane vehicles on the road than either electric or natural gas vehicles. Propane is also used as a fuel in the industrial sector both for space heating and process applications. Propane is used on nearly one million farms for irrigation pumps, grain dryers, standby generators, and other farm equipment.

Propane is a low-carbon fuel. At the point of combustion it produces 62 kg of CO_2/MMBtu, compared to 53 kg for natural gas, 71 kg for gasoline, and 93 kg for bituminous coal. Factoring in upstream emissions, propane produces 74 kg of CO_2/MMBtu, compared to 65 kg for natural gas, 91 kg for gasoline, and 221 kg for electricity. (The large number for electricity reflects the significant thermal loss in generation and the thermal loss in transmission and distribution.) A key fact in regard to carbon emissions is that when propane is released (*i.e.*, fugitive) into the atmosphere, it has essentially no greenhouse gas (GHG) effect because it deteriorates rapidly. In contrast, natural gas released into the atmosphere is approximately 25 times more potent than CO_2 as a GHG.

Propane accounts for approximately two percent of the primary energy consumed in the United States, compared to 29 percent for natural gas, 28 percent for coal, and 41 percent for petroleum products. Yet propane accounts for only one percent of the nation's GHG emissions.

Propane is essentially "portable natural gas." Most propane today is produced alongside natural gas. It is used in the same applications as natural gas. Propane has an emissions profile similar to natural gas but with the added benefit of not being a GHG itself. Propane has the important benefit of being easily transportable to areas where there is no natural gas infrastructure.

Source-Based or System-Based Regulation?

EPA plans to promulgate proposed regulations in 2014 with respect to GHG emissions from existing electricity generation units as a corollary to its recently proposed regulations for new electricity generation units. NPGA and its members bring no particular expertise to the complexities of central station generation units, as, to our knowledge, propane is not employed as either a primary or backup fuel in central station generation units. Nevertheless, NPGA can contribute to the conversation in terms of reducing electricity demand, thereby reducing GHG emissions.

In its September 23, 2013 memorandum (Considerations in the Design of a Program to Reduce Carbon Pollution from Existing Power Plants) EPA inquires whether "source-based" regulation or "system-based" regulation is most appropriate. Recognizing that, although NPGA and its members have no special expertise in electricity generation, we expect that, when the record is complete, it will demonstrate that source-based regulation utilizing proven technologies cannot provide the reductions in GHG's that are necessary to meet the emissions targets that have been posited as necessary to address the issue of anthropogenic climate change. Looking ahead, it is reasonable to expect that EPA will propose a system of regulation that will have at least some system-based elements. (Obviously, layers of complexity are added by virtue of the structure of Section 111(d) of the Clean Air Act.)

As we will discuss below, propane can make a significant contribution in reducing GHG's as part of a system-based scheme of regulation. Propane can reduce GHG emissions when employed in combined heat and power and direct flame application appliances (for example, furnaces and water heaters). In each case, propane applications produce less GHG's than comparable electric applications. (Combined heat and power would in essence be an "inside-the-fence" compliance avenue while direct application appliances would be a demand-side or "outside-the-fence" compliance option.) To the extent that EPA provides guidelines to the states under Clean Air Act Section 111(d) that encourage or incentivize propane applications, GHG's will be reduced on a system-wide basis. To the extent that propane applications displace electric applications, GHG emissions will be reduced, helping to achieve EPA's goal of reducing GHG emissions from existing electricity generation units. Encouraging fuel-switching to propane applications is an efficient, economical, and proven means to reduce GHG emissions.

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Propane-Fueled Combined Heat and Power Results in Reduced GHG Emissions

An essential fact in the generation of electricity from coal, natural gas, and fuel oil is that more than sixty percent of the primary energy value is lost in the process of converting the fuel to electricity. Almost all of this is thermal loss from the combustion process. Moreover, all forms of electricity generation, including renewables, lose an additional several percent of their energy value in the transmission and distribution process. Thus, essentially sixty to seventy percent of the initial energy value is wasted in fossil-fired central station electricity generation. Viewed another way, an enormous volume of GHG's is generated in the process of creating thermal waste.

Combined heat and power (CHP) is an effective tool in addressing this wasted energy and the corollary unnecessary emissions of GHG's. CHP can operate at efficiencies of seventy to eighty percent. CHP facilities work well at factories, hospitals, hotels, and the like. In essence they deliver approximately twice the energy value from a unit of fuel when compared to electricity from a central generation station. For present purposes this amounts to a reduction of GHG's of about one half. CHP is hardly a new concept. It is cost-effective and adequately demonstrated as witnessed by the plethora of facilities that have installed CHP. (For additional detail on CHP, NPGA directs EPA's attention to the submission dated November 22, 2013, by The Alliance for Industrial Efficiency.)

The vast majority of CHP facilities are fueled by natural gas. Where natural gas service is available, CHP facilities in all likelihood will be fueled by natural gas. Yet there are large areas of the United States that do not have natural gas service and where the geography and demographics are such that they will likely never enjoy natural gas service. In these areas, propane-fueled CHP can be an important, effective, and efficient tool in reducing GHG's. NPGA urges EPA to establish guidelines for states that encourage the deployment of propane-fueled CHP as a means of reducing GHG emissions from existing power plants.

Propane CHP systems provide efficiencies as high as 85 percent when compared to standard power plant electric generation which, including delivery losses, ranges 30 and 50 percent. This technology is not being capitalized on and is extremely economically viable. According to EPA estimates from August of this year, 10,000 hotels could purchase CHP and receive a positive return on investment within five years.

Further improving both the greenhouse gas reductions and the economic viability of CHP are net metering programs, which are offered in many states. Net metering programs allow building owners to sell excess electricity back to the grid, which in turn gives them kilowatt-hour credits. This encourages energy efficiency and less dependency on the grid and at the same time bolsters the grid without the emissions that come from fossil fuel burning power plants. (Although not necessarily germane to EPA's decision making, CHP bolsters grid resilience, as was amply demonstrated in the wake of Hurricane Sandy.)

Propane powered Micro-CHP (MCHP) can also be used to reduce GHG's. MCHP is used in the residential market. It is essentially a smaller, quieter system than the standard CHP equipment that is used in commercial markets. MCHP also converts about 85 percent of fuel energy to heat and power. In some instances, MCHP can provide 50% of a home's electricity needs. The same type of net metering programs offered for CHP are offered for MCHP, which again, further reduces GHG emissions and makes the technology more economically viable by shortening the length of time for a return on investment.

Direct Use of Propane Results in Reduced GHG's

"Direct use" refers to using propane (or natural gas) to fuel appliances for space heating, water heating, cooking, and clothes drying in the residential, commercial, or industrial sectors. For present purposes, this is to be contrasted with using electricity generated from fossil fuels for these applications. When propane is utilized in these applications instead of electricity generated from natural gas or coal, the result is lower overall GHG emissions—approximating a one-half reduction. As explained above this difference results from the significant thermal, transmission, and distribution losses associated with electricity generated from fossil fuels.

The efficiency, environmental, and GHG benefits of direct use apply for both propane and natural gas. Propane enjoys the benefit of being available in those locations where there is no natural gas infrastructure. Thus, in the context of the benefits of direct use, natural gas and propane are complementary fuels, able to deliver these benefits in somewhat different market niches. Policies that encourage the direct use of propane are, therefore, effective GHG reduction strategies.

These GHG benefits can be understood in the first instance by engaging in "full-fuel-cycle" analysis. Historically, most energy efficiency analyses have focused upon the efficiency of energy consumption at the site of consumption. For example, traditional efficiency ratings for water heaters focus only upon comparative efficiencies at the site of consumption. This "site-based" analysis entirely ignores upstream energy consumption. When one instead engages in full-fuel-cycle analysis, one sees that more than sixty percent of the primary energy is wasted before electricity ever reaches an electric water heater. Thus, from the perspective of conserving resources, the direct use of propane or natural gas for space heating, water heating, cooking, and clothes drying is far superior to using electricity created from fossil fuels for these applications. Propane is approximately 90 percent efficient on a full-fuel-cycle basis, while electricity from all sources in the United States is only slightly more than 30 percent efficient on a full-fuel-cycle basis.

Section 1802 of the Energy Policy Act of 2005, P.L. 109-58, required the Department of Energy to contract with the National Academy of Sciences to undertake a study of the site-based efficiency analysis versus full-fuel-cycle analysis. The National Academy of Sciences study concluded that full-fuel-cycle analysis gives a more accurate picture of energy efficiency and resource efficiency than site-based analysis. The complete study can be found at: http://www.nap.edu/catalog.php?record_id=12670.

The full-fuel-cycle efficiency benefits of the direct use of propane (or natural gas) translate directly into GHG reduction benefits. In simple terms, utilizing propane for space heating, water heating, cooking, and clothes drying, when compared to the same electric applications, results in a total GHG reduction of almost one-half. (Although beyond the scope of EPA's current endeavor, propane also produces no mercury and far lower emissions of nitrous oxides and sulfur oxides than coal-fired electricity generation.) When the upstream energy consumed in producing electricity is combined with the energy consumed at the point of use, the higher full-fuel-cycle efficiency of propane makes it a superior GHG reduction strategy.

These direct propane applications have been employed for the better part of a century. There is no question as to either their efficiency or their reliability. Their use by millions of Americans is testament to their cost-effectiveness. Moreover, propane appliances use a fuel that is entirely domestic, with no need to rely upon unstable energy trading partners.

There is significant opportunity for increased deployment of propane technologies to stem some of the anticipated growth in electricity demand and the concomitant growth in GHG emissions. The direct use of propane in lieu of electric furnaces (particularly electric resistance) and electric water heaters can lead to significant reductions in GHG emissions by backing down fossil-fired electricity generation. Thirty-eight million homes in America use electricity for space heating, and nearly half of these use electric resistance heating. Forty-five million homes use electricity for water heating, almost all of them using electric resistance. Some of these homes are candidates for conversion to natural gas space heating, which promises similar emissions gains. Others, however, do not have nearby natural gas infrastructure and, in all likelihood, never will.

Converting these homes to propane space heating and water heating can produce significant efficiency and GHG gains. A propane household produces on average 7.6 metric tons of CO_2 annually compared to 10.1 for an all-electric household. Electric baseboard heat and electric furnaces produce approximately three times as many GHG emissions as a propane furnace. Similarly, a propane water heater produces one-half the GHG emissions of an electric storage water heater.

Numerous Policy Avenues Are Available to Encourage Propane Use

States can follow a variety of policy avenues to promote propane uses of the types discussed above that result in reduced GHG emissions. State energy offices can encourage deployment of propane CHP with incentives such as loans, grants, tax credits, and rebates. State public service commissions can encourage deployment of propane CHP by removing regulatory barriers in areas such as standby rates, interconnection standards, net metering policies, and feed-in tariffs. Legislatures and public service commissions can encourage deployment of propane CHP with portfolio standards or energy efficiency resource standards.

States can encourage the direct use of propane in residential and commercial customer classes by adopting full-fuel-cycle based building codes and standards. For example, EPA's Energy Star program for commercial buildings employs full-fuel-cycle measures. State energy offices can offer incentives for switching from electric resistance space heating and water heating to propane space and water heating. State public service commissions can adopt policies that encourage electric customers to meet their space and water heating needs with propane or natural gas rather than electricity. Among other means, public service commissions can give close scrutiny to applications to build new power plants when lower carbon alternatives—such as fuel switching—are available and more efficient than fossil-fueled electricity.

Propane residential and commercial applications (like natural gas applications) often have a first-cost disadvantage when compared to electricity, even though on a life-cycle basis the propane or natural gas application is more economical. Thus, policies that assist in ameliorating this cost disadvantage are important. Additionally, as to new construction there is an incentive mismatch between builder and resident. The builder, which makes the appliance decision, has the incentive to select the least expensive appliance (usually electric), even though for the resident the more expensive first-cost choice—propane or natural gas—is most economical in the long term. Thus, the builder has an interest in utilizing the most polluting technology, while the owner has an interest in using the less polluting technology.

If the nation is serious about reducing its carbon footprint, then state energy offices and state public service commissions should prohibit electric utilities from engaging in or encouraging wasteful programs such as incentives, discounts, and subsidies for all-electric homes and businesses, which only encourage the wasteful dissipation of GHG's into the atmosphere. Similar waste and inefficiency is also promoted by mechanisms such as declining block rates, which make electricity less expensive the more it is used.

Similarly, state energy offices and state public service commissions can adopt programs aimed (for example, through utilities) at educating consumers to the GHG implications of their choices of energy sources for their homes and businesses. This would include, among other things, energy and carbon footprint labels for appliances.

Conclusion

Propane CHP and propane residential and commercial direct-use applications are all viable, low-tech tools to achieve GHG reductions. They are tried and true technologies rather than untested technologies. The use in the United States of extensive propane applications for almost a century demonstrates that they are both effective and economical. NPGA expects that ample North American supplies of propane will be available for decades to come or longer.

To the extent that EPA adopts a system-wide approach to reducing carbon emissions of existing electric power generation units, propane provides an effective low-cost tool in reducing electricity demand and concomitant GHG emissions. NPGA also believes that state policies that promote propane usage as a GHG-reduction strategy would fit with other, complementary policies of this sort such as renewable energy, energy efficiency, and demand-side management. NPGA believes that it would be appropriate for EPA to announce a wide-ranging series of complementary compliance avenues embracing all of these technologies.

We look forward to continued participation with EPA in this venture. If we can provide further information or assistance, please contact NPGA at jpetrash@npga.org or 202.355.1327.

NATIONAL PROPANE GAS ASSOCIATION

We very much appreciate your consideration of our thoughts as you move forward.

Very truly yours,

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