ALTERNATIVE FUELS COALITION OF CONNECTICUT

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Submitted Comment by:
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On behalf of the:
National Propane Gas Association
(NPGA)

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Connecticut Department of Energy and Environmental Protection
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Elm Street Hartford, Connecticut

As State Director to the National Propane Gas Association (NPGA) I am using this opportunity to submit to you our thoughts on The Clean Power Plan, an important component of Connecticut's Green House Gas Initiative.

The Clean Power Plan offers a great opportunity for the propane industry to partner with Connecticut's policy makers in improving the state's air quality. Propane can make a significant contribution in reducing greenhouse gases (GHG) 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 than comparable electric applications. To the extent that propane applications displace electric applications, GHG emissions will be reduced, helping to achieve the Clean Power Plan 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.

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 C3H8, it is one of the least complex hydrocarbons (technically an alkane). Propane is colorless, odorless, and tasteless. It is gaseous at normal temperatures and pressures. With pressure, propane becomes a liquid at somewhat higher temperatures, which is why "liquefied petroleum gas" (LPG) is another name for propane. Propane is produced 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 70 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. 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). 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. 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.

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, and approximately 10 million households' heat with propane. Additionally, propane commands a significant market as a transportation fuel, for forklifts, buses, vans, trucks, and cars. Propane is also used as a fuel in the industrial sector both for space heating and process applications. Propane is used on nearly 1 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 C02/MMBtu, compared to 71 kg for gasoline and 93 kg for bituminous coal. Factoring in upstream emissions, propane produces 74 kg of C02/MMBtu, compared to 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 into the atmosphere, it has **essentially no greenhouse gas effect** because it deteriorates rapidly. In contrast, natural gas released into the atmosphere is approximately 25 times more potent than C02 as a GHG.

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

In the generation of electricity from coal, natural gas, and fuel oil, more than 60 percent of the primary energy value is lost in the process of converting the fuel to electricity. Combined heat and power (CHP) is an effective tool in addressing this wasted energy and the corollary unnecessary emissions of GHGs. CHP can operate at efficiencies of 70-80 percent. CHP facilities work well at industrial applications including factories, hospitals, hotels, and schools. CHP delivers 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.

The vast majority of CHP facilities are currently fueled by natural gas and where natural gas service is available, CHP facilities 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 GHGs.

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. Propane powered Micro-CHP (MCHP) can also be used to reduce GHGs. 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 percent 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 GHGs

When propane is utilized in applications such as space heating, water heating, cooking, and clothes drying in the residential, commercial, or industrial sectors instead of electricity generated from natural gas or coal, the result is lower overall GHG emissions-approximating a one-half reduction. In approximate terms, propane water heaters save 1,000 kilograms of CO2 per year compared to electric water heaters.

This difference results from the significant thermal, transmission, and distribution losses associated with electricity generated from fossil fuels. Propane enjoys the benefit of being available in those locations where there is no natural gas infrastructure. Policies that encourage the direct use of propane are effective GHG reduction strategies. 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.

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 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. A propane furnace saves more than 5,000 kilograms of CO2 per year compared to an electric furnace. Others do not have nearby natural gas infrastructure and likely 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 C02 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

There are a number of ways to promote propane applications that result in reduced GHG emissions. We recommend the following:

• Encourage the deployment of propane CHP with incentives such as loans, grants, tax credits, and rebates.
• Encourage the deployment of propane CHP by removing regulatory barriers in areas such as standby rates, interconnection standards, net metering policies, and feed-in tariffs.

• Encourage deployment of propane CHP with portfolio standards or energy efficiency resource standards.
• Encourage the direct use of propane in residential and commercial sectors, our state can adopt full fuel cycle based building codes and standards.
• Offer incentives for switching from electric resistance space heating and water heating to propane space and water heating and adopt policies that encourage electric customers to meet their space and water heating needs with propane or natural gas rather than electricity.

Propane residential and commercial applications often have a first cost disadvantage when compared to electricity, even though on a life-cycle basis the propane application is more economical. Thus, policies that assist in ameliorating this cost disadvantage are important. Additionally, in 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 of propane 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.

Conclusion

Propane is a greenhouse gas-fighting fuel that should be included as part of Connecticut's Clean Power Plan compliance plan. Propane CHP and propane residential and commercial direct-use applications are all viable, low technology 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.

We look forward to continued participation with DEEP in this venture. If we can provide further information or assistance, please contact me.

Sincerely,

T. Michael Morrissey
State Director – National Propane Gas Association

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Additional Documents (next page)

NATIONAL PROPANE GAS ASSOCIATION

EPA'S CLEAN POWER PLAN – THE BASICS

What is the Clean Power Plan? The U.S. Environmental Protection Agency (EPA) released the Clean Power Plan on August 3, 2015, the first time the federal government has addressed carbon dioxide emissions from existing power plants. The plan is expected to reduce carbon dioxide emissions from existing power plants by 32 percent below 2005 levels by 2030. The rule sets a target emissions rate for each state of carbon dioxide that can be emitted per megawatt-hour of power produced. To see the entire rule, visit http://www.epa.gov/airquality/cpp/cpp-final-rule.pdf or for the EPA's fact sheet, visit http://www2.epa.gov/cleanpowerplan/fact-sheet-overview-clean-power-plan. (In a separate action EPA has set carbon-emission limits for new power plants.)

How soon must states comply? Compliance is already underway. By September 2016, states must submit final plans to EPA or request an extension until September 2018. The plans must include details of how states will reach emissions goals in the 2022-24, 2025-27 and 2028-29 periods and reach the interim emissions rates set for each state. States must be working towards the average emissions rate for the 2022-2030 period by 2022. If states do not submit a plan, EPA will establish a plan for the state.

How will states comply? EPA is setting standards to reduce emissions of existing fossil -fired electric steam power plants (such as those with coal or oil) as well as natural gas-fired combined cycle generating units. In the rule, EPA established three building blocks to achieve the goals:

- **Building Block 1** - reducing the carbon intensity of electricity generation by improving the heat rate of existing coal-fired power plants.
- **Building Block 2** -substituting increased electricity generation from lower-emitting existing natural gas plants for reduced generation from higher-emitting coal-fired power plants.
- **Building Block 3** - substituting increased electricity generation from new zero-emitting renewable energy sources (like wind and solar) for reduced generation from existing coal-fired power plants.

States are also encouraged to deploy energy efficiency programs to reduce emissions. Actions that reduce the demand for electricity also reduce carbon emissions. To see fact sheets on each state's goals, visit http://www2.epa.gov/cleanpowerplantoolbox/clean-power-plan-state-specific-fact-sheets or see a map of the target reductions at http://www.eenews.net/interactive/clean_power_plan.

EPA'S CLEAN POWER PLAN – THE OPPORTUNITY FOR PROPANE

Does propane qualify to help states meet the Clean Power Plan? Yes. Propane is an approved, clean fuel listed in the 1990 Clean Air Act as well as the National Energy Policy Act of 1992. Burning coal to generate electricity releases carbon dioxide and other greenhouse gases into the atmosphere. Per pound of fuel burned, coal emits more than twice the amount of carbon dioxide as does propane. By using propane gas instead of electricity, consumers can cut emissions and help preserve the environment. According to the EPA, much of the sulfur dioxide in the atmosphere, which produces acid rain, is attributable to coal-fired electricity-generating facilities. In contrast, neither the process by which propane is produced nor the combustion of propane gas produces significant acid rain contaminants.

In addition to producing low levels of greenhouse gases, propane is cleaner than diesel, fuel oil, gasoline, and coal, producing fewer criteria pollutants including reactive hydrocarbons and nitrogen oxides forming ozone, sulfur oxide, mercury, and particulate matter. Propane itself is not a greenhouse gas, unlike natural gas, and it is not a groundwater contaminant, unlike fuel oil. Propane is domestically produced, contributing to energy security, national security, and creating American jobs.

How can propane be used to meet the goals? There are two main ways propane can help states: energy efficiency and combined heat and power. Propane applications that can save greenhouse gases from power plants will typically involve using propane in direct applications, such as space heating, water heating, cooking, and clothes drying. These applications can be deployed in residential, commercial, agricultural, and industrial settings. They will also use propane in combined heat and power systems.

Why do propane applications reduce greenhouse gas emissions? Propane applications involving direct use have lower greenhouse gas emissions than comparable electric applications. This is because virtually the entire energy content of propane is employed for productive use—such as in a water heater— compared to a competing electric application, where the majority of the primary energy content is lost at the generation station and in transmission and distribution lines. On a full fuel cycle or lifecycle emissions basis, which consider emissions both downstream and upstream in the energy cycle, propane applications result in approximately half the carbon emissions of comparable electric applications. In approximate terms, propane water heaters save 1,000 kilograms of CO_2 per year compared to electric water heaters.

What energy efficient options can propane offer? Primarily, by moving residential, commercial, and industrial consumers to new propane appliances in substitution for electricity in an effort to reduce electricity use and improve efficiency. In the residential sector, tankless water heaters, dryers, and furnaces offer significant efficiency improvements (visit http://www.buildwithpropane.com/Propane-Systems/ for details). In the commercial sector, propane appliances and applications can dramatically reduce emissions and help buildings achieve strict LEED standards (visit http://www.buildwithpropane.com/Propane-Systems/Commercial-Applications/ for details).

Propane furnaces result in fewer carbon emissions than oil furnaces, electric furnaces, and electric baseboard/resistance heat in both residential and commercial applications. For example, a propane furnace saves more than 5,000 kilograms of CO_2 per year compared to an electric furnace. In the same vein, propane back-up generators account for fewer greenhouse gases than power from the grid.

Is the propane water heater a greenhouse gas-fighting tool? Yes. The propane water heater on a full fuel cycle basis produces approximately half the carbon emissions of an electric water heater. This is true in basic or best available storage tank or tankless water heaters. In short, this common, 20th century technology is a greenhouse gas-fighting tool. Approximately 4 million homes that currently use propane have electric water heaters. Switching out electric water heaters in these homes for propane water heaters would result in significant reductions in overall carbon emissions, on average about half on a national basis. Similar greenhouse gas savings or even better can be achieved in commercial water heating.

What is propane combined heat and power (CHP)? Propane CHP systems provide heat and generate electricity with higher efficiency and lower emissions levels than conventional heating and grid-supplied power. Instead of purchasing electricity from the local utility and burning fuel in an on-site furnace or boiler to produce thermal energy, an industrial or commercial facility can use CHP to provide both energy services in one energy-efficient step. Propane CHP produces less than half the carbon emissions when compared to electricity from the grid for power and heating. This is true for both reciprocating and turbine CHP. CHP systems have been used in large-scale industrial and commercial applications for decades. It is most effective in buildings with significant and steady thermal demands and can be ideal for retrofit situations when existing water heating equipment needs replacement, electric rates are increasing, or on-site power generation is an increasing priority. New CHP systems can also provide continuous backup power when a grid is down, which could be especially useful in major metropolitan areas with anti-terrorism security plans.

GETTING PROPANE IN STATE CLEAN POWER IMPLEMENTATION PLANS

Can propane have a role in Clean Power Plan compliance? Yes. Under the Clean Power Plan states are required to submit a compliance plan to the U.S. Environmental Protection Agency. States are given two broad options: (1) rate-based, where the state plan would focus on the amount of carbon dioxide emitted per unit of energy generated; and (2) mass-based, where the state plan would focus on the total amount of carbon dioxide emitted by power plants. Propane can reduce the total amount of carbon dioxide emitted by power plants.

How can propane be included in the compliance plans? Most states are appointing a lead regulatory agency to conduct workshops or listening sessions to discuss potential compliance strategies. Industry members must participate in these meetings and ensure propane is included in any future incentive programs and offered as an alternative for energy efficiency measures alongside natural gas.

What avenues can states follow to increase the usage of propane? State plans under the mass-based approach will undoubtedly employ a wide variety of technologies and approaches to achieve the maximum overall greenhouse gas reductions at minimum cost. As a result, it is not possible to specifically say what technologies or mechanisms any given state should employ to reach the goal. The blend of technologies and mechanisms will turn on the demographics, energy supply, and energy demand of each state. But propane technologies can certainly reduce greenhouse gas emissions in every state, often at significantly lower costs compared to other emission reduction strategies.

States can incentivize or mandate the deployment of propane technologies, including:

- Grants or rebates from energy efficiency funds, general funds, or other funds, such as fuel taxes. These grant and rebate programs may already exist but could be expanded to include propane applications.
- Tax credits or accelerated tax depreciation.
- Low-interest loans for whole-house or commercial renovations to energy efficient technologies.
- Building and appliance codes can mandate the use of gas appliances. For example, California Title 24 requires the installation of gas water heaters if gas service is available.

Depending upon state laws and constitutions, incentives or mandates might require legislative actions or administrative orders or both. State public service commissions should also review their policies and remove programs that directly or indirectly encourage electricity consumption that promotes greenhouse gas emissions.

Many state propane organizations offer appliance rebate programs. In the coming years, these programs may want to expand to include combined heat and power applications. These programs should also be promoted to legislative and regulatory officials when state compliance plans are being developed.