CROWLEY®
People Who Know®

LNG vs. Propane Operational Cost and Capital Expense For Power Generation

Today`s natural gas technology has become much more accessible and more affordable. In fact, many natural gas generators now offer a significantly lower total cost of ownership than their ultra-low sulfur No 2 diesel and highly de-rated propane counterparts. Technology enhancements create efficiencies that translate to cost savings in nearly every aspect of the product lifecycle, from installation to maintenance to fuel cost. Some of the primary cost reduction benefits are detailed below.

- **Investment and installation cost:** The capital investment to specify and install two paralleled lower-kW generators compared to one larger-kW generator can be similar. However, paralleled units often have the advantage of greater installation support from the supplier, which offsets some of the initial cost. Their lighter weight makes them easier to move and place on job sites, requiring smaller, less-expensive lifting equipment, and the simple design means installation time is decreased. Compare this to propane generators, which need to be larger to provide an equivalent KW (due to the large derating – at times up to 45 percent, depending on the engine manufacturer).
- **Fuel cost:** In the U.S., the cost of natural gas trends significantly lower than ultra-low sulfur No 2 Diesel. According to the U.S. Department of Energy's April 2017 Alternative Fuel Price Report, the national average price between January and October 2017 for LNG was $16/MMBTU. The average price of propane during that same period was $18/MMBTU, a 12.5% difference.

How to fairly compare fuel costs

Any effort to compare the price of natural gas with the price of propane should start with an apples-to-apples comparison. Propane is generally sold in liquid gallons and must be converted to MMBTU units to ensure a fair comparison. The formula to convert a gallon of propane to a gallon of LNG is as follows:

$$\frac{\text{Propane BTU}}{\text{LNG BTU}} = \frac{91{,}000}{82{,}600} = 1.1$$

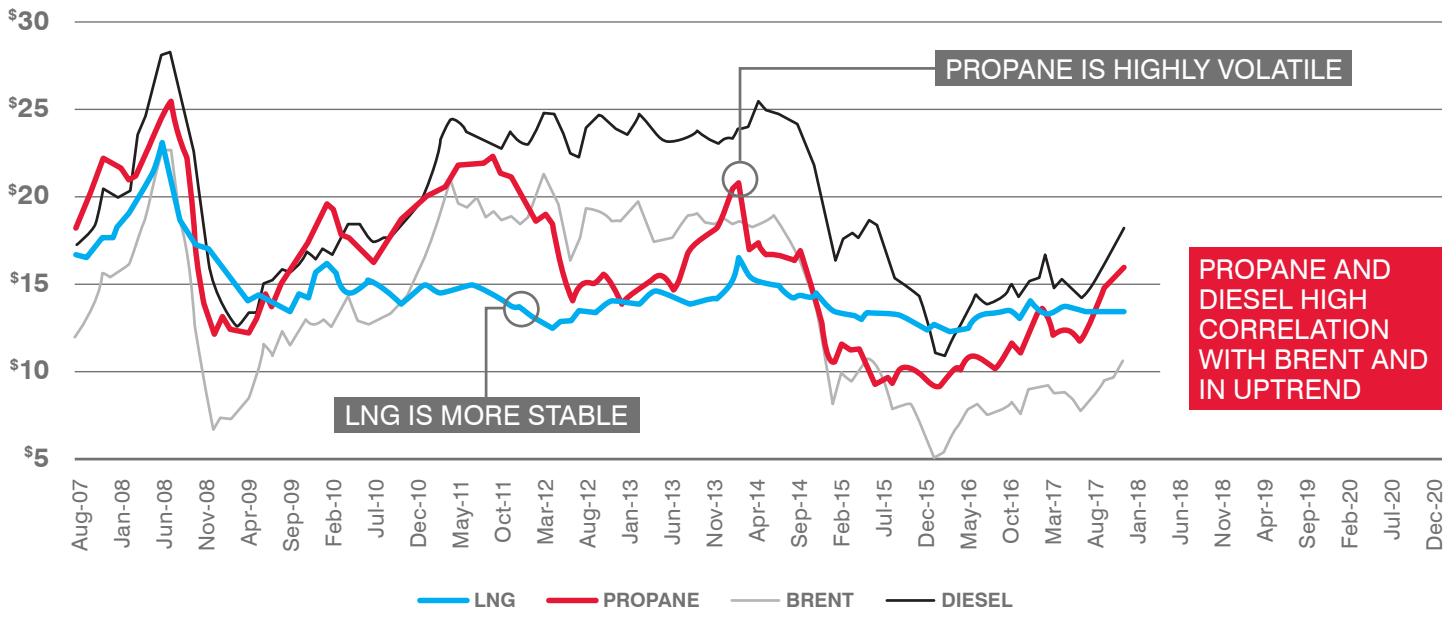
The answer nets a conversion factor of 1.1 gallons of liquefied natural gas (LNG) to one propane gallon. We can also demonstrate the energy equivalents per fuel type with the following formula:

$$\frac{\text{LNG BTU}}{\text{Propane BTU}} = \frac{82{,}600}{91{,}000} = 0.90$$

This formula demonstrates that one gallon of propane has 10 percent more of the energy found in the same amount of LNG fuel. Alternatively, it shows that one gallon of LNG contains 10 percent less energy than in the same amount of propane. The key point to this exercise is to calculate how much one is truly paying for the same amount of energy.

Now, look at the 10-year historical pricing of LNG, propane and ultra-low sulfur No 2 Diesel in Puerto Rico. You'll see that the price of natural gas (LNG) offers a much better economic value than propane or gasoline. Propane and ultra-low sulfur No 2 Diesel also have a high correlation with the Brent crude oil market index. Because natural gas is not correlated with this index, it offers a more stable fuel price over the long term.

HISTORICAL FUEL PRICES IN PUERTO RICO LAST 10 YEARS - $/MMBTU



The above graph also demonstrates that propane prices are higher than those of LNG for 67 percent of the months included in the time period shown, a significant majority.

Performance and engine operation: LNG vs. liquid propane (LPG)

When comparing the costs of fuels, one of the important factors to consider is engine performance. Using the same generator, review the energy output of propane vs. natural gas in the performance cut sheets below:

- Propane engine performance (click to learn more)
- Natural gas engine performance (click to learn more)

Looking at the energy balance on these data sheets, you'll see that running the engine at 70 percent on natural gas generates power equivalent to 100 percent propane. This means that using propane as fuel will result in more wear and tear than when using natural gas.

To understand what this means in costs, consider the following:

GENERAL ASSUMPTIONS	
Yearly Operating Hours (95% Avail.)	8,322
KW Demand	2,000
KWh Cost from Utility	$0.20

LNG CHP ELECTRICAL DETAILS					
Engine(s)	Max KW Out	Utilization	KW Output	Avail. (Uptime)	Yearly KWh Output
#1	2000	100%	2000	95%	16,644,000

PROPANE CHP ELECTRICAL DETAILS					
Engine(s)	Max KW Out	Utilization	KW Output	Avail. (Uptime)	Yearly KWh Output
#1	1335	75%	1000	95%	8,322,000
#2	1335	75%	1000	95%	8,322,000
2 (Total)	2,670	75%	2,000	95%	16,644,000

Estimated total capital cost savings using LNG over LPG, per capital investment ≈ **$1,100,000**

LNG FUEL CONSUMPTION DETAILS (1 ENGINE)			
100% Util. Consumption	Hour	Month	Yearly
Fuel Consumption /MMBTU	15.7	11,340	136,086

PROPANE FUEL CONSUMPTION DETAILS (2 ENGINES)			
75% Util. Consumption	Hour	Month	Yearly
Fuel Consumption /MMBTU	17.9	25,858	620,595

Total MMBTU savings with LNG over LPG, per annum ≈ **$484,508**

Result: The power loss due to de-rating is 33.25 percent, so the added cost of your equipment is 100 percent more due to number of engines required to compensate for it. In addition, the cost of propane fuel costs 15-25 percent more in most months.

Conclusion

LNG is growing rapidly in popularity due to the above reasons, its multitude of uses and rise in natural gas production and infrastructure. In fact, because of the radically increased production of natural gas in the U.S., there is now a growing glut, which has created economic benefits for consumers.

Just as the technology for natural gas recovery has advanced, so has the technology of natural gas liquefaction and LNG transportation. This further coincides with ever-increasing demand for fuel in developing nations, leading to a confluence of events which has created a sort of perfect storm for LNG.

As the uses, benefits and technologies associated with LNG further progress, it seems very likely that far from scaling back or fading, this gas will only grow in popularity and profile – further stabilizing the cost and availability for island locations and remote areas. All of this combined makes LNG a potentially very important source of future economic growth and sustainability.

Is an LNG conversion right for your business? Talk to one of our experts.

Ready to learn more about switching to natural gas? If you're a business or commercial operator in the Southeastern US or Alaska, the Caribbean or Central America, Crowley can answer your questions and help you decide whether LNG conversion is the right fuel solution for your enterprise.

Get started by contacting Crowley today.