

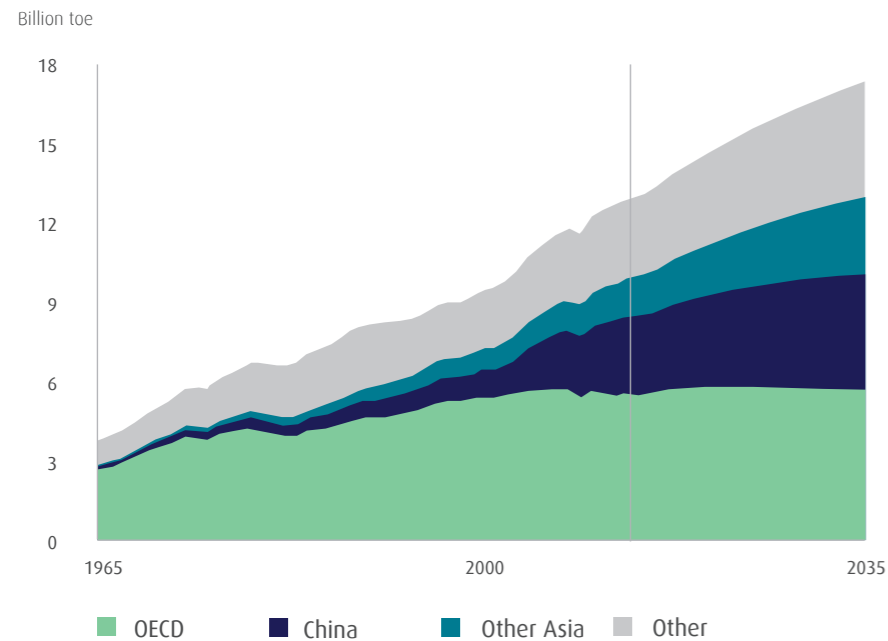
# POWER OF LPG

The increase in global population and income are key drivers to the growing demand for energy. The visible effects of increasing levels of carbon emissions have accelerated the need for cleaner energy. Liquefied Petroleum Gas (LPG) is a clean and modern energy source, and it is used by millions of consumers worldwide. The boom in shale gas extraction has increased the supply of LPG which is used in a range of applications in business, industry, transportation, farming, power generation, cooking, heating and for recreational purposes.

## Growth in the world's population drives higher consumption of energy

With the world's population estimated to increase by approximately 1.5 billion people by 2035, energy consumption is estimated to increase by 34% between 2014 and 2035.

### Energy Consumption Growth by region



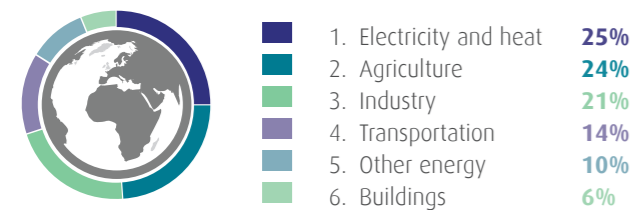
**LPG**  
The sustainable solution



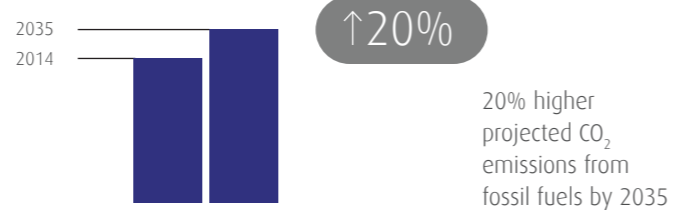
## Population growth and the increase in consumption of fossil fuels are key drivers contributing to higher levels of global carbon emissions

CO<sub>2</sub> emissions from energy make up approximately two thirds of all global man-made global greenhouse emissions. Energy is primarily used for electricity, heating, agriculture, industry and transportation. It is projected that global CO<sub>2</sub> emissions from fossil fuels may be 20% higher in 2035 than in 2014.

### Global Greenhouse Gases



### CO<sub>2</sub> emissions

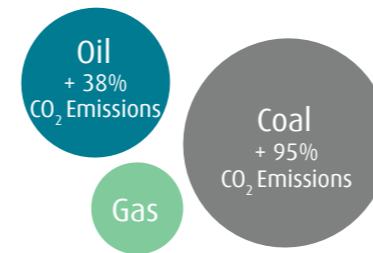


## Clean Energy

Gas has a significantly lower carbon footprint than alternatives like coal and oil and emits virtually no black carbon particles, making it one of nature's cleanest fuels, much cleaner than coal and oil.

### Hydrocarbon Emissions Comparison

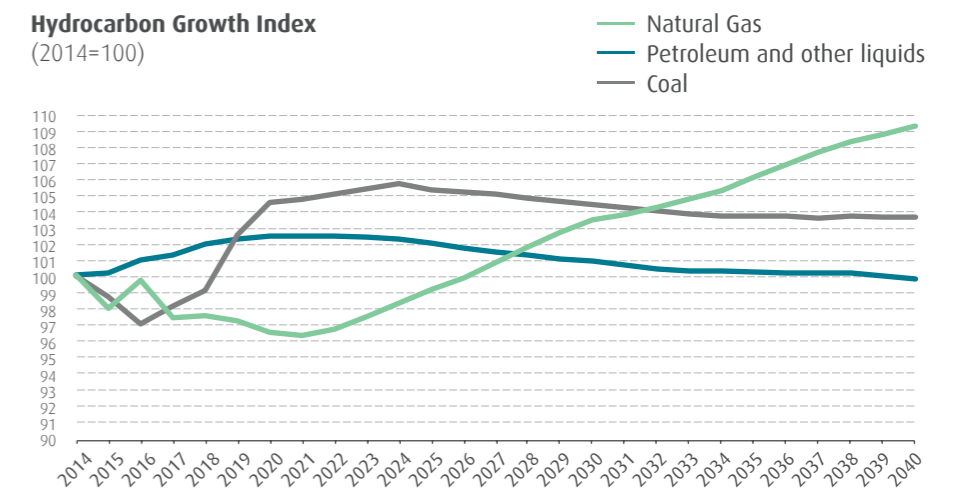
(Carbon Dioxide emissions per unit of energy (mBtu))



## Rising Consumption of Gas

The consumption of gas is expected to rise faster than consumption of any other fossil fuel, reflecting the increase in demand and popularity of gas as an alternative fuel source for many applications.

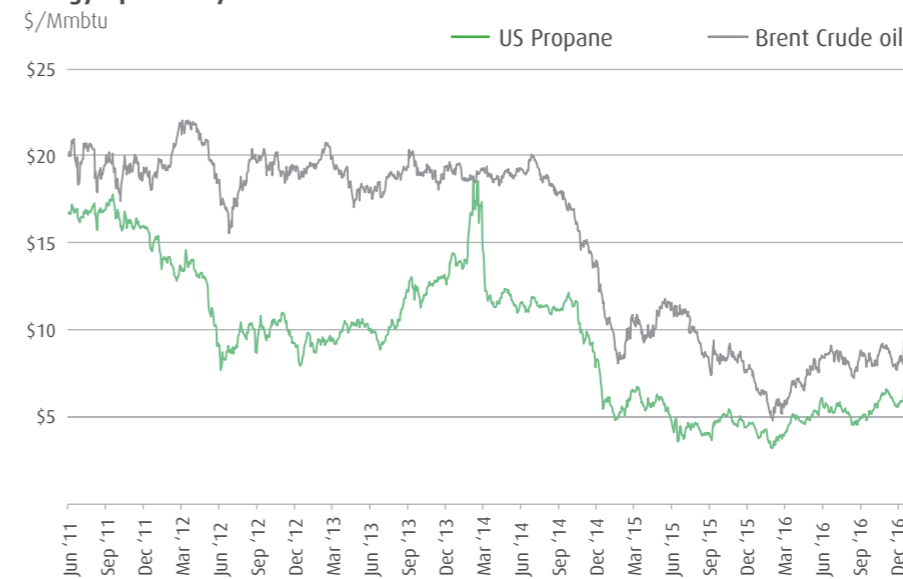
### Hydrocarbon Growth Index (2014=100)



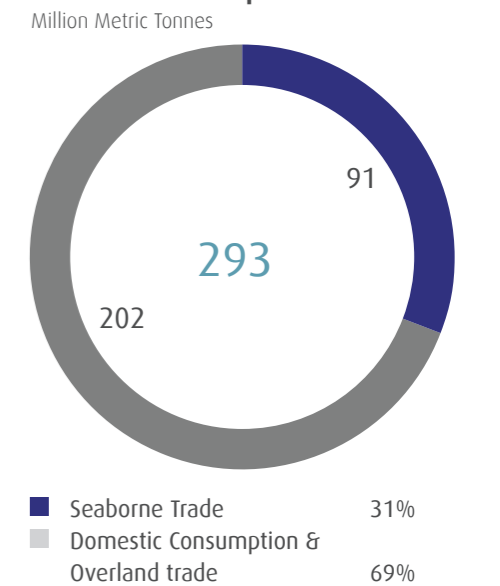
## LPG is cost effective and in abundance

U.S. Propane is cheaper than Brent crude oil, making it a cost effective solution. With the continued stream of shale gas resources, an established supply chain and market structures, global LPG consumption increased by 4% in 2016 to 293 million metric tonnes, 31% of which is seaborne.

### Energy Equivalency Price



### 2016 LPG Trade Composition



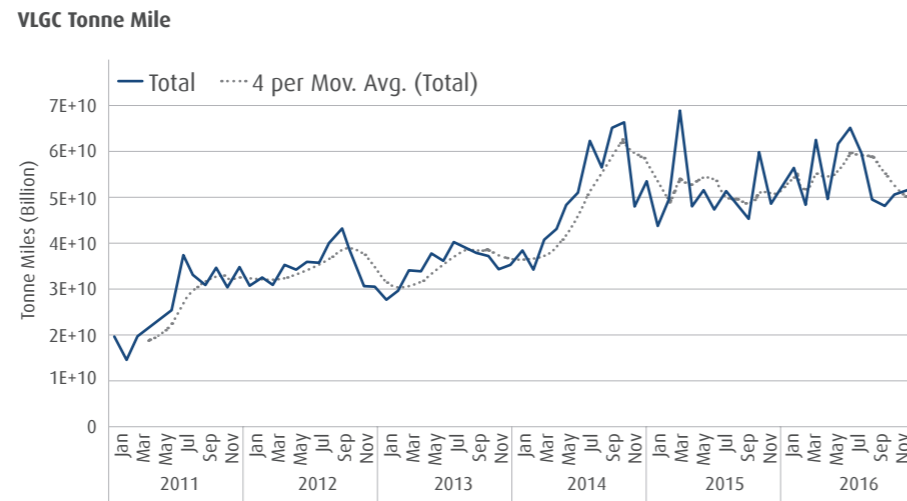
POWER OF LPG

**VLGC tonne mile has been increasing**

Main trade routes for LPG shipping are out of the Middle East and the U.S. to Asia and Europe. More LPG has been traded due to growing demand in Asia and in the Far East. VLGC tonne mile has been on a general increasing trend.



One of BW LPG's most recent VLGC newbuilding, BW Malacca, delivered in 2016.



**LPG used everywhere in the world**

LPG is a highly versatile fuel with applications ranging from cooking fuel, fuel for cars and ships, and feedstock for chemicals and pharmaceuticals. Referred to as one of the world's most versatile forms of energy, LPG consumption is growing across all sectors as it is increasingly recognised as a clean, modern energy that can meet the demands of a growing global population without compromising our environment.

**Cooking for life**



60% of all LPG used in Agriculture is used in Canada and US

50% of all LPG used in Domestic applications is used in Asia

68% of all LPG used in South & Central America is used at home, 85% of which is mainly used for cooking

**Autogas**



vehicles are powered by autogas, making it the most used alternative fuel



50% The bulk of the global consumption is concentrated in key markets, of which the top 5 countries - South Korea, Turkey, Russia, Thailand and Poland account for 50%

**LPG to Power: BW LPG is part of the world's first floating storage project for converting LPG for power generation in the U.S. Virgin Islands**



An aerial view of the WAPA power plants in the U.S. Virgin Islands

In a first project of its kind, the U.S. Virgin Islands Water and Power Authority (WAPA) has turned to LPG for electrical power generation. This reduces costs while providing power and water for the U.S. Virgin Islands. In partnership with Vitol, BW LPG is playing a pivotal role in this project with its Very Large Gas Carrier (VLGC), Berge Summit.

The closure of the Hovensa Refinery in the U.S. Virgin Islands in 2012 and rising fuel prices led WAPA to search for alternative sources of fuel. LPG was chosen as the best suited solution. In July 2013, Vitol was selected as the project partner for infrastructure upgrades and supplying LPG to the power plants.

BW LPG's Berge Summit serves as a floating storage for the propane which will be supplied to the power plants on St. Croix and St. Thomas islands. It conducts multiple ship to ship operations a week with small tankers, which delivers the propane to the power plants.

The National Renewable Energy has assessed a 60% reduction in fossil fuel and a 30% reduction in fuel costs in the U.S. Virgin Islands by 2025. This conversion to LPG represents the best possible near term project as a way to reduce costs for power generation.



BW LPG's Berge Summit moored off the U.S. Virgin Islands

"One of the challenges of this project was to build a storage facility in these islands to allow a constant supply of LPG to the islands. A floating storage vessel solved that issue and we chose BW LPG considering its expertise in the VLGC sector."

**Ralph Delia**  
Chartering Manager, Vitol

**Future of LPG: An innovative alternative to marine fuel**



With the International Maritime Organisation's (IMO) push to cap sulphur content of marine fuels at 0.5% by 2020, LPG is increasingly being considered as a viable alternative for marine fuel over

LNG and heavy fuel oil (HFO). With the continued supply of shale gas resources and an established infrastructure in place, LPG is poised to be a serious alternative to marine fuel.

	LPG	LNG	HFO
Ease of Implementation	✓	✗	✓
Efficiency	✓	✓	✓
Cleanliness	✓	✓	✗