ABDULLAH BIN HAMAD AL-ATTIYAH INTERNATIONAL FOUNDATION
FOR ENERGY AND SUSTAINABLE DEVELOPMENT

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Expert sustainability opinion and insight

Green LNG:

Is Liquefied Natural Gas (LNG) the Clean Energy we need?

The Paris Agreement came out of the COP21, the 21st Conference of Parties of the UNFCCC (United Nations Framework Convention on Climate Change), held in Paris, 2015. At the convention, a common goal to keep the global temperature increase to below 2°C above the pre-industrial levels was agreed, and all member nations agreed to commit resources to fight the rising global temperatures affecting our climate to safeguard the future of the planet.

Logically, the advancements in renewable energy provide a path to revamp the energy sector and move away from non-renewable energy sources that are a major contributor to climate change. But, a complete shift presents economic challenges. Renewable energy sources, though advanced, still exhibit shortcomings during implementation and operation. The result of which leads to the reliance on fossil fuels as an interim solution, as businesses and governments wait for renewable energy to reach a level of maturity to take over a larger percentage of the energy sector required to meet targets, such as those set in Paris. Can LNG bridge the gap while we wait for renewables to mature? How clean is LNG and can it be branded clean energy resource? Will the popularity of LNG act as a competitor to the future of renewable energy itself?

Executive Summary

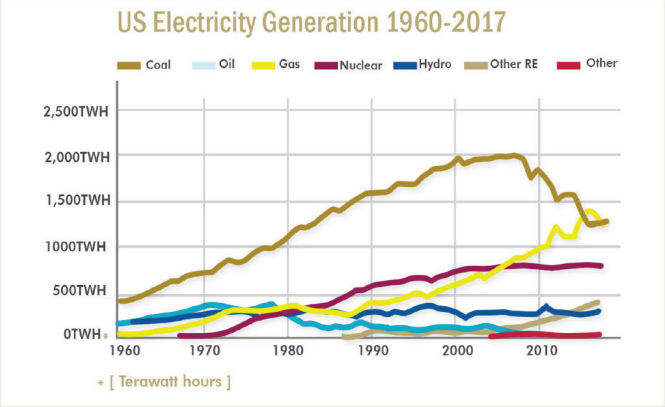
- As we strive for decarbonisation, LNG presents a viable lower carbon solution for the energy sector.
- Renewable Energy sources benefit from the affordable cost of LNG as it provides a solution to the intermittency problems commonly faced by wind and solar.
- LNG was branded by the EU as a clean energy resource and receives funding for research and development under the various schemes developed for the renewable energy sector.

Filling the Gap

Relying on fossil fuels as a fail-safe to challenges such as power-intermittence, often experienced in the renewables sector, could undo the entire aim of the Paris Climate Accord. As renewable energy evolves to become more reliable for widespread acceptance, the gap in energy supply has to be filled with a resource that is cleaner and affordable. And this is where Liquefied Natural Gas (LNG) comes to play.

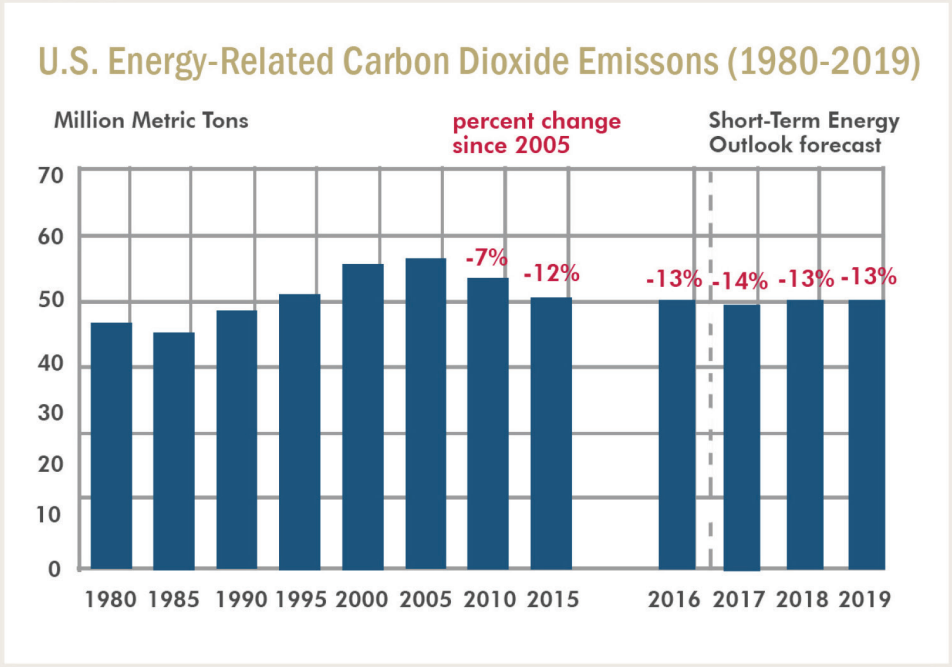
LNG Fast Facts

LNG is a hydrocarbon mixture primarily containing Methane. The reservoirs lie deep underground and are often found in conjunction with oil or coal reservoirs. The gas is cooled to -162°C, reducing the volume 600 times which makes it easier to store and transport over long distances. When used as a fuel, the LNG is turned back to its gaseous state for combustion. For every unit of energy produced, LNG emits 50% to 60% less carbon dioxide (CO_2) when compared with emissions from a typical new coal plant. In addition, improvements in extraction techniques have resulted in an LNG Boom across the world and this has made its price very competitive when compared to other fossil fuels such as coal.

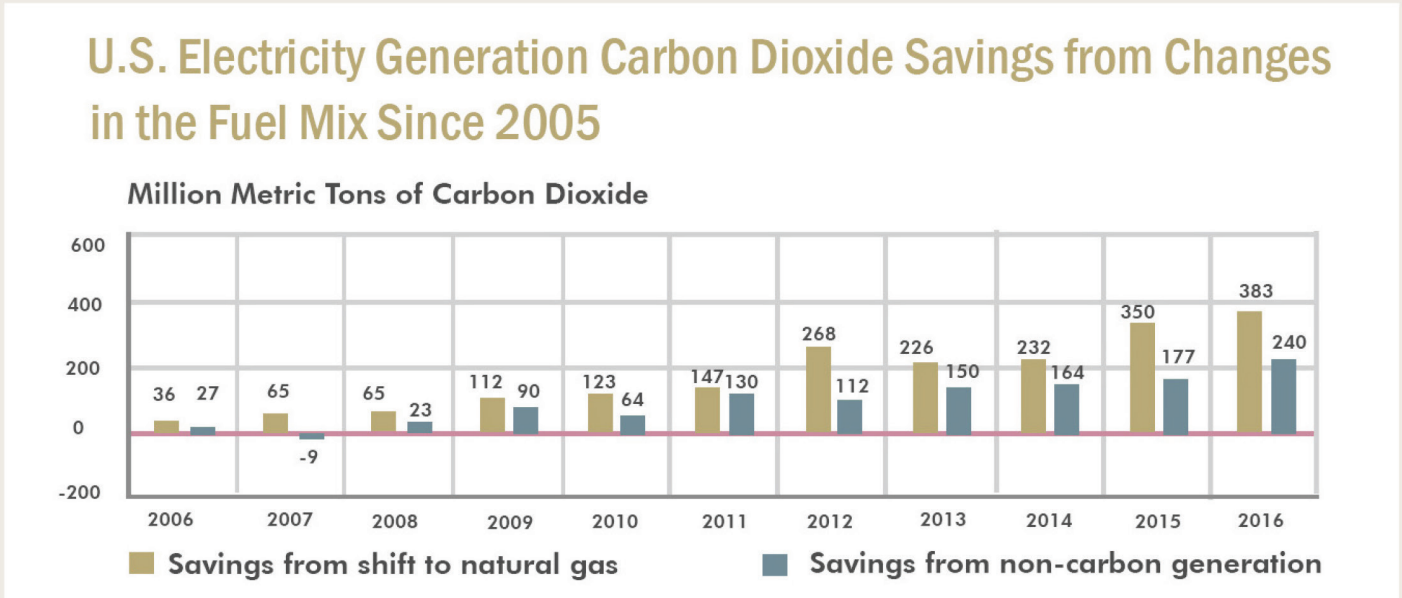


The price, efficiency and clean nature of LNG is the reason why it is seen as the bridge in our shift from unclean to clean fuels. Wind, Hydro and Solar have a long way to go to cover our complete energy demand. As we push towards decarbonising our planet, LNG presents an option to fill the large energy gaps left over by the renewables sector. It also allows the renewable energy market to disconnect from the political pressure of over-expectations and mature naturally as a technology.

The USA presents an excellent example of how LNG can be utilised and its direct effect on reducing carbon emissions. While the worldwide consumption of coal increased, LNG in the USA replaced coal as the largest source of electricity generation in 2016, accounting for 32% of all the electricity produced.



The popularity of LNG has also resulted in the closure of 150 coal powered power plants in the USA. The 12% decrease in the carbon emissions from 2010 to 2015 is attributed to the increased use of LNG for electricity generation.



Growth in Demand

Worldwide, LNG currently provides 22% of the energy in demand. Industrialisation in Asia and Africa and the shift from coal to LNG (switching) are expected to increase the LNG demand to 40% by 2040.

Half the growth in demand for LNG is expected to come from switching, as countries look for lower carbon emitting options for energy generation. The USA, Australia and Qatar are expected to provide the bulk of the supply; with Russia and African nations joining the major suppliers in the coming years. China, Japan, Pakistan, India and the EU are expected to be the largest markets for LNG. The Middle-East is likely to consume some of its gas supply, as it looks for cleaner alternatives for its power-hungry desalination plants.

Renewables Supporter?

Could the popularity of LNG be detrimental to the future of renewable energy?

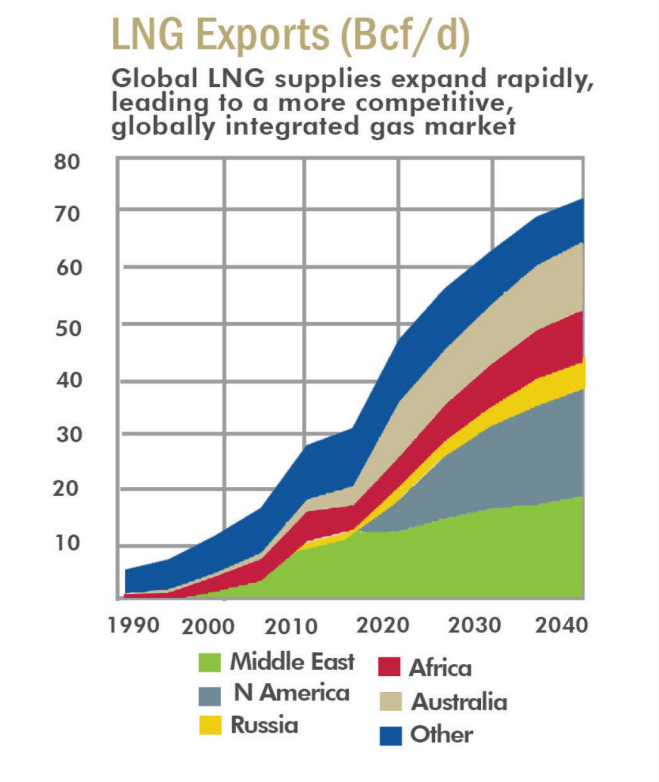
While promoters of renewables may consider the popularity of LNG a competitor to the rapid uptake of renewables, evidence shows great synergies between LNG and renewables. Renewable Energy sources like wind and solar have actually benefitted from the affordable cost of LNG since it provides a solution to the intermittency problems commonly faced by wind and solar.

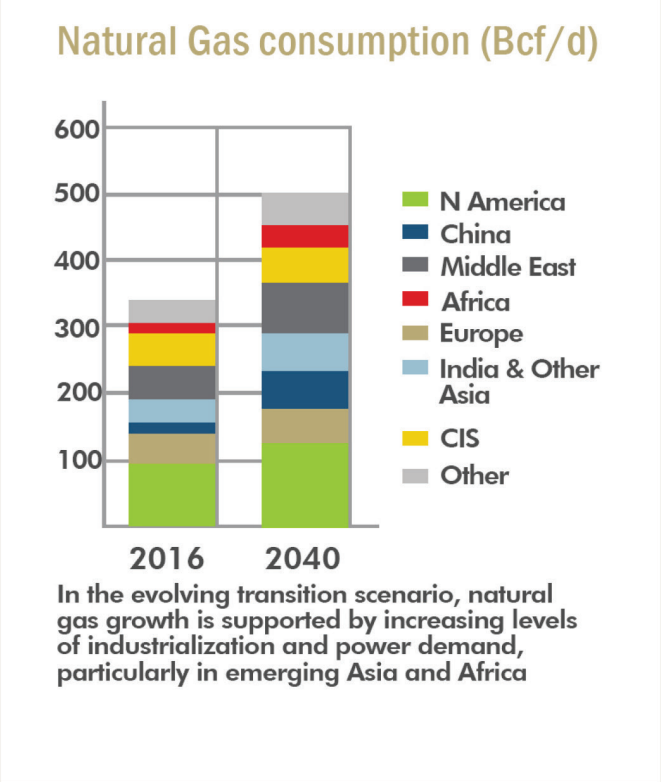
The output of renewable power production is entirely dependent upon environmental factors such as the intensity of sunlight, the amount of wind or the quantity of rainfall. This creates obvious problems; especially as peak energy use often takes place at the times when the supply from renewable sources is low. During a 24-hour cycle, energy demand typically peaks between 6pm – 9pm, at the time power output from solar drops off. Likewise, over the course of the year energy demand for home heating is at its highest during the winter months when solar power generation is at its lowest.

There are two key solutions to the problem of renewable energy intermittency. One is the use of peaking power plants – typically natural gas power plants which can step in during the hours when demand is high and renewable power supply is low – while the other is storage of the excess energy.

	Natural Gas	Coal	Nuclear
Power Generation Ability	Peaking	Baseload	Baseload
Lifecycle Greenhouse Gas Emissions	CO^2	CO^2 CO^2 CO^2	CO^2
Water Use	1	1	3
Levelized Cost of Electricity (LCOE)	$	$ $	$
Average Capacity Factor (CF) in 2016	56%	53%	92%

The capital cost of implementing a backup LNG powered power plant is significantly lower than a coal powered plant, which would obviously make renewable energy more competitive in the marketplace. LNG power plants can also help in scaling - providing additional power during peak hours, while the cost of power generation remains affordable - without any heavy price fluctuations.





Challenges for LNG and its implementation

"LNG is different"

LNG, while homogenous, has particular challenges when it comes to extended transportation and storage. LNG "boils off", or evaporates, at all stages of its transport, storage and re-gasification and the longer it is in any of these processes, the more that will be lost. This simply isn't the case with other fuels such as oil, which can be stored for longer periods of time and its ability to move through very long and vast distances between continents is only limited by the economics of shipping costs.

LNG boils off at about 0.1 to 0.15 percent per day while being transported by ship, and at a lower rate while being stored in tanks. So even a typical 20-day voyage from Australia to Japan could result in about 3 percent of the cargo being lost. A much longer journey, for example from the U.S. Gulf coast to China around the Cape of Good Hope, would see a greater loss.

Since the principal component of natural gas, methane, is a potent greenhouse gas, in order for gas to be widely accepted as more climate friendly than coal, producers of LNG need to find ways to keep gas leakage to a minimum.

Conclusion: An Ally for Renewables

Renewable energy sources are predictably going to capture a major part of the energy market in the future. But today, they still face some technological growing pains, even minute faults may open larger political schisms questioning the widespread adoption of renewable energy technologies. Renewable energy, therefore, needs an ally that will cover for its deficiencies, and LNG presents itself as that ally. LNG is cheap, easy to store and transport, and produces around 50% fewer greenhouse gases compared to coal. LNG power-plants are also the cheapest to build and operate. LNG removes the economic concerns of affordable power generation and provides support to renewables. However, emissions from gas leaks remain the Achilles heel for growth in LNG popularity.

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