# THE NUTS AND BOLTS GAS TO LIQUIDS (GTL)

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The world's proved natural-gas reserves, currently exceeding 5,000 TCF, have grown at a faster rate than proved oil reserves. Approximately 3,000 TCF of the gas reserves is considered stranded (i.e., accessible by drilling but too far from potential markets for economical transportation to those markets) and chemical conversion of methane to liquid fuels and other higher value products such as DME or Diesel as a more cost effective solution in compare to LNG or pipeline transport has attracted renewed interest. Even though Fischer-Tropsch (FT) synthesis (FTS) is a technically proven gas-to-liquids (GTL) technology, the conversion of natural gas to liquid fuels such as diesel and gasoline has only recently been perceived as a potentially viable commercial proposition. The current world diesel demand derived from crude refining is enormous at around 28 MMBPD and GTL is considered a very small player in this vast diesel market and such market potential for GTL products can essentially be considered unlimited.

In addition with its superior environmental qualities the market for GTL diesel is expected to be unhindered. Further environmental benefits of GTL conversion come from facilitating production and transportation of associated gas that is normally flared. Worldwide, the industry flares or vents 2 TCF [57 billion m3] of gas per year. When allowed, operators flare produced gas if their field's surface facilities are designed solely for oil production or if the gas cannot be reinjected. However, flaring wastes natural resources and contributes to air pollution. To reduce flaring of associated gas without jeopardizing oil production requires solutions for transporting gas from remote, and usually, offshore, locations. This is where GTL conversion promises to make a big difference, once the industry can build conversion plants that are small enough to install on floating platforms or vessels. However before GTL conversion can become more widespread, certain technological challenges must be overcome, such as the size, cost and efficiency of GTL plants. For example the first step in the current process requires oxygen to combine with natural gas. Separating oxygen from air is one of the more costly steps in the GTL process. Scientists are exploring new avenues in air-oxygen separation, including new ceramic membranes. Preliminary research shows that some ceramic membranes selectively allow oxygen ions to pass while excluding other air components. Costs of GTL conversion could be reduced by as much as 25% with ceramic membrane technology, depending upon conversion plant configuration. Improving upon the Fischer-Tropsch process itself is one more focus of current GTL research. The multistep Fischer-Tropsch process first converts methane to synthetic gas, then converts the synthetic gas into liquid hydrocarbons. Scientists are trying to find a single-step process that will convert natural gas directly into liquid hydrocarbons. They propose to combine theory, modeling and experiments to devise a direct conversion process. A single-step process could solve many of the problems that currently keep GTL from being economically viable. Different aspects of GTL production (Technical, Economical and Environmental) has been discussed in this paper based on most recent research in this area that has been developed or under development in the world.

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