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"OIL-INDEXATION AND PRICING NATURAL GAS"

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Oil-Indexation and Pricing Natural Gas

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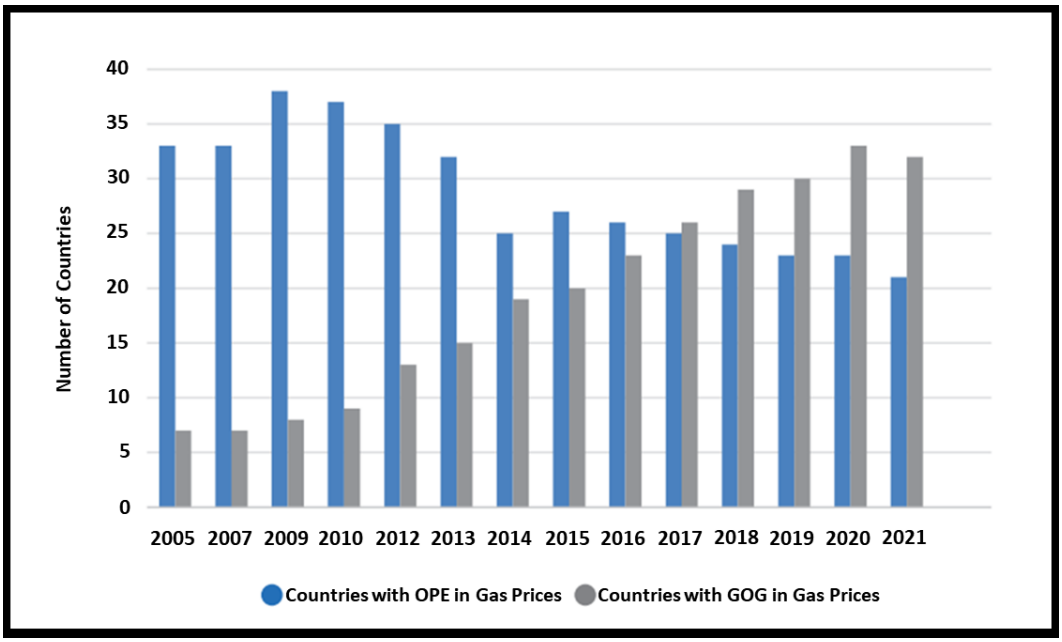
The oil and gas markets have functioned over the years through megacycles that are driven by the balance between demand and supply. The trajectory of these oscillations is determined by the magnitude and the nature of the price shocks. The COVID-19 pandemic created a new paradigm that combined both unprecedented demand destruction and a simultaneous supply shockwave that reverberated throughout the fabric of the energy ecosystem.

The global health crisis had a profound impact on the economy as a whole and more specifically on the oil and gas markets. It is reasonable to anticipate that this development may accelerate some existing trends. It is also natural to be curious about the impact of these developments on oil-linked natural gas contracts that had already been losing their luster even before the pandemic. What are the structural challenges of oil-indexation? Will it survive in the long run?

Broadly speaking, there are three main regimes for pricing natural gas, whether delivered by pipeline or via Liquefied Natural Gas (LNG) transport, namely: (1) hub pricing, also known as gas-on-gas competition ("GOG") or market-based pricing, which represents the framework by which natural gas is competitively priced based purely on the interplay between gas demand and supply; (2) oil-indexation, sometimes referred to as oil price escalation ("OPE"), which means contractually pricing natural gas using oil or other refined fuels prices; and (3) regulated prices set by governments.

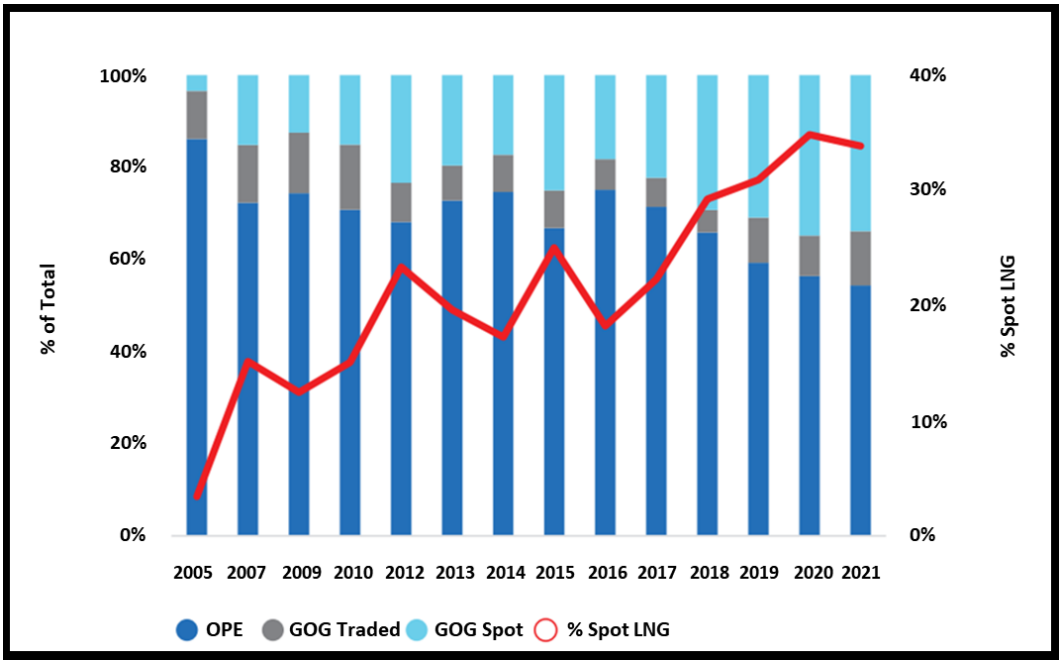
Over the years, the gas industry used oil-indexed long-term contracts that usually were 20 to 25 years in most parts of the world. Figures 1 and 2 on the next page illustrate how more countries are straying away from OPE as a pricing mechanism and adopting GOG instead. This explains the significant rise of the market share of GOG in LNG imports from 2005 to the most recent published data of 2021 while the share of OPE continues to decrease.

Figure 1
Number of Countries by Price Formation



Source: International Gas Union (IGU) Wholesale Price Survey 2022.

Figure 2
World Price Formation - LNG Imports



Source: IGU Wholesale Price Survey 2022.

Regional Differences

The linkage of gas and oil prices is not uniform across the global market and should be analyzed in a regional context because natural gas is priced differently in North America, Europe, and East Asia. See Figure 3 on the next page. Each regional market has historically followed a different evolutionary path and developed independently from the others due to various considerations including regulatory environment, contractual structuring, and economic conditions. Subsequently each regional market has gained its own distinctive attributes and idiosyncrasies.

The natural gas market in North America relies on a purely hub-based pricing or GOG mechanism whilst at the other end of the spectrum, the East Asian gas market is still heavily indexed to oil. Corbeau (2017) noted that "[c]reating a transparent and liquid hub … [can] take a decade." The American experience is the most successful representation of the hub-based market structure. In essence, the U.S. has become home for the most mature, highly competitive, and fully liberalized gas market in the world after going through major milestones of deregulation and market liberalization, which in turn took 15 years of gradual public policy changes (Till, 2018). The U.S. gas market is anchored around Henry Hub natural gas futures, which serve as a benchmark to all locations in the form of a differential or basis to account for regional market conditions, transportation costs, and available transmission capacity between locations.

The picture in Europe can be thought of as a mosaic since the level of transition from oil-indexation to hub pricing varies across subregions. For example, Northwest Europe has the most advanced hubs followed by Central Europe. Southern Europe, in turn, is at an embryonic stage in hub pricing.

Contractual Linkage Versus Economic Linkage

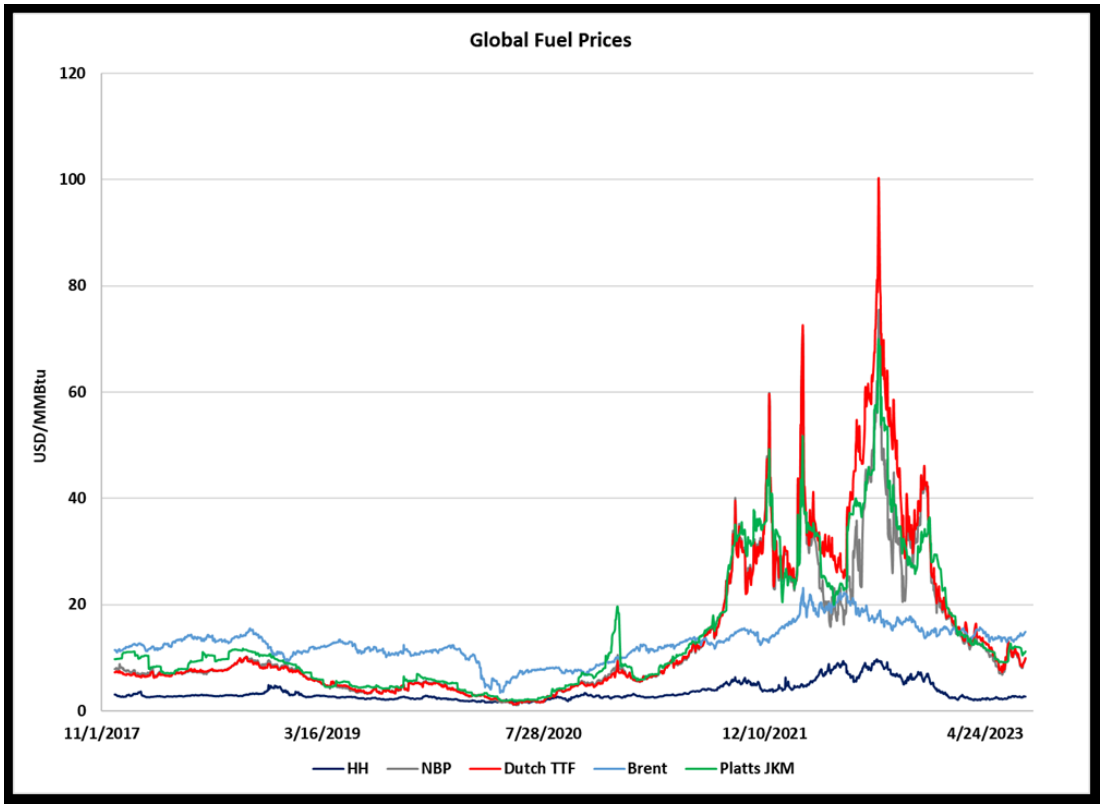
It is important to differentiate between economic linkage versus contractual linkage with natural gas and oil. Oil-indexation is a contractual linkage that is explicitly embedded in the contract while economic linkage refers to the direct relationship between the two fuels based on supply and demand factors. For instance, U.S. gas prices are established by the balance of gas demand and supply without any explicit reference to oil although natural gas and oil prices have moved in tandem in the long run due to their linkage through a substitution effect and resource competition (Mchich, 2018). This price relationship reached an inflection point after 2008, and they have since decoupled as the crude oil production surplus from the shale plays redefined the relative supply structure of the two fuels.

Oil & Gas Are No Longer Competing Fuels

In Asia, the genesis of linking gas prices to those of oil related products goes back to the 1960s when Japan enacted environmental regulations and started to offer financial assistance to power generation companies to incentivize them to switch to LNG/gas instead of burning crude oil and coal. In addition, Continental Europe independently adopted a similar strategy to promote switching from oil products to gas. This contractual linkage was founded on the hypothesis that oil and gas are close fuel substitutes in energy generation and industrial plants. Essentially, this makes their *relative value* equivalent to the difference in intrinsic heat contents in addition to any costs associated with transportation and

production. Their relative value had historically kept both fuel prices from deviating significantly from each other. In comparison to crude oil, gas is now the *de facto* fuel of the stationary sectors, which includes the commercial, industrial, residential, and power generation sectors.

Figure 3
Global Fuel Prices



Sources: CME Group and Bloomberg.

Notes: HH stands for Henry Hub; TTF: Title Transfer Facility (in the Netherlands); NBP: National Balancing Point (in the U.K.); and JKM: Platt's Japan/Korea Marker. MMBtu stands for one million British Thermal Units.

LNG has traditionally relied on oil-indexed long-term contracts to secure supply and finance capital intensive projects. Added Corbeau (2017): "Long-term commitments from buyers [were] … regarded as … [critical] for projects to move ahead, notably because banks [had] regard[ed] these elements as an essential part of project financing." In the Asian markets, imported LNG has historically been priced based on the average of a basket of crude oil imports into Japan known as the Japanese Customs-cleared Crude (JCC) price. The JCC price usually has a one-month lag from the Brent oil price. The duration of the lag varies depending on the negotiated contract terms. Some contracts can be priced based on averaging JCC prices from one year to 5 years. This type of pricing is usually supplemented by spot transactions to balance the positions of importers in those markets. The spot transactions are usually priced using gas-on-gas competition-based markers such JKM or Henry Hub. The rationale behind averaging the Brent price is to smooth out any spikes or price shocks that are inherent to the oil market.

Oil-indexation has been subject to criticism due to its structural flaws, which have prohibited a full-commoditization of LNG. This pricing system can create an economic disparity between the current market price when the gas is delivered (via cargo or pipeline) and the contracted price. The effect of the embedded lagged oil price is significantly amplified in an extreme volatile environment. For example, oil prices suffered a severe price shock in March 2020 due to fundamentals that are intrinsic to the oil market. Yet, residuals of this shock were to be carried and rolled several months forward to price gas that was to be delivered at a future date under very different market conditions.

Pirrong (2017) provided an apt historical analogy in understanding how problematic the oil-indexation approach is:

> "[I]t would arguably be only slightly less efficient to put LNG on the gold standard than the oil standard. From 2009 to 2015, the correlation between the spot price of LNG, delivered to Japan and South Korea … and the price of Brent crude oil was -1.4%. During the same period, the correlation between the JKM LNG price and the price of gold was -2.4%. Thus, *pace* Keynes, oil benchmarking of LNG has become a 'barbarous relic' because oil-linked prices do not reflect the value of gas to purchasers, or the cost of producing it."

The economic misalignment caused by oil-indexation represents a major risk that can potentially erode the profitability of a commercial deal for either the buyer or the seller side depending on the direction of the price shock. The industry has traditionally relied on contractual provisions called "Price Review Clauses" or "Price Openers," which allow the parties to make price adjustments if the market conditions change and the contract price does not adequately reflect current supply and demand dynamics. Since there is no standard language for those clauses, parties may find themselves in a situation where they have to negotiate and come to an agreement about the elements and circumstances that can trigger such stipulations. According to Christie and Ogut (2017), enforcing a Price Review provision is not an easy exercise because parties tend to have different interpretations of the terms which can subsequently become a fertile ground for debate that can often end up in arbitration or litigation.

Endnote

This article is updated from Mchich and Till (2020).

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Adila Mchich is a Director in Research and Product Development at the CME Group. She focuses on the fundamentals of energy markets. She has over 10 years of experience serving multiple roles in Market Research & Development, Risk Management, and Product Valuation at the CME Group. Mchich started her career as a Quantitative Analyst.

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She has a B.A. with General Honors in Statistics and with Concentrations in Computer Science and Economics from the University of Chicago. In addition, she has a M.Sc. in Statistics from the London School of Economics where she studied under a scholarship administered by the Fulbright Commission.

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