# *A MARKET MODEL FOR LNG TRADING AND LNG SHIPPING*

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## Overview

LNG markets have significantly evolved over the last three years. In terms of volumes first with a rebound in LNG trades by 12% from 2018 to 2019 that followed an increase by 9% from 2017 to 2018. LNG markets have also moved towards commoditisation as more numerous buyers now trade smaller annual volumes, thus increasing the uncertainty on LNG demand. On the supply side, the number of market players has also expanded, with growing volumes originating from Australia and the US. Between producers and ultimate buyers, LNG portfolio players have finally seen their intermediation role widening. Such shifts in LNG markets have therefore triggered major evolutions in the LNG shipping market. The last three yars have witnessed a major increase in the fleet with 48 ships delivered in 2018 and 39 ships delivered in 2019. Spot charter rates have been quite volatile in 2019, even if the 2018 pikes were not reached. As for LNG trading, changes in the global fleet size comes with a shift towards more liquidity and the development of LNG shipping paper trades. First LNG freight indexes were launched by the Baltic exchange in 2019 and the first Over The Counter swap was settled in July against one of this index while LNG freight futures have been launched on NYMEX in December 2019. Those major evolutions observed in LNG trading and LNG shipping come with a higher complexity for market analysts and forecasters. This paper aims to present a market modelling platform able to deal with such complexity.

## Methods

In this paper, we present a modelling platform which leverages techniques of operational research and applied economics to provide fundamental views on the LNG market and LNG shipping market. The platform assesses a linear least cost minimisation of LNG flows on a monthly basis while taking into account a set of physical and economic constraints of which: the port to port distances, the liquefaction or regasification capacities of LNG trains, the volume of boil-off gas, the LNG contracts… From this flow allocation is derived a LNG shipping demand estimated in bcm.miles. When compared with the LNG shipping supply derived from the number and the capacity of LNG carriers available on the market, the model gives views on the LNG shipping balance and thereafter views on the pressure on the shipping market. The modelling platform is fully developed in Python programming and involves advanced techniques of data storage and visualization to ease the analysis of results.

## Results

The LNG flows allocation provided by the model shows a high degree of similitude with actual historical LNG flows. In particular, the model replicates the seasonal dynamics of supply profiles by sources for major LNG importing regions. The associated shipping demand crossed with the number of LNG carriers available on the market becomes then a tangible indicator of the pressure on the LNG shipping market. Finally, we demonstrate the link between the seasonality of LNG physical flows and the seasonality of LNG freight rates.

## Conclusions

The model provides insights into the LNG market and its associated shipping market and can support decision makers assessing associated risks and opportunities. Further developments are foreseen such as the modelling of the repositioning of ballast LNG carriers or the integration of the whole natural gas market with the aim to enhance the reliability of the market views.

[1] The views expressed are those of the authors and do not necessarily reflect the views of TOTAL SA.