

# ***FUTURE ROLE OF NATURAL GAS STORAGE AND COMPETITION WITH ALTERNATIVE FLEXIBILITY SOURCES***

Igor Riepin, M.Sc., BTU Cottbus-Senftenberg, (+49)0355694043, [iegor.riepin@tu-cottbus.de](mailto:iegor.riepin@tu-cottbus.de)  
Felix Müsgens, Prof. Dr., BTU Cottbus-Senftenberg, (+49)0355694504, [muesgens@tu-cottbus.de](mailto:muesgens@tu-cottbus.de)

## **Overview**

The European gas storage sector grew significantly over the past decade. Storage capacities in EU28 reached 94.5 BCM on Jan 2016. This amounts to a raise of about 40 % over the last 10 years. This process has to be viewed in the light of declining indigenous gas production in continental Europe, growing dependence on gas imports, concerns about security of supply, and a potential increase in price volatility. Gas storages were always considered a key factor in the provision of flexibility and security for gas supplies. They deliver both seasonal as well as short-term flexibility and thus smooth price spikes.

However, storages compete with other flexibility options such as switches in national production, pipeline and LNG imports or demand-side management. Hence, the future role of gas storage facilities and in particular their utilization is debated. The objective of this paper is to analyse the future role of storages and their position in competition with different flexibility sources to meet countries' specific demand within Europe, especially during possible stress demand situations.

## **Methods**

The analysis is performed with a large-scale natural gas market model for Europe. The model encompasses 31 countries with detailed data of transmission pipelines and transit activities, major production regions, natural gas liquefaction and regasification terminals. The analysis covers the time period until the year 2025. The model is formulated as a social-welfare optimisation problem (nonlinear programming). The approach allows us to solve the model with a monthly time resolution, what also provides an opportunity to capture monthly storage injection/withdrawal volumes and seasonal price spreads. The model is solved in GAMS.

## **Results**

Based on the modelling results we show that:

- Indigenous natural gas production has a low contribution to provision of seasonal flexibility;
- There is no clear indication that LNG or pipeline imports may substitute storages as a major tool to provide seasonal flexibility during modelled time period;
- Even though seasonal price spreads on gas hubs have a decreasing pattern, results show high storage utilization levels for the next decade. That suggests a vague correlation between seasonal price spreads and utilization of storage capacity;
- The value of seasonal flexibility provided by storage facilities differs broadly across European countries;
- Supply flexibility provided by pipeline or LNG imports in one country may come from dispatch of storages or flexible gas production facilities in other countries.

## **Conclusions**

We conclude that seasonal flexibility provided by natural gas storages cannot be substituted by alternative flexibility sources on a large scale. The value of seasonal flexibility provided by storage facilities differs broadly across European countries. Furthermore, storage utilization levels will remain high for the next decade, despite low values of winter-summer price spreads.