Caroline Dieckhoener[1]

SIMULATING SECURITY OF SUPPLY EFFECTS OF THE NABUCCO AND SOUTH STREAM PROJECTS FOR THE EUROPEAN GAS MARKET

[1]Institute of Energy Economics at the University of Cologne (EWI), Germany
+49-221-27729-312, Caroline.Dieckhoener @uni-koeln.de

OVERVIEW

In addition to the Nord Stream pipeline, the Nabucco and South Stream pipeline are projects planned for the next decade to provide further gas supplies to the European market. Due to the increasing European import dependency, significant additional gas volumes will be required. (See [1] and [2].) As one of the European Union's energy policies' foci is security of supply, the question can be raised if and how these projects contribute to this objective not only in terms of diversification but also in case of supply disruptions such as occurred in 2009 during the Russian-Ukraine gas crisis. This paper discusses these major gas import pipeline projects to Europe and analyzes their effects on gas flows and marginal cost prices in case of gas supply disruptions (of different duration) via Ukraine in a model-based analysis.[1]

METHODOLOGY

The paper outlines the pipeline projects Nabucco and South Stream and their potential for the European gas market. The major changes of aggregated annual gas flows throughout different scenarios simulated with the European natural gas infrastructure and dispatch model TIGER (see [3]) are analyzed for the year 2020. TIGER optimizes the natural gas supply and dispatch of volumes for Europe, subject to the available infrastructure, by minimizing the total cost of gas supply. The model enables an integrated evaluation of the infrastructure components, i.e. pipelines, storages and LNG import terminals, and their interaction. Moreover, the model allows for the computation of locational marginal cost price estimators. Security of supply issues may be in focus of the analysis, e.g. to analyze effects on the marginal cost prices and the utilization of infrastructure (see [4]) in certain crisis situations. The model's database has just been updated in the context of the EWI's study conducted for the European Regulator's Group for Electricity and Gas (ERGEG) (see [3]).

As about 80% of Russian gas to the European Union is transited via Ukraine, a supply disruption on this route seems to be most threatening for the European gas supply. The effects of the inclusion of the Nabucco or the South Stream pipeline in the model's infrastructure on the locational marginal cost price estimators are therefore simulated and evaluated for a supply disruption of two, four and eight weeks of gas imports via Ukraine. This evaluation is based on simulated daily gas flows.

RESULTS AND CONCLUSIONS

As future Russian gas supplies will mainly stem from Western Siberia and the Yamal Peninsula and as Russian exports to Europe are assumed to not be much higher than 200 to 220 billion cubic meters in 2020, the gas flow simulations show that gas volumes transported

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[1] A similar analysis has been performed by EWI in its study for the European Regulator's Group for Electricity and Gas (ERGEG) (see [3]). However, this paper's simulations are based on slightly different assumptions on the pipeline projects and are extended by different disruption durations. Furthermore, the analysis goes more into detail.

via South Stream would mainly substitute gas transited to Europe via Ukraine (quod vide [5]). In addition, assuming sufficient gas supplies will be available to fill the Nabucco pipeline, these volumes would support the intention of the European Union to diversify its gas supplies and reduce its dependency on Russian gas (quod vide [6]).

The simulation of a four week supply disruption via Ukraine leads to the marginal cost price increases (compared to the same scenario without a disruption) shown in Figure 1 for the Baseline Scenario (without any of the two pipelines). Consumer cut-offs are indicated by dark purple colour. Figure 2 shows the marginal cost price increases for the same disruption but with the Nabucco pipeline included in the simulation. Thus, based on simulations with the TIGER model, it can be highlighted that the additional gas volumes transported to Europe on the Nabucco pipeline reduce marginal cost price increases and consumer cut-offs from gas supply in case of another Ukraine crisis.
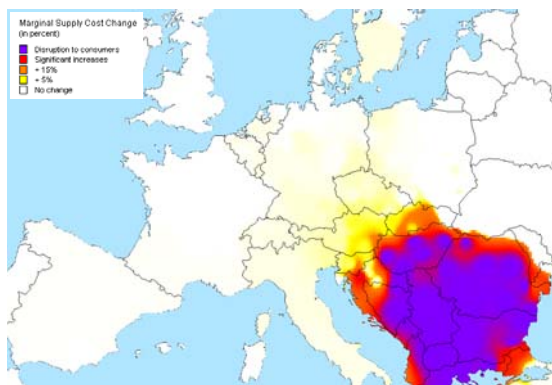

Fig. 1: Marginal Cost Price Changes and Consumer Cut-offs (Baseline Scenario)
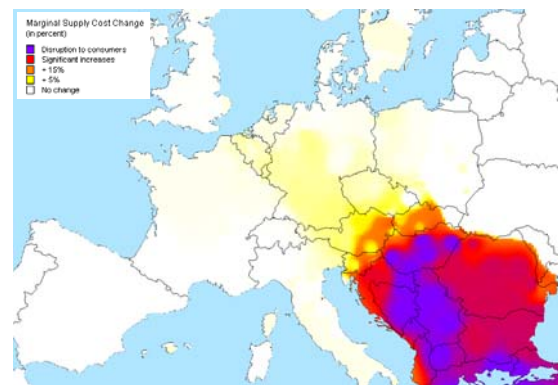
Fig. 2: Marginal Cost Price Changes and Consumer Cut-offs (Nabucco Scenario)

Generally, the inclusion of Nabucco and South Stream in the model simulations both lead to reductions of disruptions to consumers and to less price increases during such a crisis, especially in south-eastern Europe. Effects in western Europe are rather small. To put it in a nutshell, Nabucco and South Stream do not only provide additional gas volumes for the European market but they could also mitigate the effects of supply disruptions via Ukraine. However, only Nabucco reduces the dependency on Russian gas if adequate alternative suppliers in the Middle East and Caspian region are available to provide gas for the pipeline.

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