From Boom to Bust?

A Critical Look at US Shale Gas Projections

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Executive Summary

In the last decade, the U.S.A has seen an unexpected increase in natural gas production. Between 2005 and 2013, production has increased by more than a third, exceeding the all-time record levels set in the early 1970s. This rise in domestic production has been almost entirely driven by a boom in the extraction of natural gas from shale formations. Despite current low natural gas prices, production is seeing further increases. Moreover, this recent rise of U.S. shale gas production is generally expected to continue, which has important implications on the U.S. trade balance. Instead of largely relying on foreign natural gas supply, envisaged less than a decade ago (e.g., EIA, 2005), the U.S.A is now projected to become a significant exporter of Liquefied Natural Gas (LNG; e.g., EIA, 2014a).

While partly backed by realized production growth, there are three reasons why it is questionable that the current U.S. shale gas boom can continue. First, there is uncertainty in the amount of technically recoverable shale gas resources. Second, it is unclear to which

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extent U.S. shale gas can be produced economically. Third, public acceptance may drop, followed by a tightening of regulation.

Estimates of technically recoverable shale gas resources (TRR) crucially rely on controversial assumptions on the potential area of shale production, on well spacing and estimated ultimate recovery per well. In essence, historical production data is used to extrapolate the TRR. However, as current production concentrates on the most productive areas and at plays with a high share of Natural Gas Liquids, TRR are potentially overestimated due to the extrapolation from non-representative production history.

Moreover, these estimates describe the technical potential, but are not an economic evaluation. Recently projected production levels can indeed be sustained by the currently estimated resource base. It is highly optimistic, though, given the share of roughly two-thirds of the estimated TRR that would be extracted through 2040. Put into perspective cumulative production would be three times larger than currently proved reserves. Prices need to be sufficiently high to maintain large future U.S. shale gas production. Hence, comparative cost advantages may eventually be lost to natural gas supply from abundant conventional sources in other world regions. Yet current U.S. shale gas production is high despite low natural gas prices. However, this is not a contradiction and can be explained by short-term factors, such as the shift to most productive shale gas deposits.

Finally, a large number of shale gas wells will have to be drilled in order to reach the projected production level. Shale gas production can have adverse local effects, particularly on society and the environment. Any fall in public acceptance and strengthening of regulation increases supply costs of shale gas production and tends to reduce resource availability. Or put differently, “[a]ny adverse change in the generally

favorable regulatory and operating environment in the United States could have a material impact on the outlook for unconventional gas production" (IEA, 2013b, p. 118).

In light of these arguments, this paper critically assesses current optimistic projections of U.S. shale gas production. I further investigate the implications of alternative developments of U.S. natural gas production on the U.S. market and on global trade flows in natural gas. To this end I make use of the Global Gas Model (GGM; see Egging, 2013), a large-scale partial equilibrium model that allows the analysis of trade flows and infrastructure expansions along the natural gas value chain. Two scenarios are constructed: One scenario is defined along a strong reduction in shale gas production as of 2015; the second by a maintained shale gas production at the level projected for 2015.

Simulation results suggest that a reduction in future U.S. shale gas production would be partly compensated for by natural gas production outside the U.S.A. Consumption would mainly decrease in other countries, while it would stabilize in the U.S.A at higher prices. LNG trade flows would be shifted toward the U.S.A, which would compete with European and Asian countries for international supply. Existing U.S. LNG import capacity would be utilized at higher rates or even extended to meet demand.

In conclusion, a critical evaluation is needed of both the estimated shale gas resource potential, and projected U.S. future production levels. The investment options of liquefaction and regasification facilities are heavily influenced by future U.S. shale gas production. Current expansions of LNG export infrastructure will only be needed if U.S. shale gas production continues its fast rise; the licensing process should be adjusted in light of the discussed uncertainties. In contrast to the current debate on U.S. export capacity

needs, the U.S. LNG import infrastructure in place may well be utilized and even extended if shale gas production cannot meet the hopes pinned on it.