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SOME FUTURE SCENARIOS OF NATURAL GAS IN EUROPE

Tatiana Mitrova, ERI RAS
Tim Boersma, Brookings Institution
Geert Greving, IGU

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Background

- The ongoing turmoil in Ukraine has fuelled a lively debate on the role of Russian natural gas in the European Union (EU). That debate is not new and has been revitalized repeatedly since the first major supply disruption in 2006, which took place after several decades of fairly stable supplies.
- Since the 1990s, European institutions have been engaged both in liberalizing European gas markets, which had historically been developed at the member state level, and in further integrating them. Though completion of the internal market is not expected before the end of the decade, currently we see a new push for further European integration, including Energy Union Package published in February 2015.
- As part of this debate European policy makers have asked for studies exploring what options the EU has to diversify away from Russian natural gas.
- Options that have actively been debated are increasing the share of liquefied natural gas (LNG) from different sources including US, and securing more pipeline gas supplies from Caspian and Mediterranean area.

Aims

- To give a realistic impression of the role of Russian natural gas in Europe in the period until 2040.
- To give a detailed account of the different sources of supply and to show how realistic recent outcries for diversification of supply are.
- To demonstrate that markets in CEE are currently not as well integrated as some scholars and policy makers have recently suggested and to show that increased market integration and de-escalation of the crisis in Ukraine are of utmost importance to safeguard EU energy security, in particular for countries in Central and Eastern Europe (CEE).
- To give a reasonable impression of the amount of US LNG that will be competitive in the European market space, a cause that has passionately been pleaded for by many in recent months.

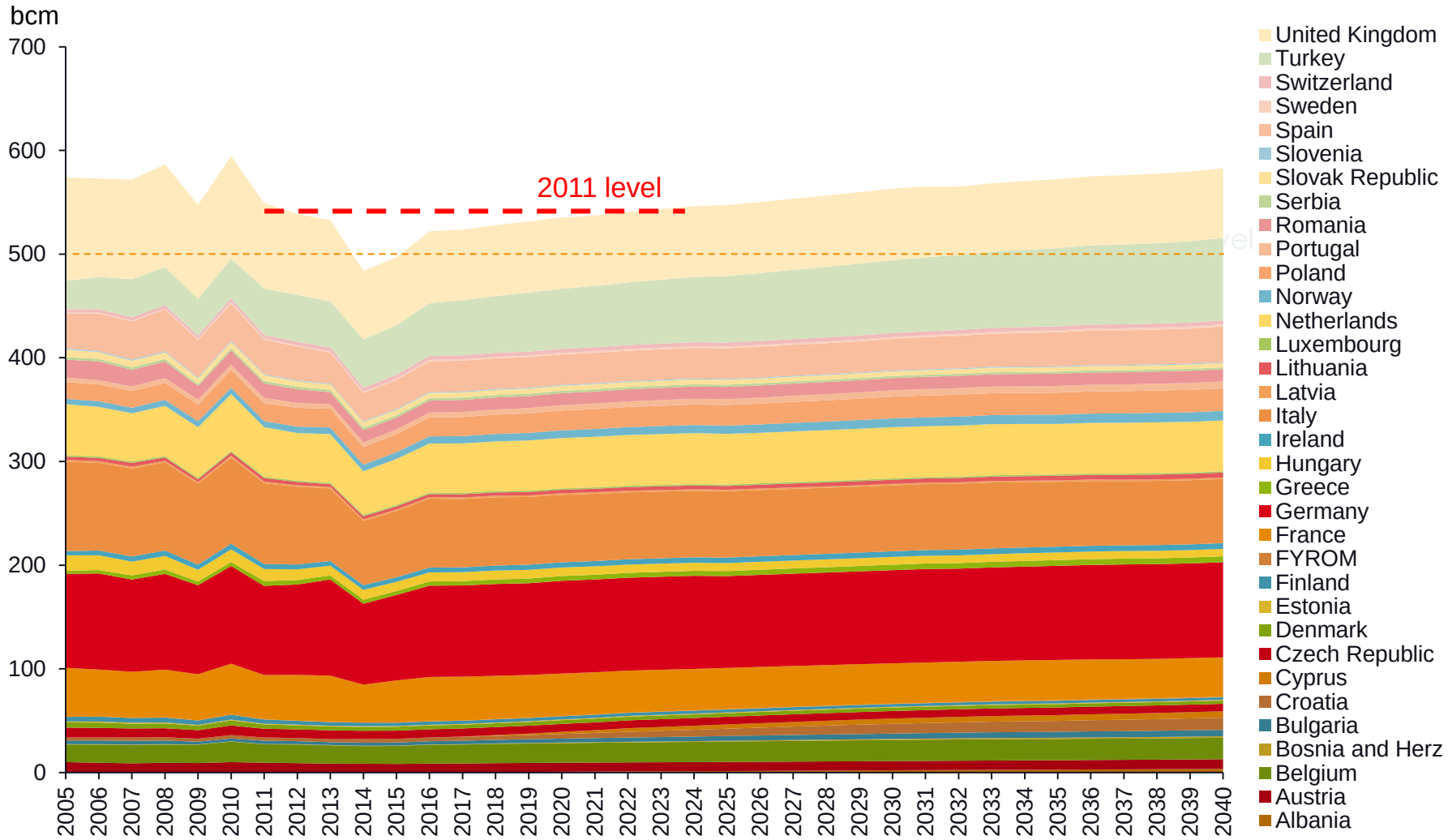
Methods

- This study builds on calculations performed using the NEXANT world gas model (WGM) integrated in ERIRAS modeling information complex SCANER.
- The calculations in the WGM are based on demand and potential production forecast in each gas producing and/or gas consuming country of the world up to 2040. The model contains a few thousands of routes of LNG and pipeline gas supply connecting these countries (and corresponding transportation costs). The aim of the WGM is to deliver optimized volumes of gas supply by each route. The optimized solution is set to be the cheapest one. In other words, the WGM searches for the minimum cost of meeting world gas demand. Unlike many energy markets models, which use prices as assumptions, the WGM calculates gas prices as marginal costs of supply in each country. To account for the features of gas markets pricing mechanisms the data on volumes, prices and take-or-pays of long-term contracts is also included in the model.
- Gas demand forecast by country is obtained from SCANER and calculated based on countries' energy balances forecast, that involves projections for economic development, demography indicators, and energy policy analyses.

General assumptions for all scenarios

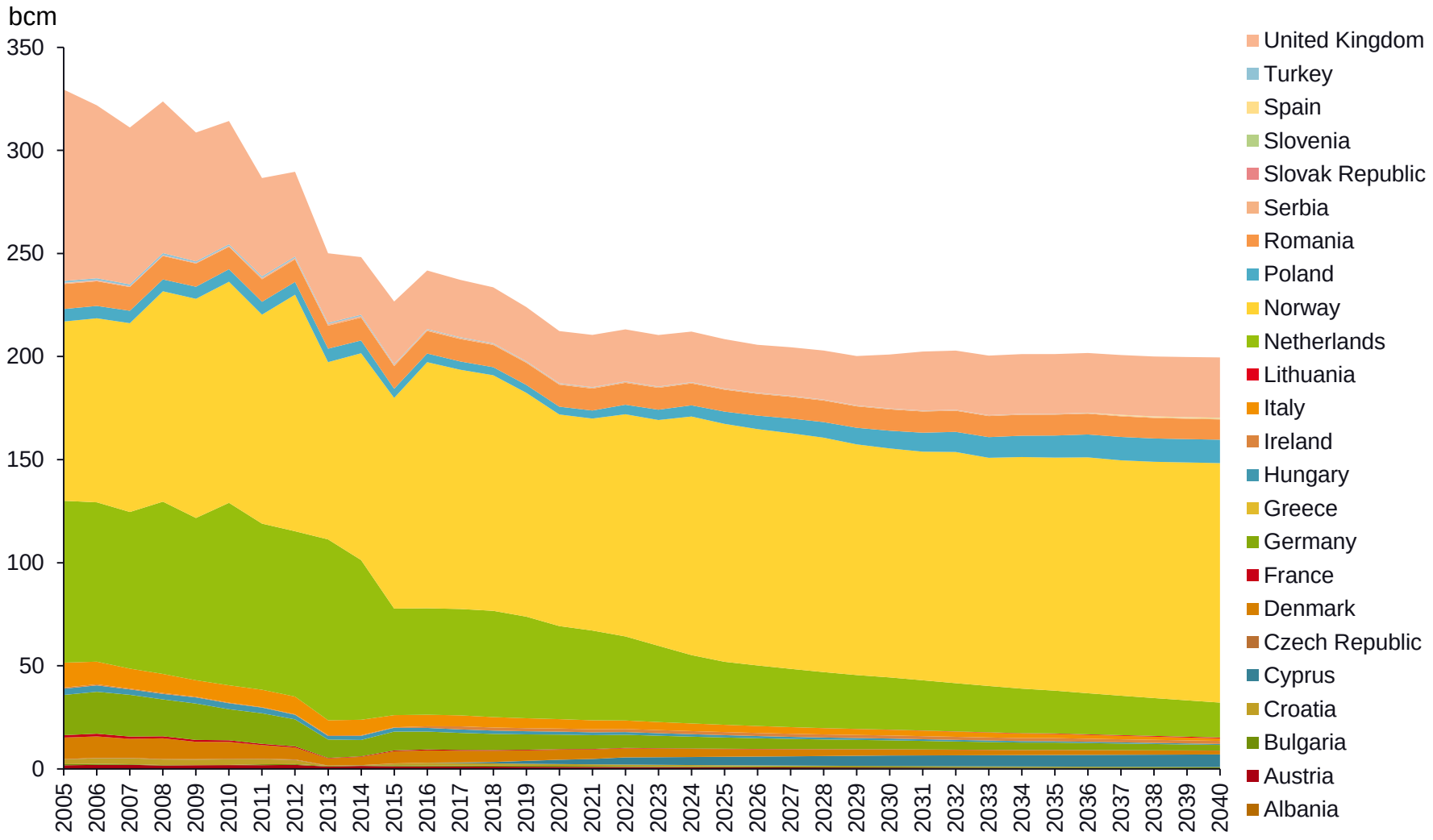
- Global gas consumption in 2015-2040 will increase by 48% to 5.3 tcm (average annual growth rate of 1.6%).
- Gas demand in Europe will begin to recover as early as 2015 and will increase by 20% to 2040, which is an average annual growth rate of 0.6% in the forecast period. (Europe includes 34 countries: Albania, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Republic of Macedonia, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom).
- Gas production in Europe (with account for a new production profile in the Netherlands) will drop to 212 bcm as early as 2020. However, after 2020 we expect domestic production to continue to decline very modestly, to 199 bcm by 2040. This includes assuming a total of 20 bcm of shale gas production in 2040. In our calculations we assume that over 80% of the European shale gas production takes place in the UK and Poland.
- Of course, at a certain price everything is possible, but we have assumed stable demand and normal market behavior according to price signals, as one may expect in a liberalized gas market, such as that of the EU.
- Average CO2 emission price of 40 euros per ton in the period from 2015 – 2040.
- Due to the political instability in Iran and Iraq, the Southern Corridor will be significantly expanded only after 2030 (existing 10 bcm deliveries from Iran to Turkey and 3-4 bcm from Azerbaijan to Turkey will be expanded by 10 bcm from Azerbaijan by 2019 and another 10 bcm from Iran plus 10 bcm from Iraq after 2030).
- Only planned LNG terminals are being built, including long-debated terminals such as the one in Croatia, not the proposed ones.
- **All the decisions by the market participants are made based on the economic rationale, not on the geopolitical considerations.**

European gas demand projection



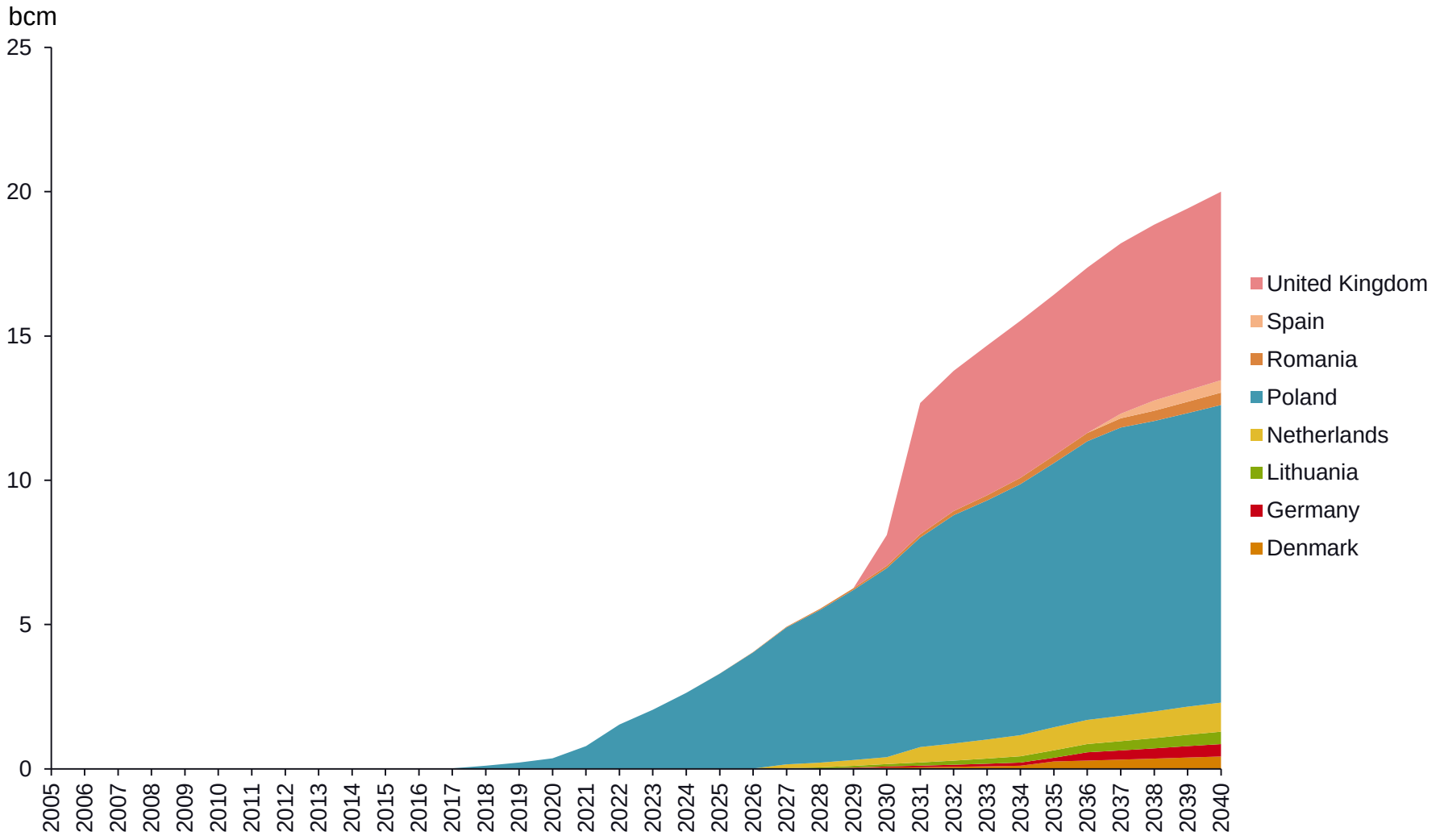
European gas demand will not recover to the pre-crises level of 2008 (and 2010) until 2040; gas demand will reach the level of 2011 only by 2025

Indigenous gas production in Europe



Total gas production in Europe will drop by 1/3 as early as 2020

Shale gas production in Europe



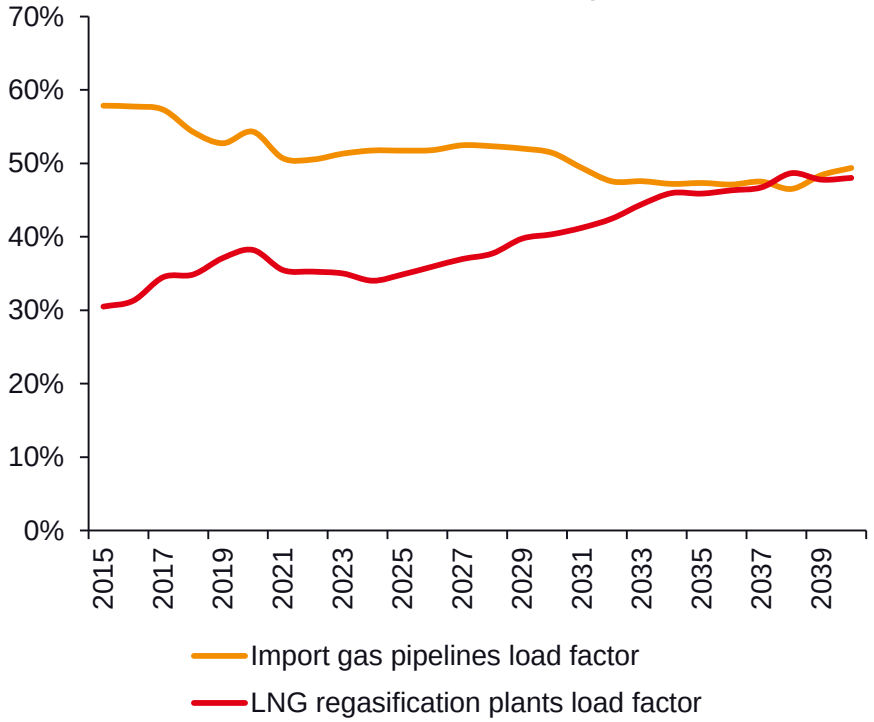
Shale gas production in Europe is not expected to exceed 20 bcm by 2040

Scenario assumptions

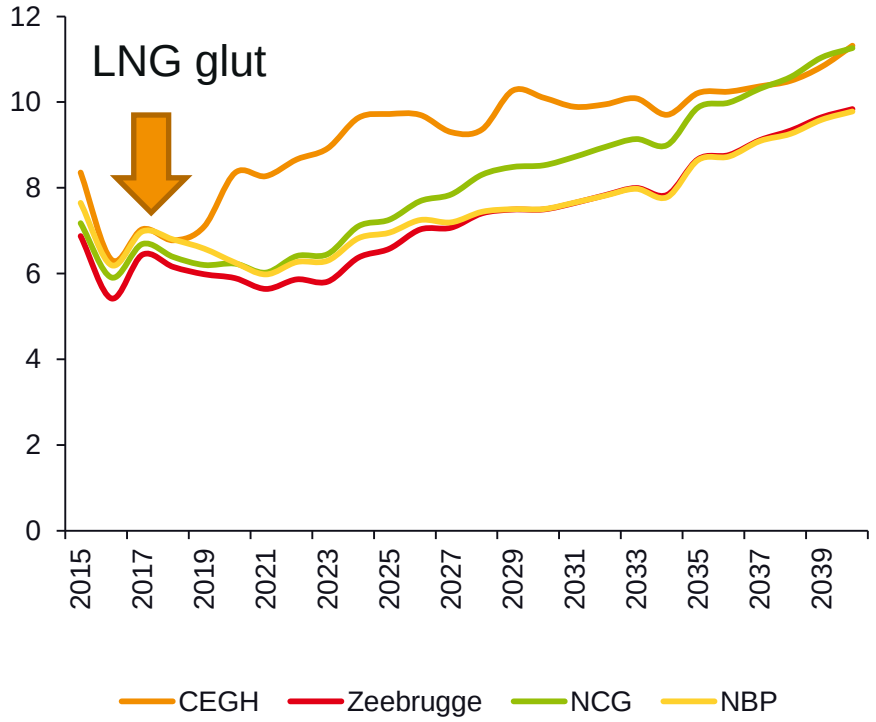
	Baseline	No contract extension	High oil price	No Turkish Stream	No Ukrainian transit
Brent oil price	$60/bbl in 2015, $70/bbl in 2016, $80/bbl in 2018 and reaching $100/bbl by 2035	60/bbl in 2015, $70/bbl in 2016, $80/bbl in 2018 and reaching $100/bbl by 2035	$120/bbl	60/bbl in 2015, $70/bbl in 2016, $80/bbl in 2018 and reaching $100/bbl by 2035	60/bbl in 2015, $70/bbl in 2016, $80/bbl in 2018 and reaching $100/bbl by 2035
Russian contracts are extended by 10 years after their expiration, with a share of spot-pricing of 35%	+	-	+	+	+
Turkish Stream is constructed	+	+	+	-	+
Ukrainian transit is accessible	+	+	+	+	- (starting from 2015)

Baseline scenario: LNG imports and prices

European import gas pipelines and LNG terminals load factors forecast, Baseline scenario, %

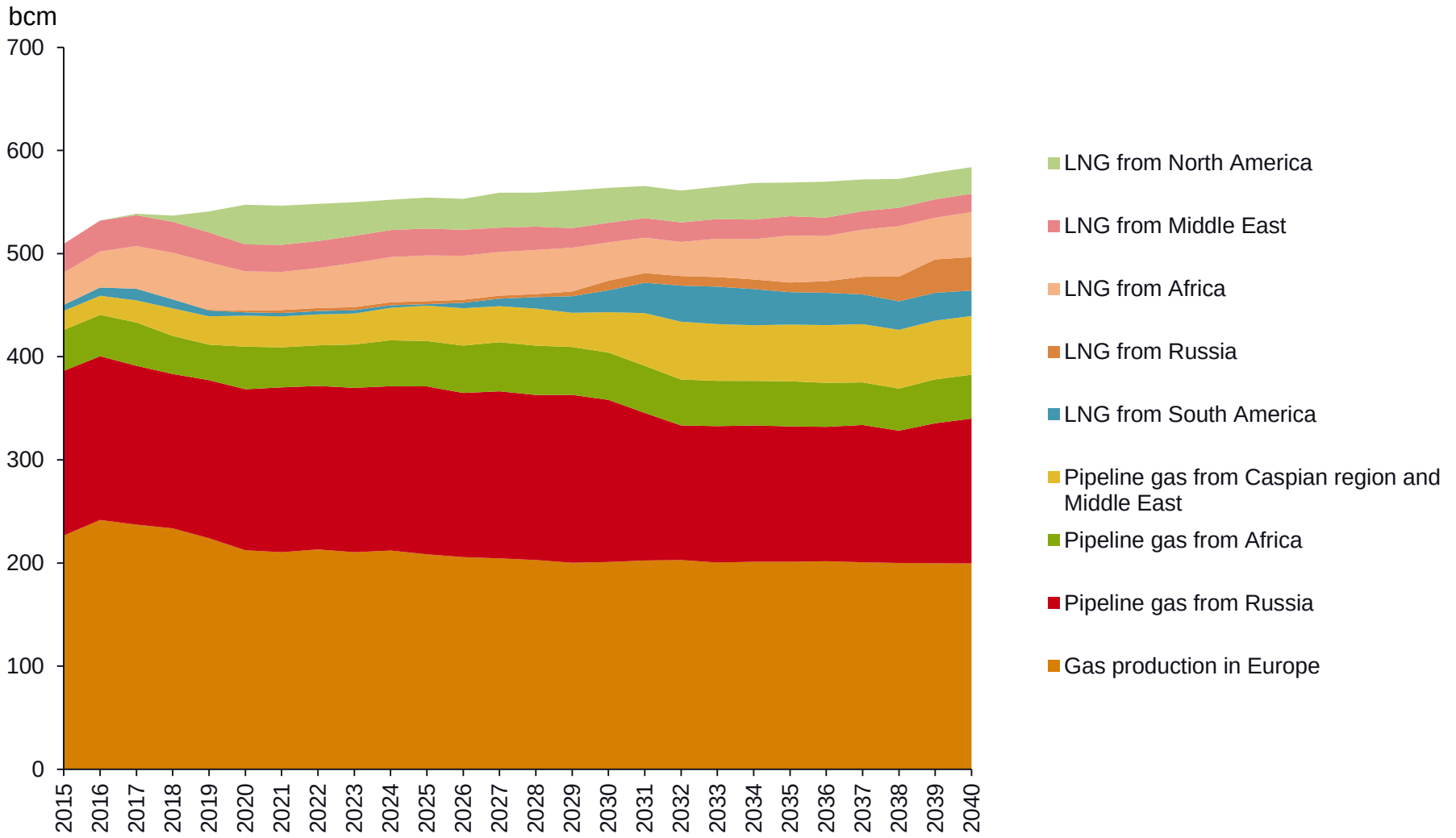


European gas hub prices forecast, Baseline scenario, $/mmbtu ($2012)



European LNG imports grow quite steadily until the end of forecast period, while pipeline imports levels out after 2025. The dramatic increase in LNG import by 2020 will hold spot prices at 6–8 $/mmBtu

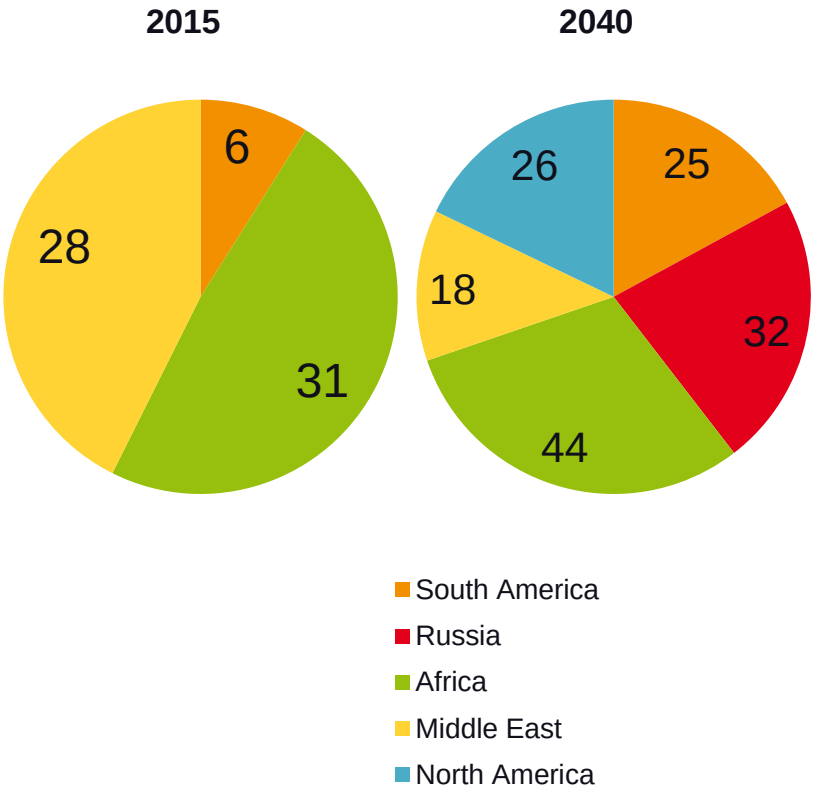
Baseline scenario: the European gas balance



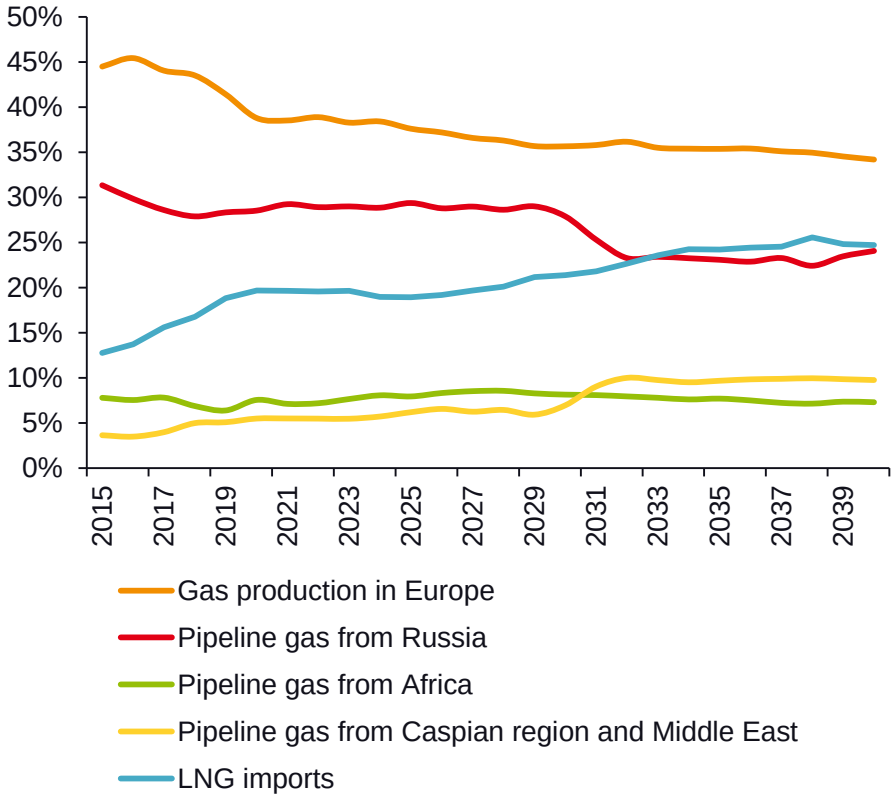
The structure of the European gas balance will not change dramatically in this scenario, pipeline supply share remains nearly flat, while growing LNG imports to Europe compensate for the declining indigenous gas production

Baseline scenario: sources of gas supply

LNG import structure by source in 2015 and 2040, Baseline scenario, bcm



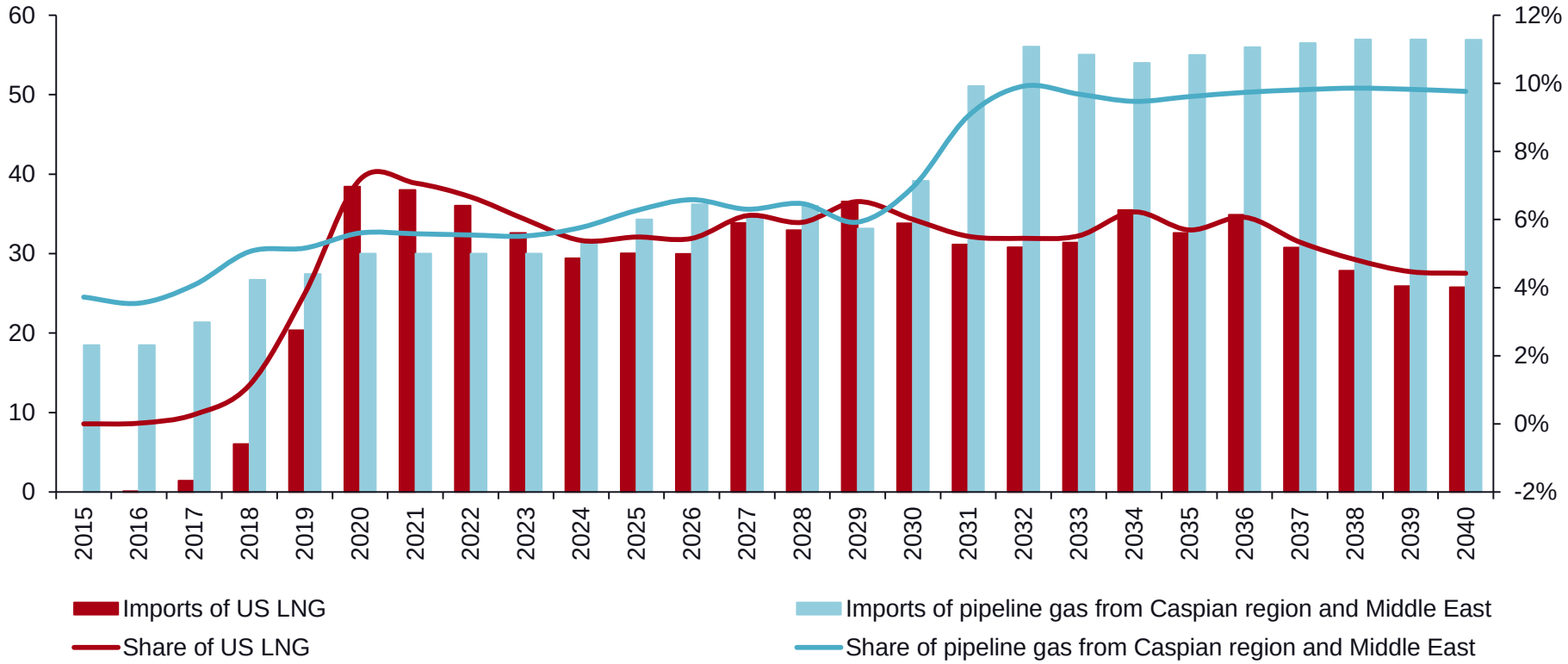
European gas market shares by major supply sources, Baseline scenario, per cent



The share of Caspian and Middle Eastern pipeline gas will nearly triple upon the corresponding decline in the share of pipeline gas supplies from Russia. Russian pipeline exports will drop from 150-160 bcm to 125-135 in 2035-2040

Baseline scenario: US LNG, Caspian and Middle East gas

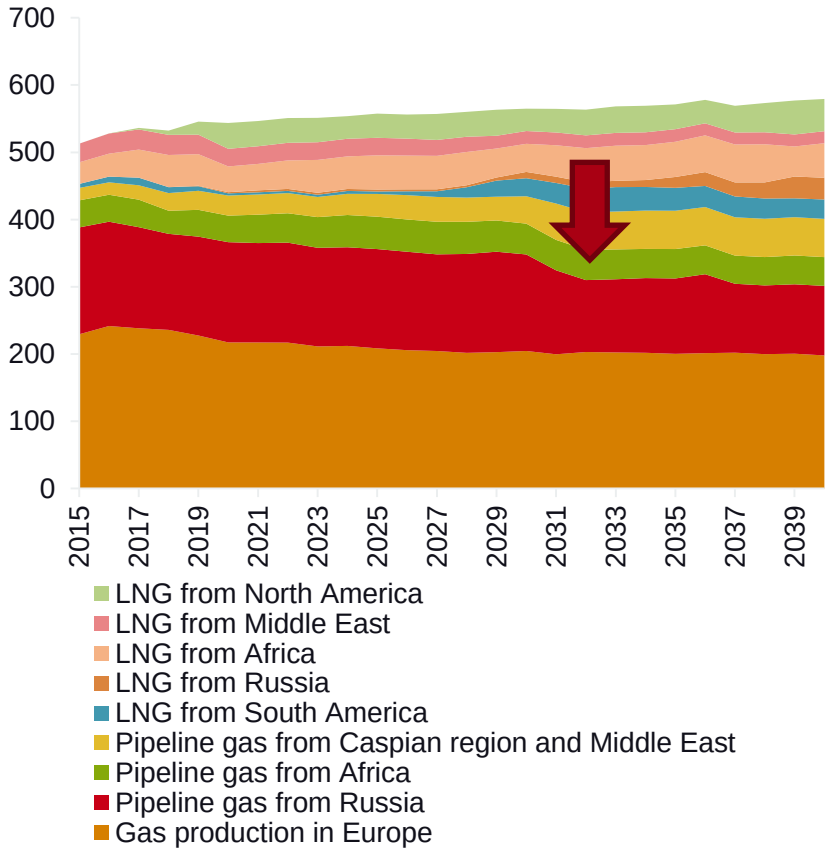
Volume and share of the US LNG and pipeline gas from Caspian and Middle Eastern countries in the European gas market, bcm (left scale), per cent (right scale)



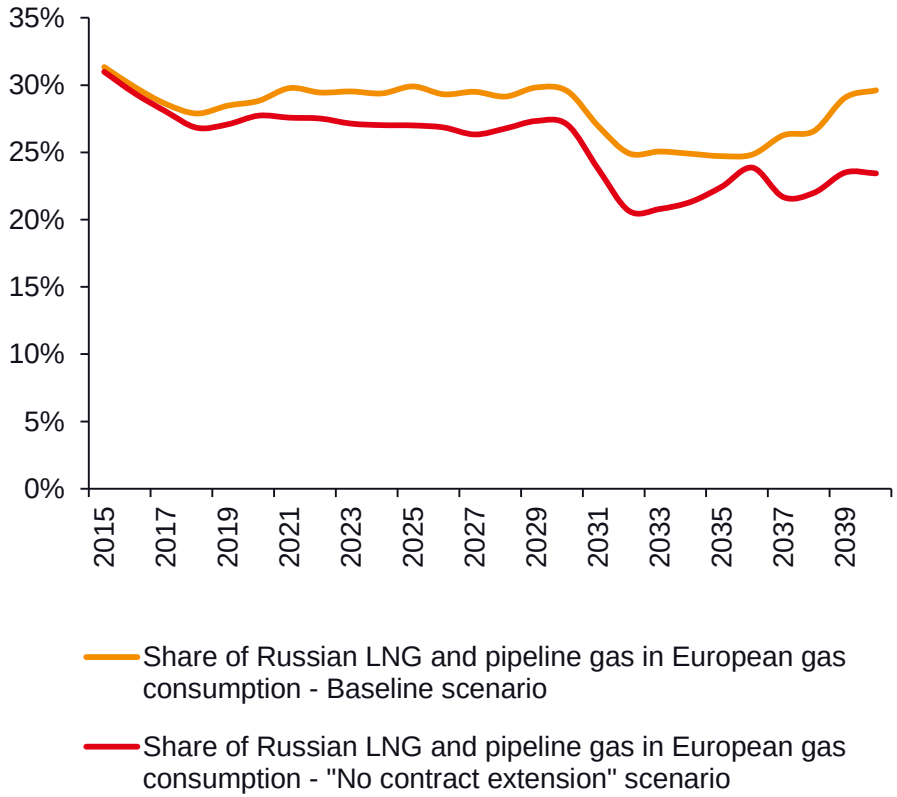
LNG imports from the US will rapidly grow up to 40 bcm by 2020 and then decline to less than 30 bcm by 2040. Pipeline gas imports from Caspian and Middle Eastern countries will steadily grow to almost 60 bcm by 2040

“No contract extension” scenario: the European gas balance

European gas balance forecast, ‘No contract extension’ scenario, bcm



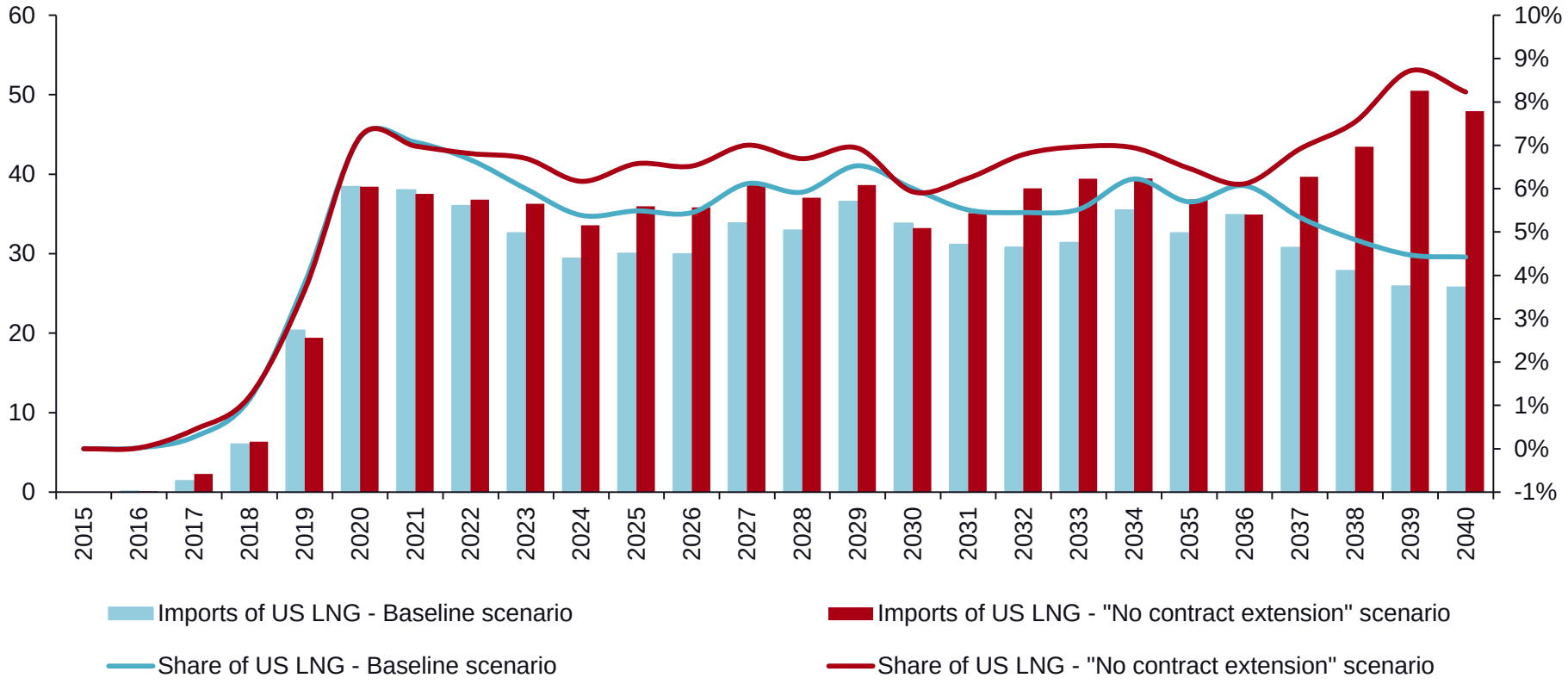
Share of Russian gas in the European gas market by scenario, %



In this scenario LNG imports are increasing faster, while pipeline imports from Russian fall to 103 bcm in 2040, but no significant changes in spot prices are observed as compared to the baseline scenario

“No contract extension” scenario: US LNG

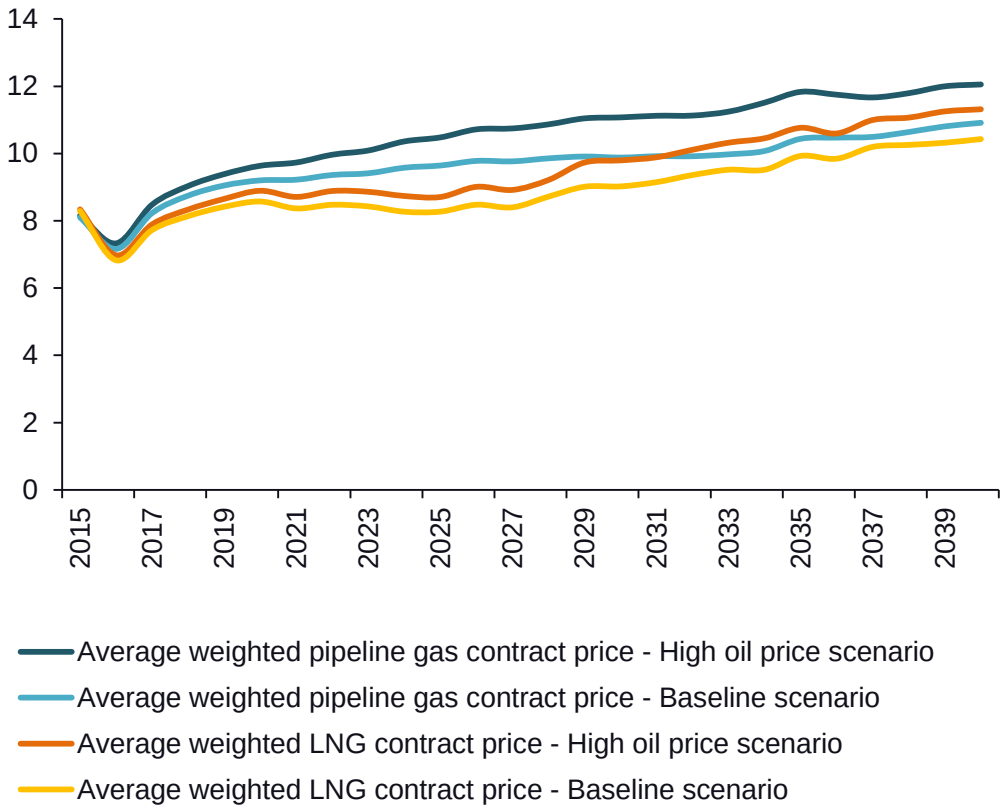
Volume and share of the US LNG in the European gas market by scenario, bcm (left scale), per cent (right scale)



LNG imports from the US will only partially substitute for Russian gas as contracts between the European companies and Gazprom expire. Share of the US LNG in the European gas market will reach about 8% by 2040

High oil price scenario: imports prices

Average weighted European gas contract prices forecast by scenario, $ (2012)/mmbtu

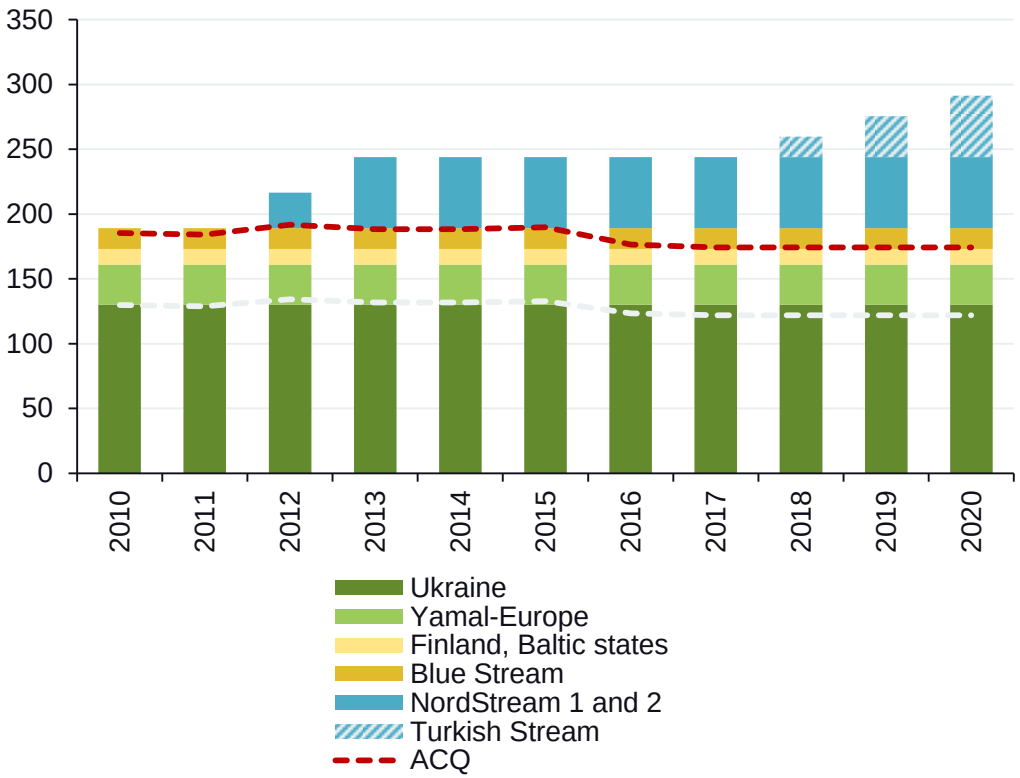


- Spot market prices at the major European hubs remain almost unchanged (higher by 3% on average for the period under study at eight European hubs).
- Prices of pipeline gas supply contracts in 2015–2040 are 9% higher than in the baseline scenario due to the higher oil prices, 10.5 $/mmBtu on average.
- Prices of long-term LNG contracts in 2015–2040 are also 6% higher than in the baseline scenario, 9.5 $/mmBtu on average.

The imports volume and structure are virtually unchanged as compared to the baseline scenario. Weighted average gas price is 3% higher in this scenario in the period 2015–2040

“No Turkish Stream” scenario

Gas pipeline exports capacities from Russia to Europe and contracted volumes, bcm

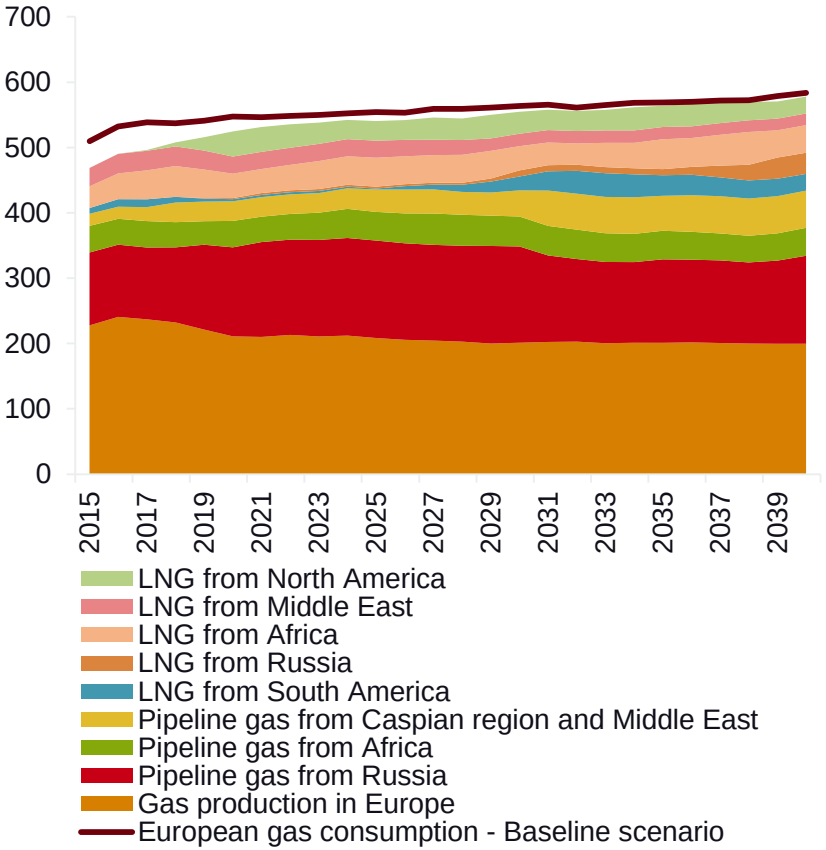


- There are no significant differences from the baseline scenario in terms of imports, including the imports from Russia (the difference in the volume of non-Russian gas imports to Europe from the baseline scenario does not exceed 3 bcm).
- Gas is delivered to Europe via Ukraine (up to 6 bcm), through Moldova (up to 10 bcm), and through the Blue Stream (up to 10 bcm) instead of the Turkish Stream.
- There are also no significant differences from the baseline scenario in terms of spot prices at eight European hubs (difference is about 0.1%).

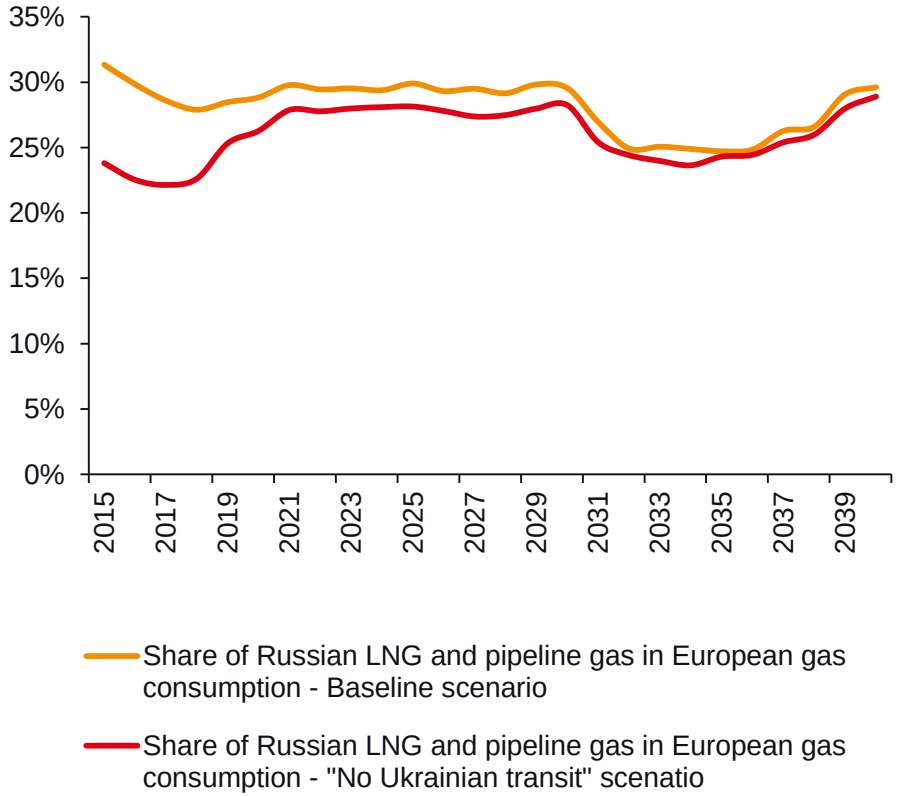
In the scenario “No Turkish Stream” there are no significant differences from the baseline scenario in terms of imports and prices – due to the fact that even in the baseline scenario utilization of this pipeline is rather low (less then 20 bcm)

“No Ukrainian transit” scenario: gas balance

European gas balance forecast, ‘No Ukrainian transit’ scenario, bcm



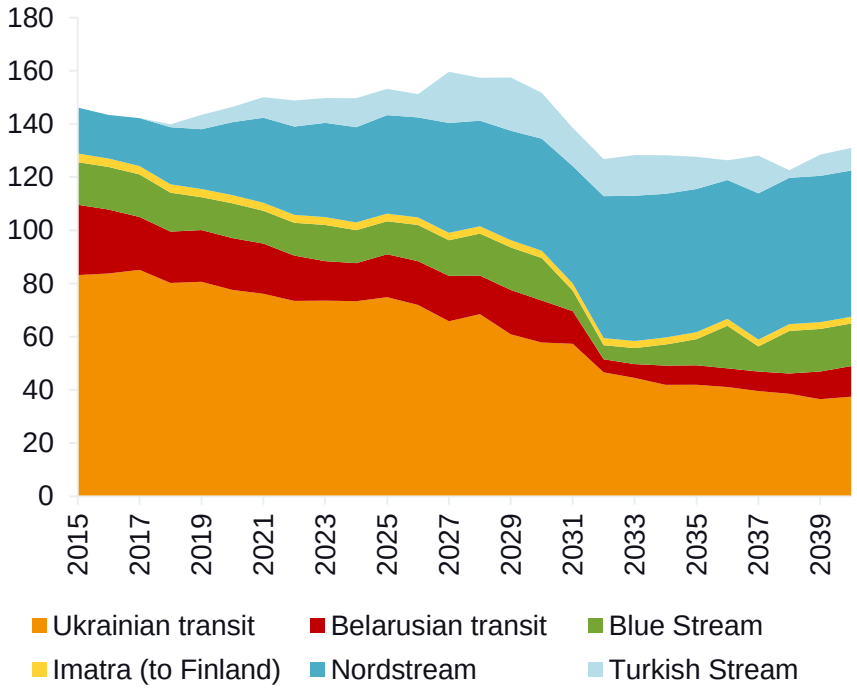
Share of Russian gas in the European gas market by scenario, %



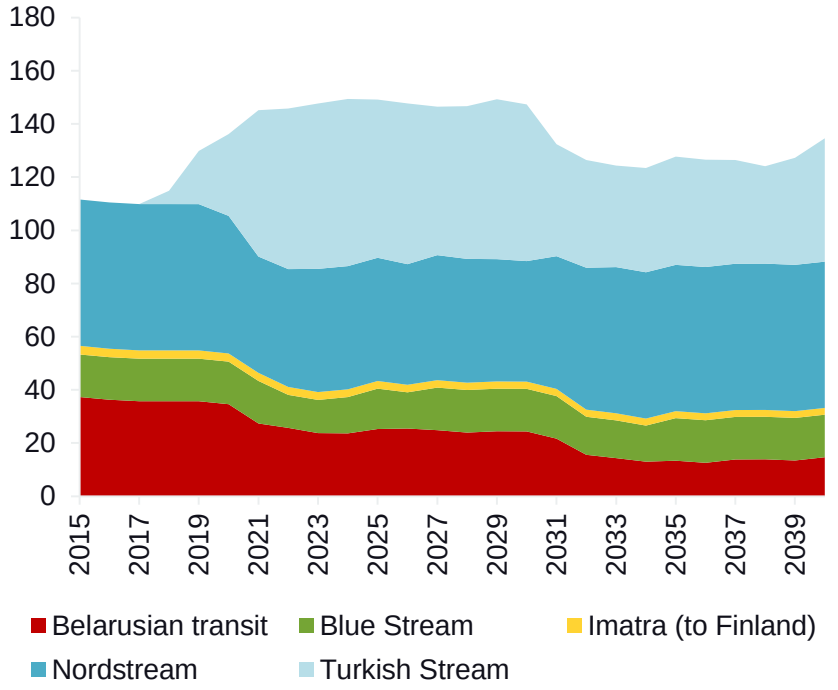
In this scenario gas consumption in Europe will reduce by 6% in 2015 and by 1% in 2040. Share of Russian gas will drop from 31% to 24% in 2015 as only 5 bcm more LNG will be delivered to the European market

“No Ukrainian transit” scenario: pipeline imports from Russia

Russian pipeline gas exports to Europe forecast, Baseline Scenario, bcm



Russian pipeline gas exports to Europe forecast, Baseline Scenario, bcm



In this scenario pipeline gas imports from Russia in 2015 is less by 47 bcm (30%) than in the baseline scenario, and it does not recover until 2040. Spot prices remain unchanged except for the Austrian hub CEGH, where they more than double in 2015, but after 2020 they will be 10% higher than in the baseline scenario

Results

- Natural gas supply and demand seem remarkably stable under these four scenarios. Even in the case of fairly dramatic policy decisions, such as the obstruction of the realization of Turkish Stream or no Ukrainian transit, the impacts on supply are fairly modest.
- Pipeline gas imports into Europe from Russia peak around 2015, and stabilize after 2025 at around 140 bcm, almost regardless whether Ukrainian transit is possible or Turkish Stream gets built.
- After 2025 average LNG regasification terminal load factors slightly recover to around 50% in all scenarios, and LNG imports more than double between 2015 and 2040. Until then pipeline load factors are around 60% and higher in all scenarios beyond 2020, before they fall to stabilize around 50% as well. Pipeline imports into Europe increase in the period up to 2040, to stabilize around 240 bcm.
- Finally, as expected domestic production in Europe gradually declines, despite shale gas production coming on stream, to 194 bcm in 2040.

Conclusions

- Natural gas supply to Europe until 2040 changes remarkably little in the different scenarios that we have considered. Despite the calls for diversification away from Russia, there are in fact very limited opportunities for EU to achieve this target even in the long term, not mentioning the short-term. Therefore, building stable relations with Russia is critical for EU energy security, as well as focusing on much deeper integration of the internal market and infrastructure development inside EU.
- In the short to medium term, the exclusion of Ukraine as a transit country, which could happen if the conflict with Russia further escalates, would have significant upward consequences for spot market prices in CEE, taking CEGH (Baumgarten) prices as an indicator for prices in that region. In contrast, the effects in Northwestern Europe (following NBP prices), where markets are better integrated, are virtually nonexistent. This confirms our hypothesis that CEE markets are currently not as well integrated as some analysts have claimed. It also confirms that market integration actually works, and is the way forward for the EU.
- We expect LNG imports to recover to essentially fill up for the decline in domestic production. The United States will be a very significant supplier of LNG to the United Kingdom, and will also ship a substantial amount of LNG to the Netherlands and Belgium. The bulk of LNG though will come from African countries such as Algeria, Angola, Nigeria, Equatorial Guinea, and also Qatar and Trinidad and Tobago. It is important to reiterate that absent further market integration these alternative supplies will add to supply diversity in the aforementioned countries and their connected neighbors, not to supply diversity in CEE member states.
- This, combined with the reality that most alternative supplies are only second best options (because their costs are significantly higher, or the quantities are not expected to be significant any time soon, or because supplies will not reach the market in the foreseeable future) and a substantial amount of natural gas supplies is tied up in long-term contracts, leads us to believe that despite the often expressed political desire to move away from Russian gas will in fact happen.