OXFORD INSTITUTE FOR ENERGY STUDIES Natural Gas Research Programme

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Russia Gas Sector

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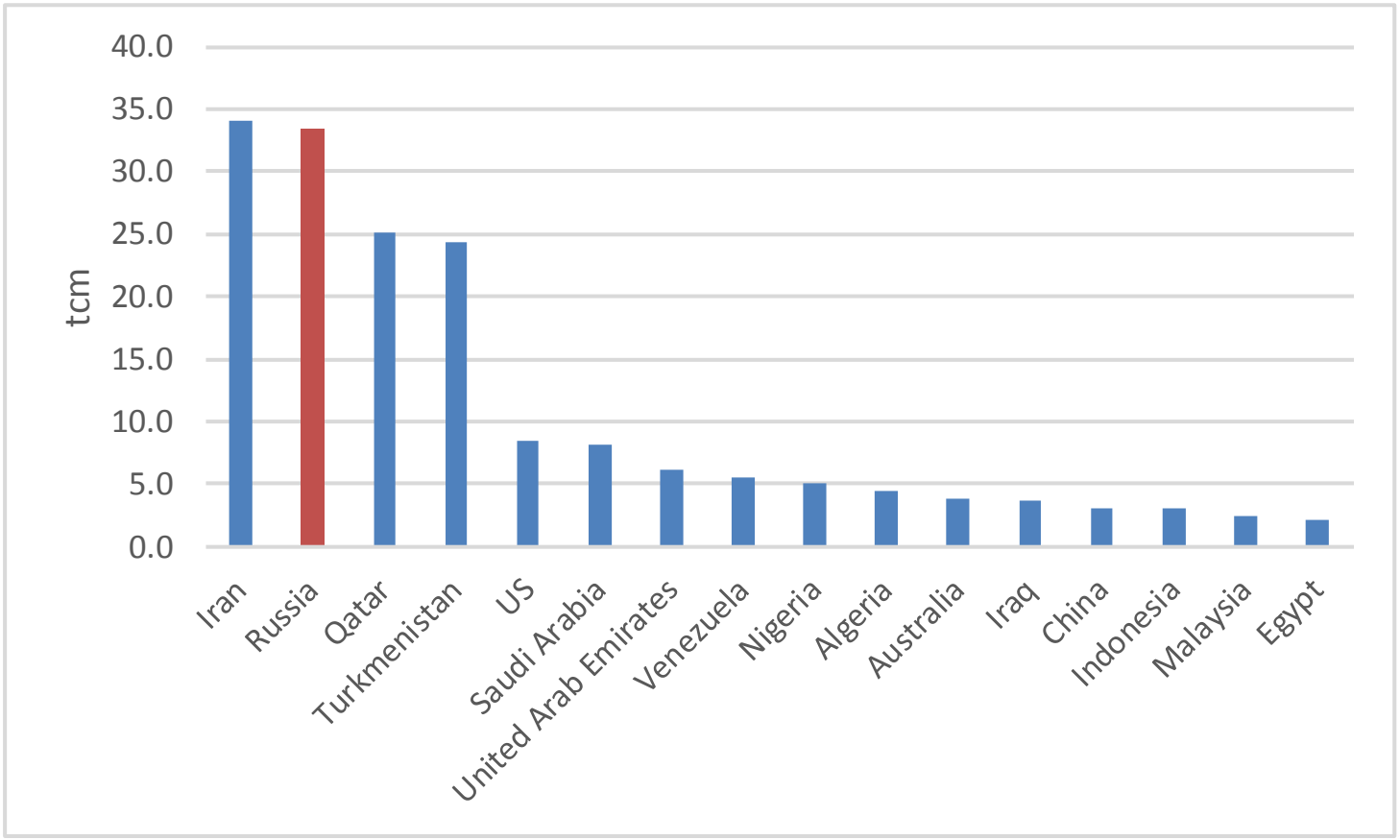
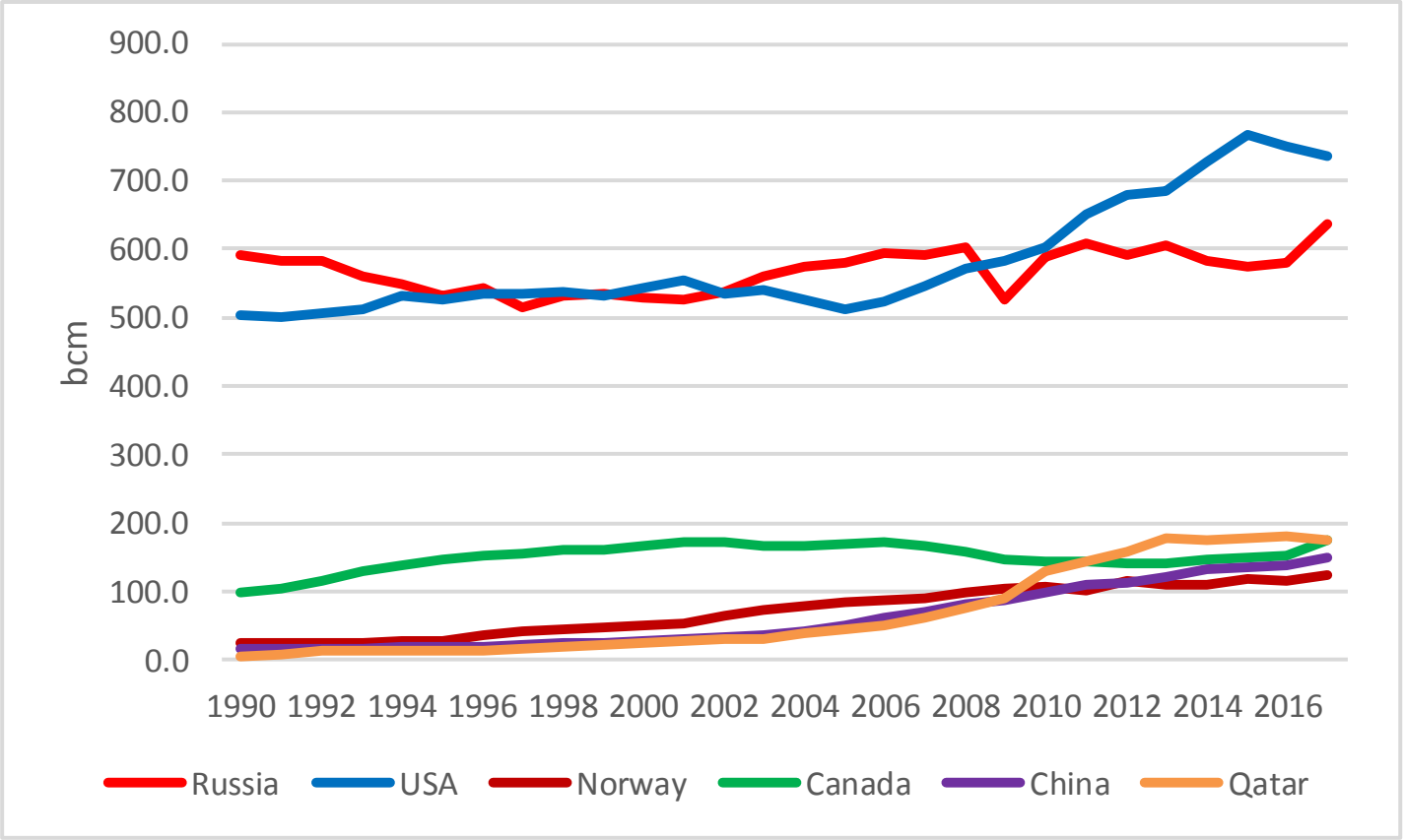
NOVEMBER 2018

Russia is the world's second largest holder of gas reserves



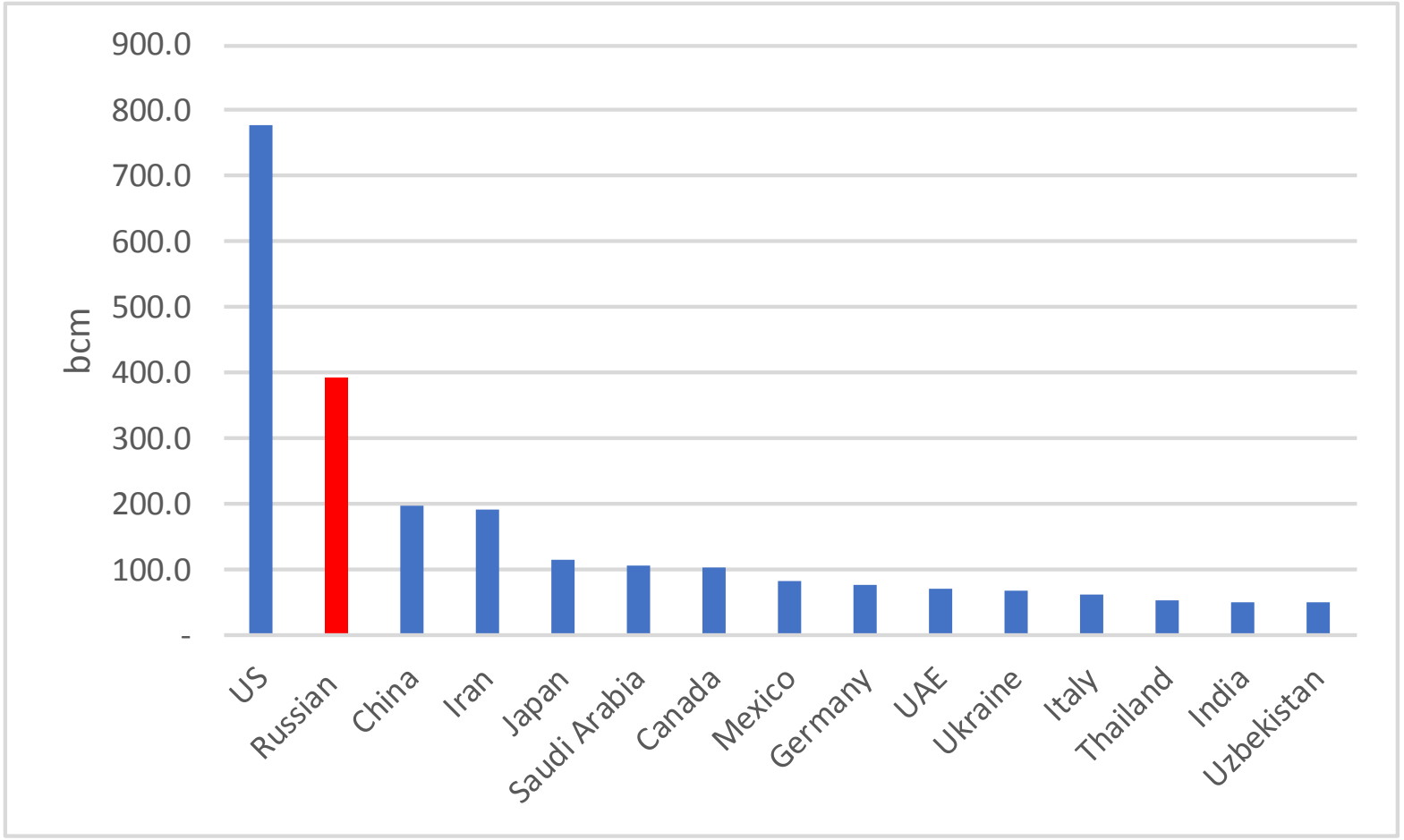
- Russia ranks only behind Iran in gas reserves, although the country's own estimate is that it has 44tcm of ABC1 reserves
- 33tcm is equivalent to almost 200 billion barrels of oil reserves, double Russia's provide oil reserves

Russia is also the second largest producer



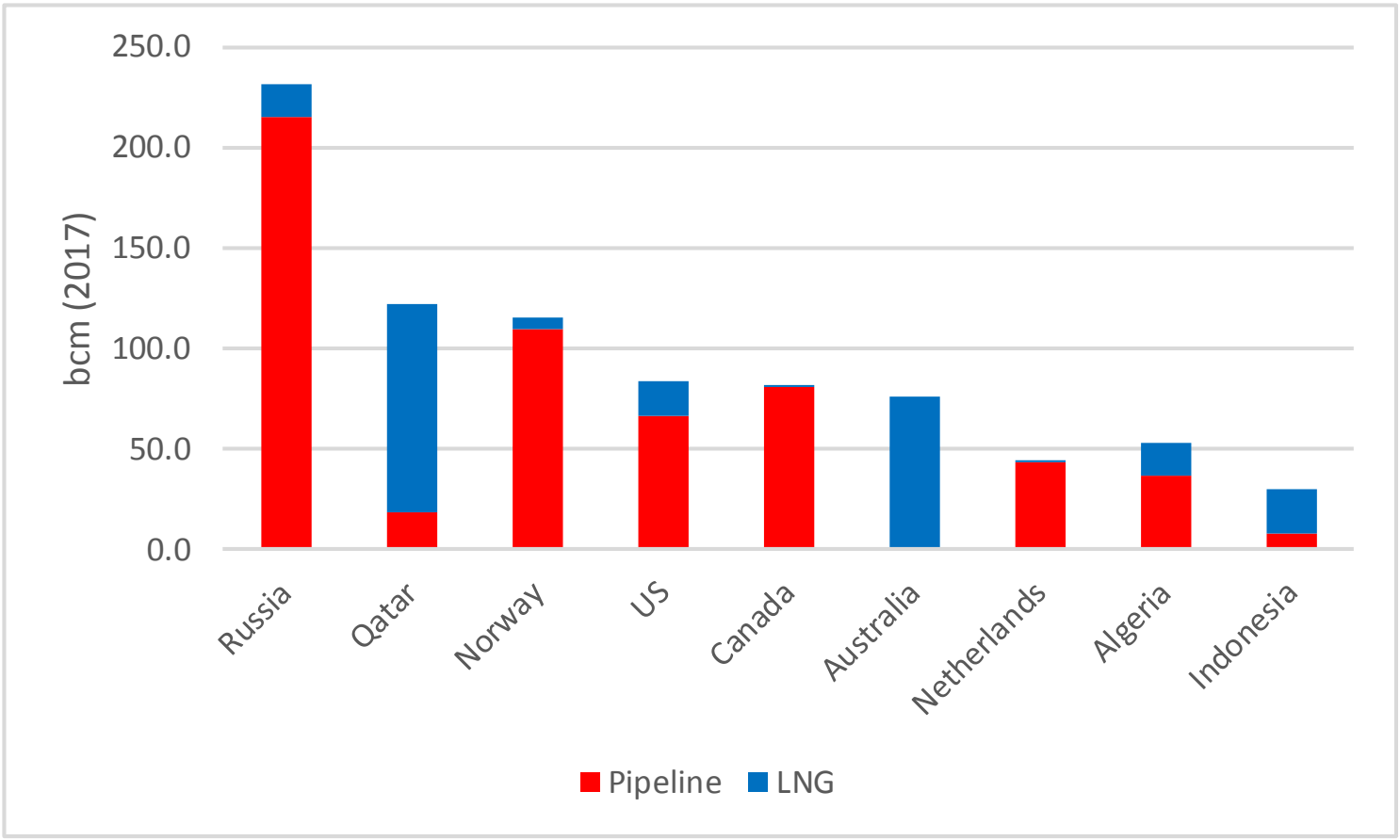
- Historically Russia (Soviet Union) has been the world's largest gas producer
- However, following the shale gas boom, it has now been overtaken by the USA
- Russia's problem is not a lack of resources, but a lack of markets

Russia is also the second biggest gas consumer



- The Russian economy depends on gas – it accounts for 50% of energy demand
- Two thirds of power generation is gas-fired, and subsidised prices support industry
- The Russian population is very dependent on gas for warmth in winter

However, it is by far the largest exporter



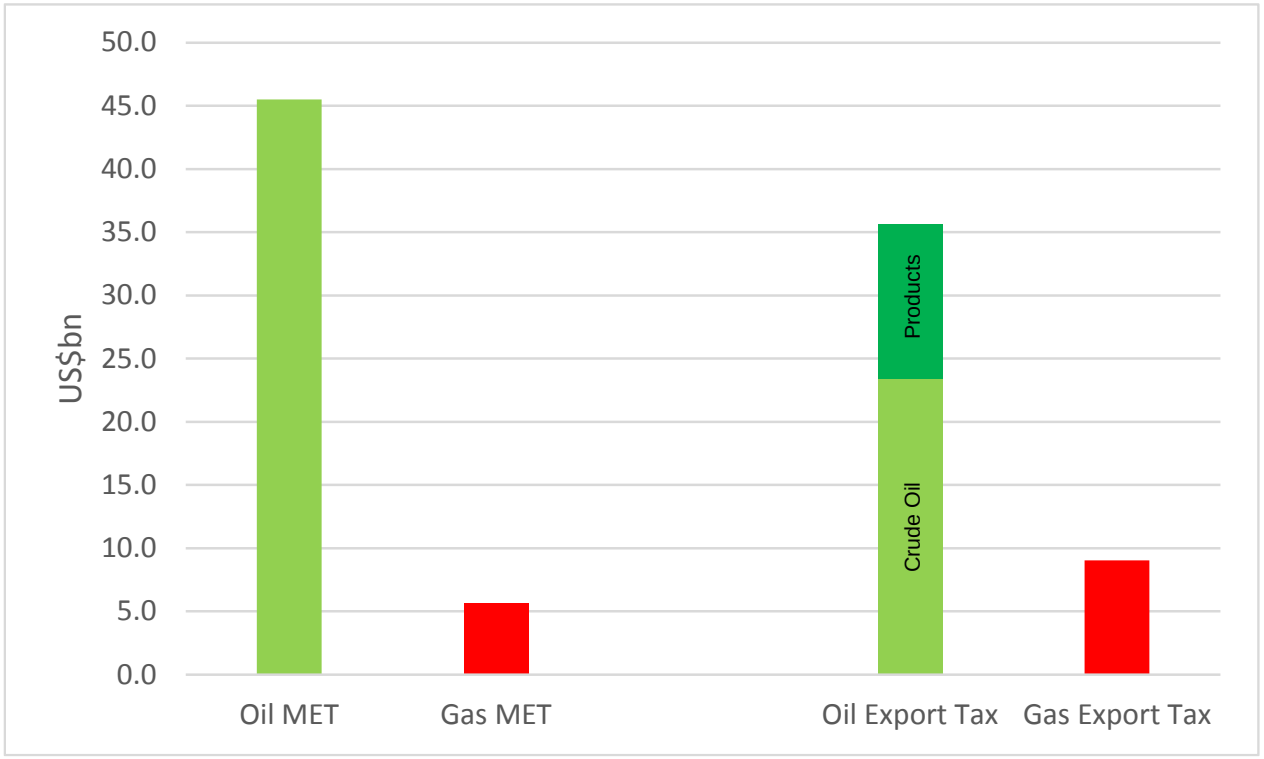
- Russia is a “gas superpower” in terms of its impact on the global market
- It exports by pipeline to Europe and the FSU and by LNG to Asia, and is expanding its gas network

Russian State is the major stakeholder with a wide agenda, seeing gas as an important domestic and international political tool

State	Gazprom	IGPs	Consumers
❑ Security of gas supply for the domestic consumers including sensitive regions and social groups ❑ Low transportation tariffs ❑ Low gas prices affordable for the industry and for the population ❑ Ensure politically important infrastructure projects and external gas policy ❑ Ensure tax revenue growth from the gas industry	❑ Company`s profitability and financial sustainability ❑ Stable production volumes	❑ Company`s profitability and financial sustainability ❑ Access to the new markets domestically and abroad ❑ Non-discriminatory pipeline and storage access ❑ Stable production volumes	❑ Acceptable (low) gas and electricity prices ❑ Reliable supplies (including for the non-payers) ❑ Gazification ❑ Transparent and easy access to gas supply services

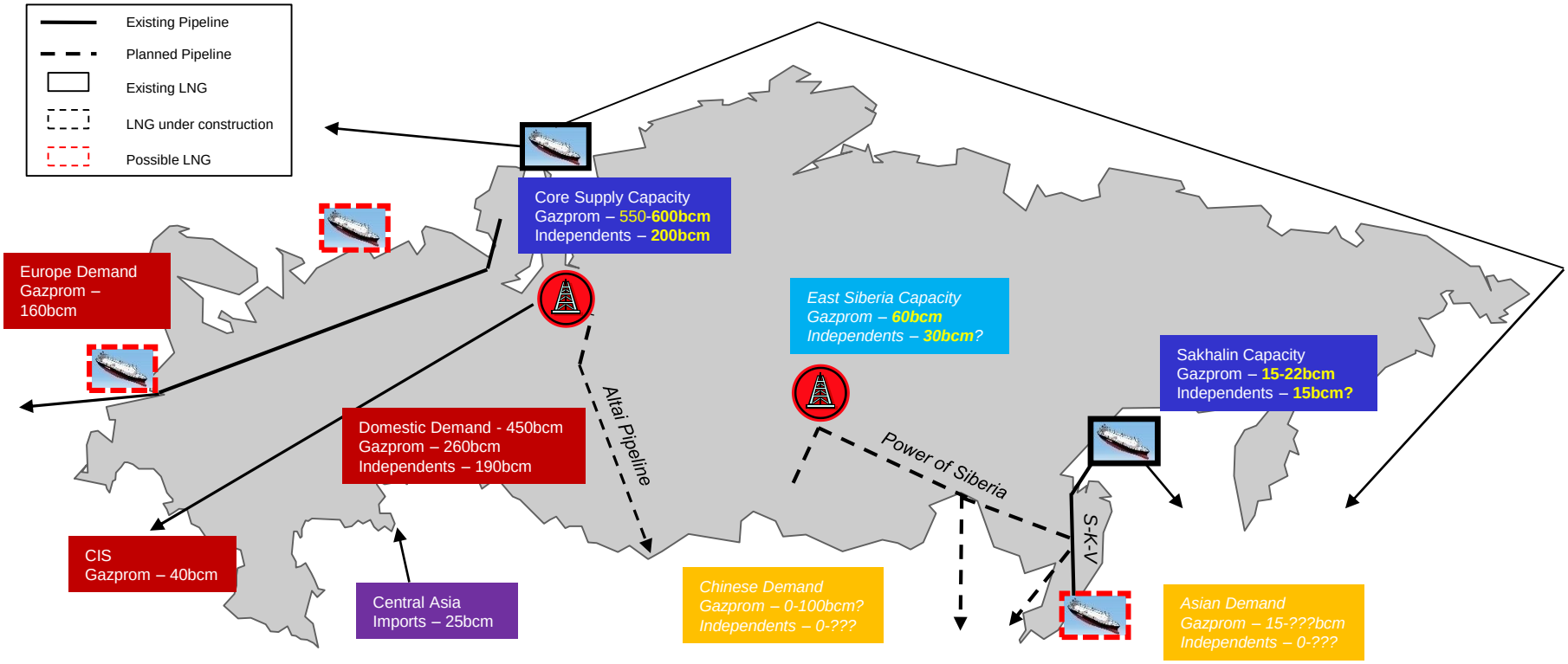
Gas taxation is not nearly as important as oil

Comparative contributions of oil and gas taxes to federal budget



- Export tax rate is 30%, and is only paid on pipeline gas exports (i.e. is only relevant to Gazprom)
- LNG is free of export tax
- MET is based on a very complex calculation, involving a base tax adjusted for a series of field characteristics and location
- Gazprom pays a different MET rate to Independent producers, in particular because in Q4 2015 the Russian government sought to extract extra tax revenue to fund the budget deficit
- Gas contributed 6% of budget revenues in 2017 compared to 40% from oil

Russia has a strategic geographical advantage



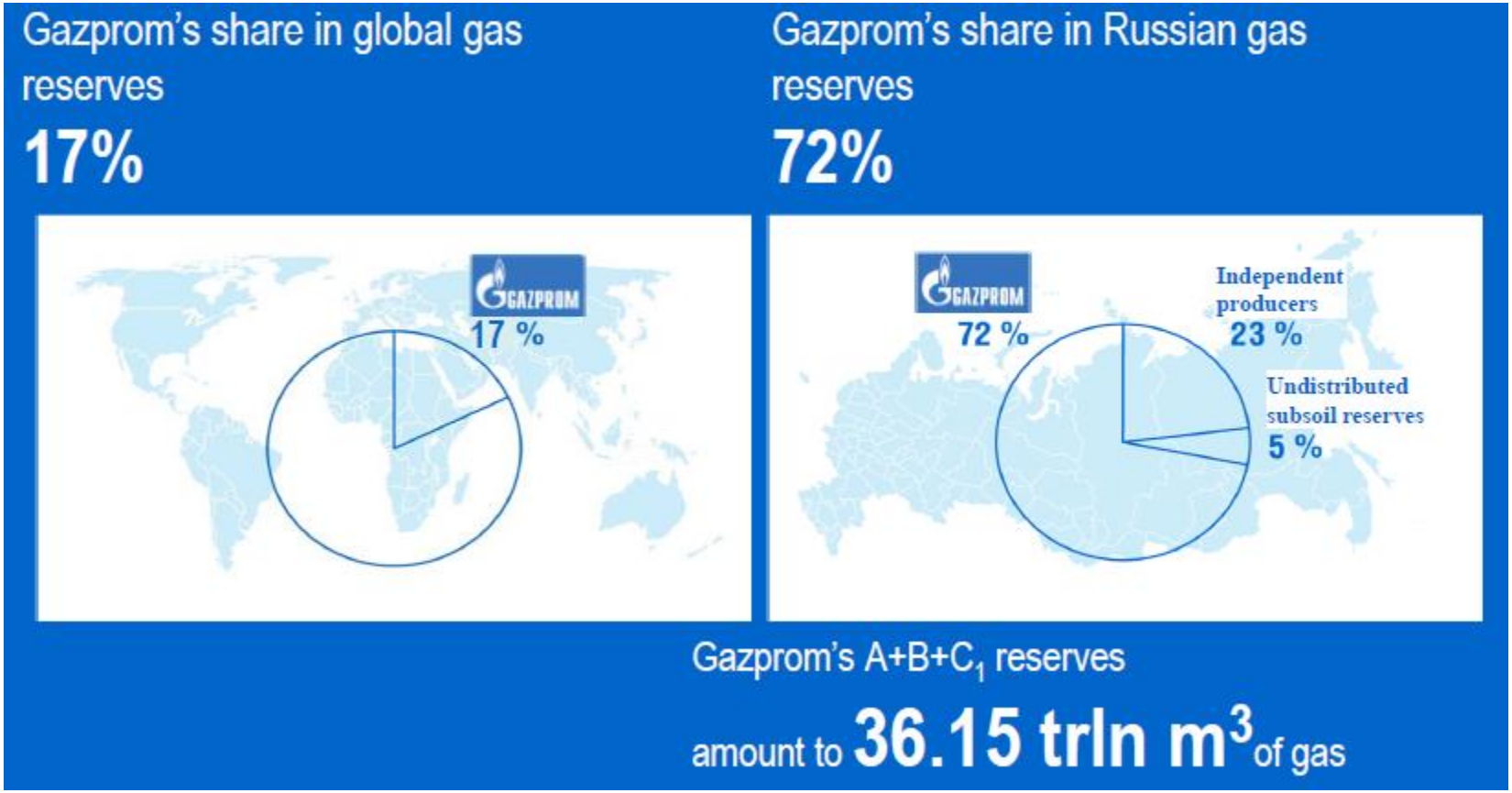
- Russia is strategically placed between the world's largest gas importing regions
- Gazprom's surplus capacity gives it a strong bargaining position, especially in Europe
- With Europe being the sink for surplus LNG, Russia's gas marketing strategy is of vital importance to global gas players
- Russian gas can also compete in Asia, both via pipeline and LNG

The Russian Gas Matrix

SUPPLY SOURCES:	**2002**	**2008**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Gazprom production	522	550	488	487	444	419	420	470
Non-Gazprom production	73	114	169	181	196	216	220	221
Central Asian imports	34	61	31	33	29	26	23	25
TOTAL	**629**	**725**	**688**	**701**	**669**	**661**	**663**	**716**
MARKETS:								
Russian gas demand (UGSS)	361	413	424	421	425	411	424	430
Consumed in Transport system	51	49	41	41	33	32	32	38
Exports to CIS countries	89	89	63	57	42	38	32	33
Exports to Non-CIS (physical Russian gas)	129	159	139	163	152	163	179	197
LNG Exports to Asia	0	0	14	14	14	15	16	16
Change in Storage	*-1*	*15*	*7*	*6*	*3*	*2*	*-21*	*2*
TOTAL	**629**	**725**	**688**	**701**	**669**	**661**	**663**	**716**

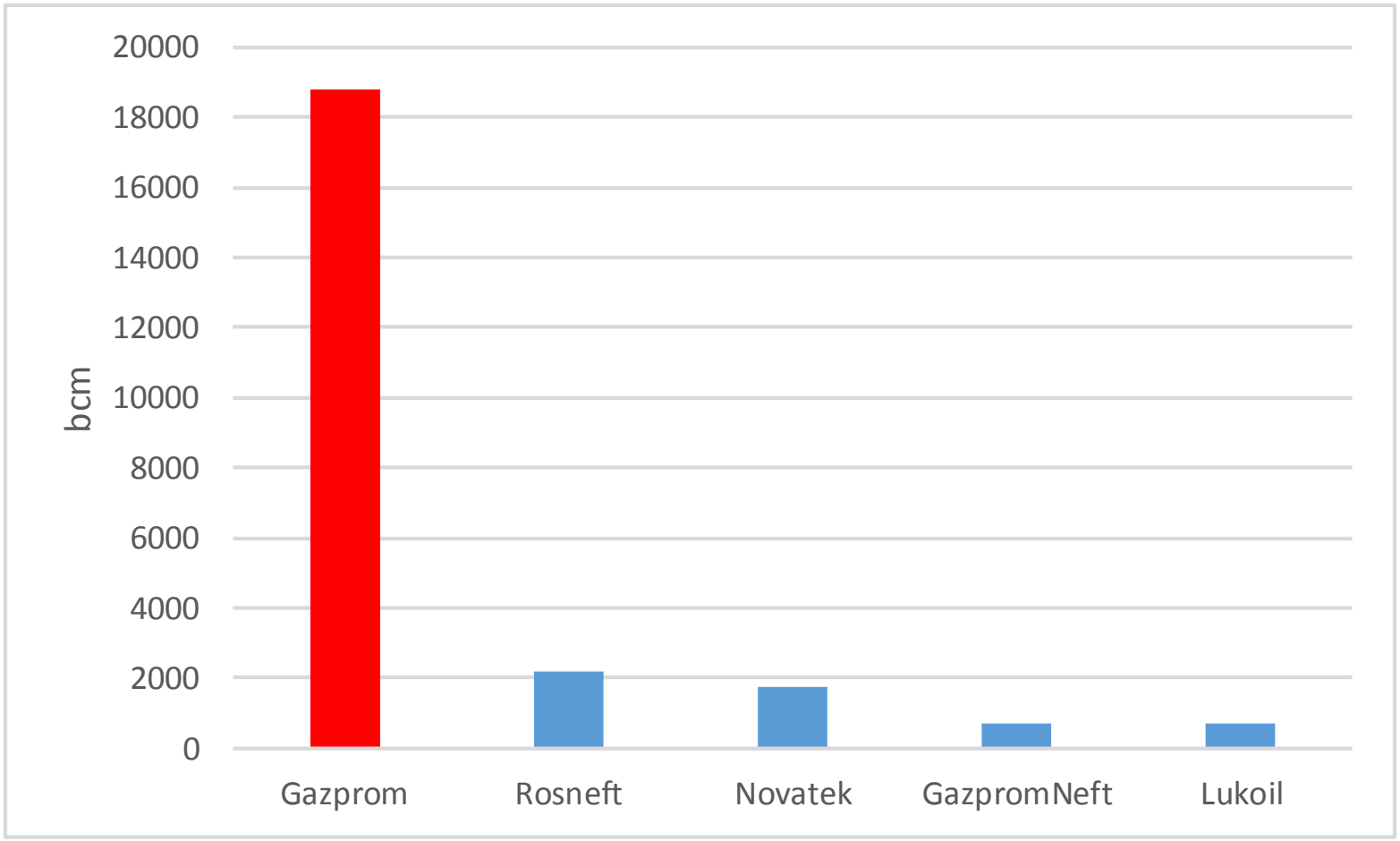
- **Supply and demand for Russian gas is only balanced because of decline in Gazprom production**
- **Domestic demand is stagnant and independents are gaining market share**
- **CIS countries are looking to diversify away from Russia**
- **European demand has been in decline and EU now wants to reduce reliance on Russia**
- **Emergence of Asia is currently based on one LNG plant on Sakhalin**

Russia's gas resources – Gazprom still dominates



- Russia has just over 50tcm of gas reserves (Russian classification)
- Gazprom continues to dominate, but the issue of available resources is becoming less relevant
- The real challenge in 2016 is monetisation, as demand has come under pressure

Comparison of proved gas reserves

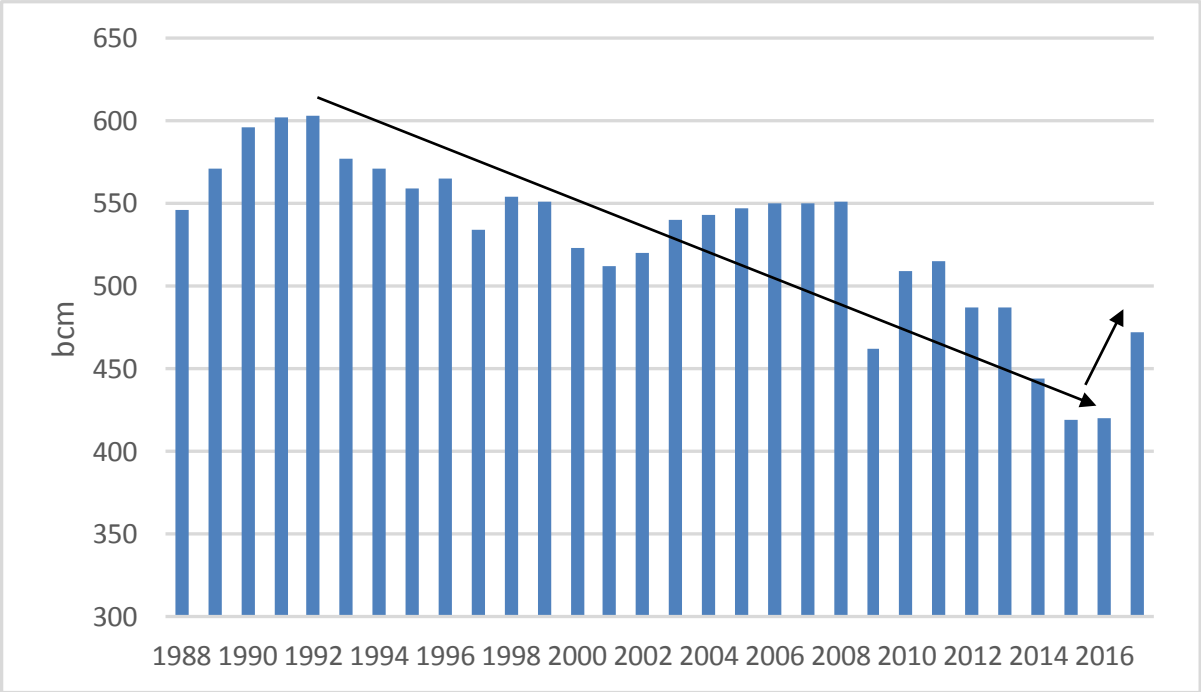


- Although Gazprom is by far the largest company, Rosneft and Novatek also have global scale gas reserves

- By comparison ExxonMobil has 1.75tcm of reserves and BP has 1.35tcm

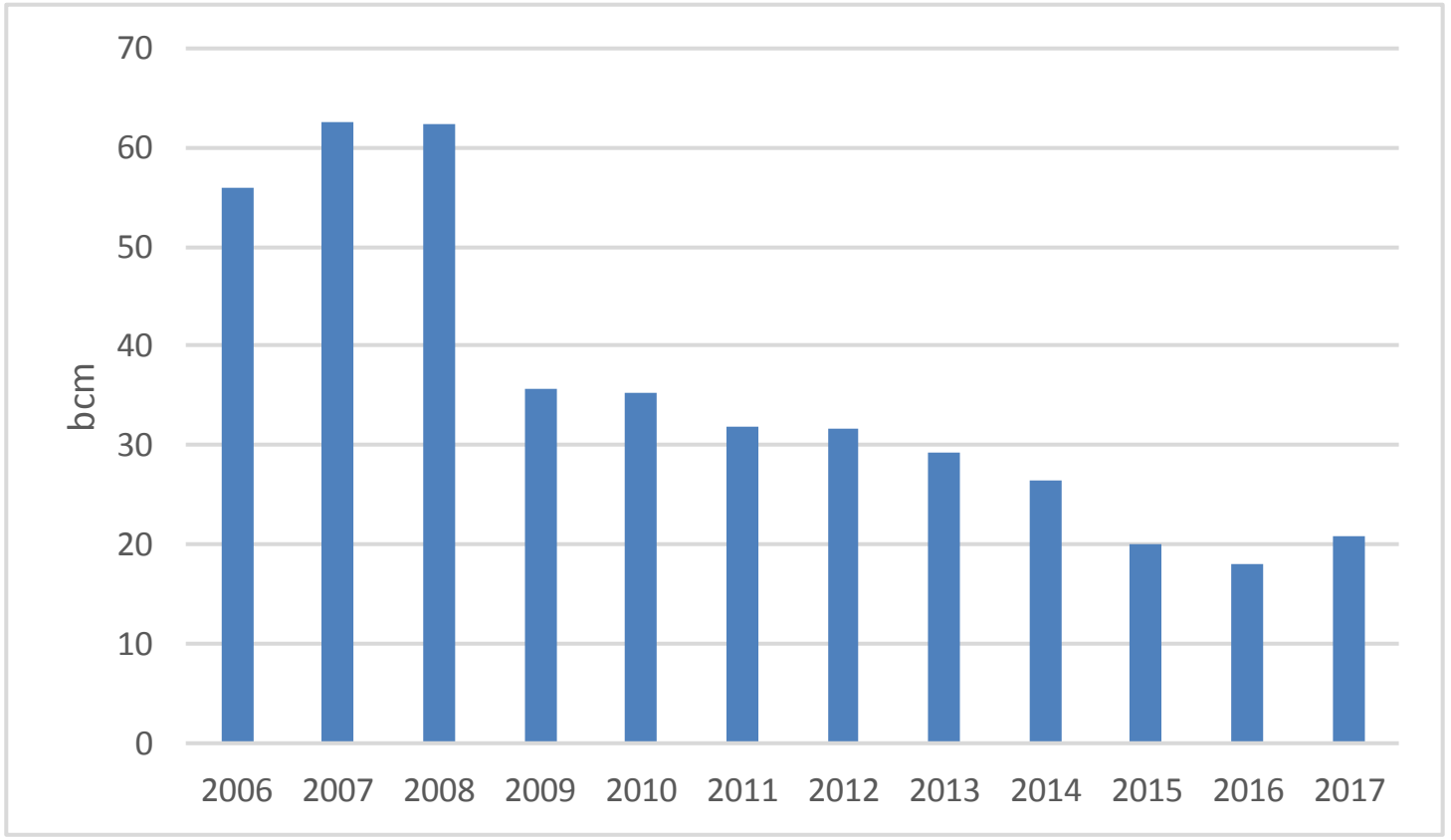
Gazprom's production has been in decline throughout the post-Soviet era

Gazprom production profile



- Gazprom production peaked at just over 600bcm in 1992
- It declined relatively consistently to 2000, before recovering for a period as Zapolyarnoye was developed to meet domestic demand
- Since 2008, however, production has fallen by more than 100bcm, to reach a post-Soviet low of 420 bcm in 2015
- Finally recovered in 2017, thanks to rebound in European demand

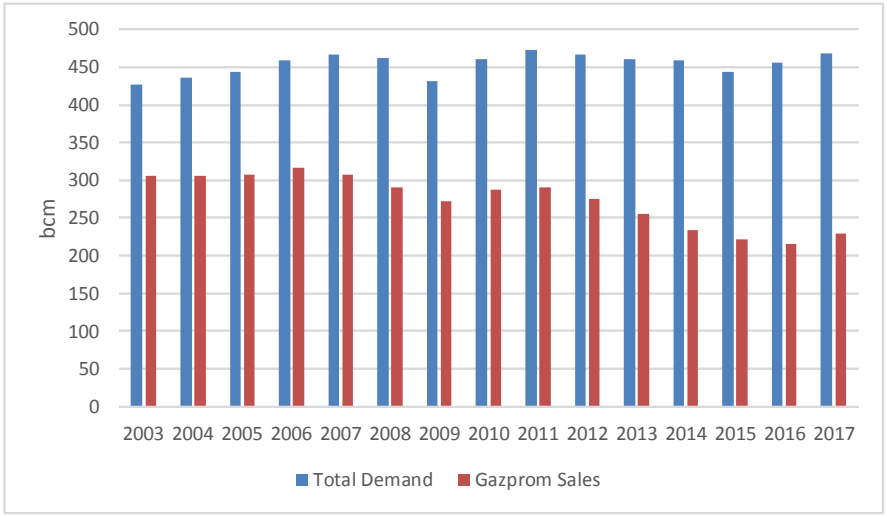
Imports from Central Asia are also down sharply



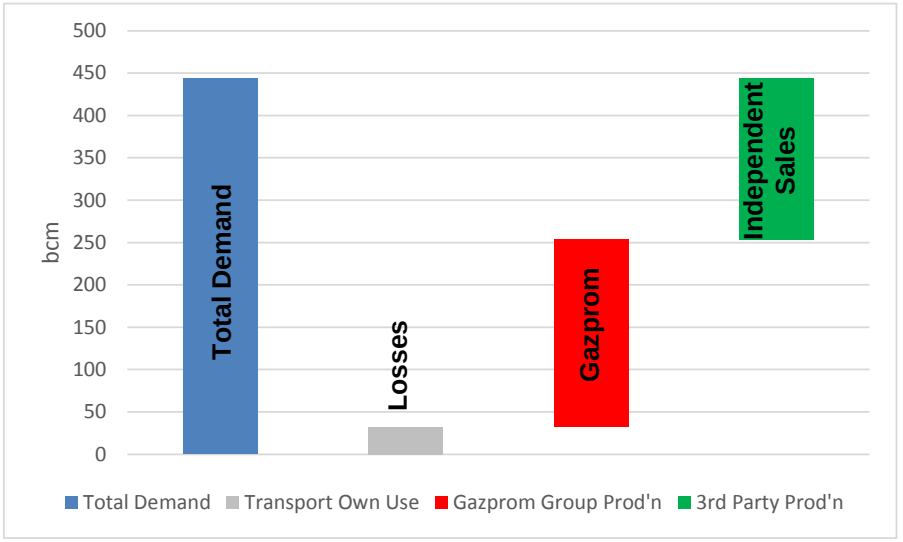
- Russia used to transit Central Asian gas to Europe
- Turkmenistan has almost ceased all sales through Russia, turning to China instead
- Kazakhstan is the only Central Asian country with any significant gas ties to Russia

The changing Russian domestic gas market

Gazprom's market share has fallen

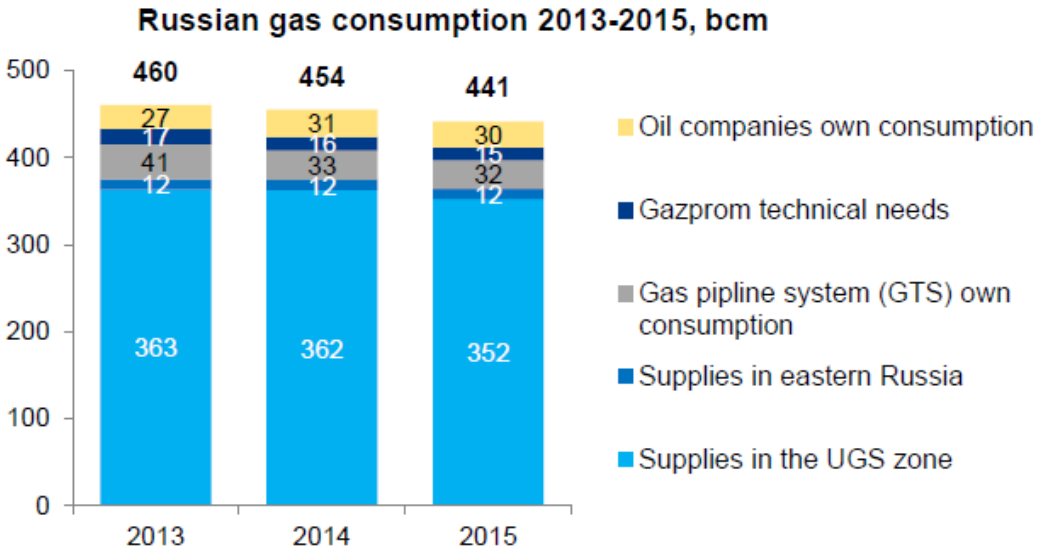


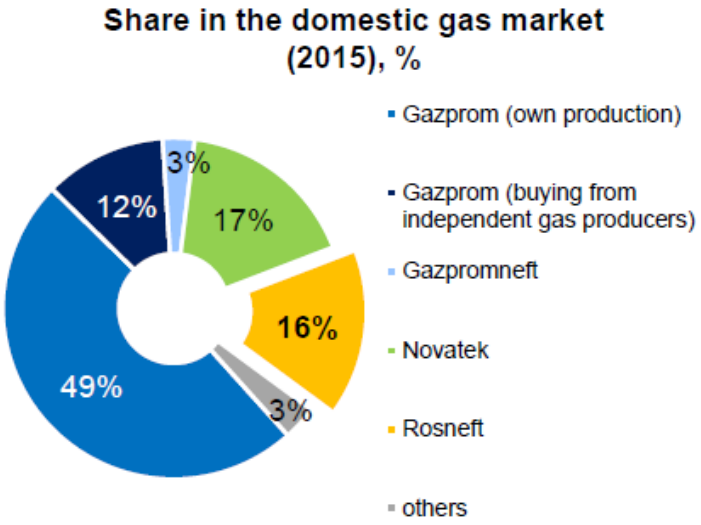
Gazprom's market share down to 50% in 2016/17



- **Rising prices and economic stagnation have dampened demand in the domestic market, although 2016-17 showed a slight recovery**
- **Alternative sources of supply have also been encouraged**
- **Gazprom has been limited in its ability to compete due to regulated prices, despite requests to allow discounts**
- **Independents have offered discounts and more flexible contract terms to win significant market share**
- **Gazprom's market share has fallen to only 50%, a landmark event**

Russian gas market breakdown

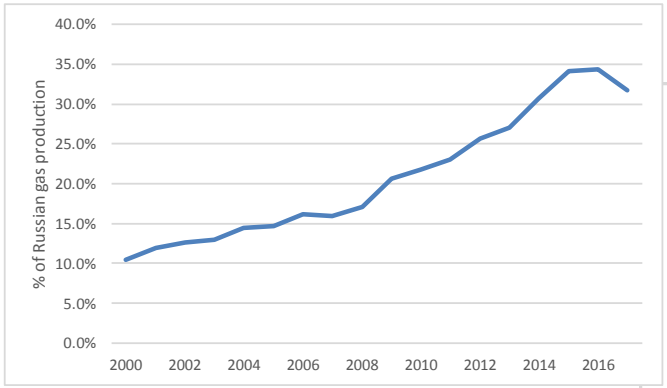




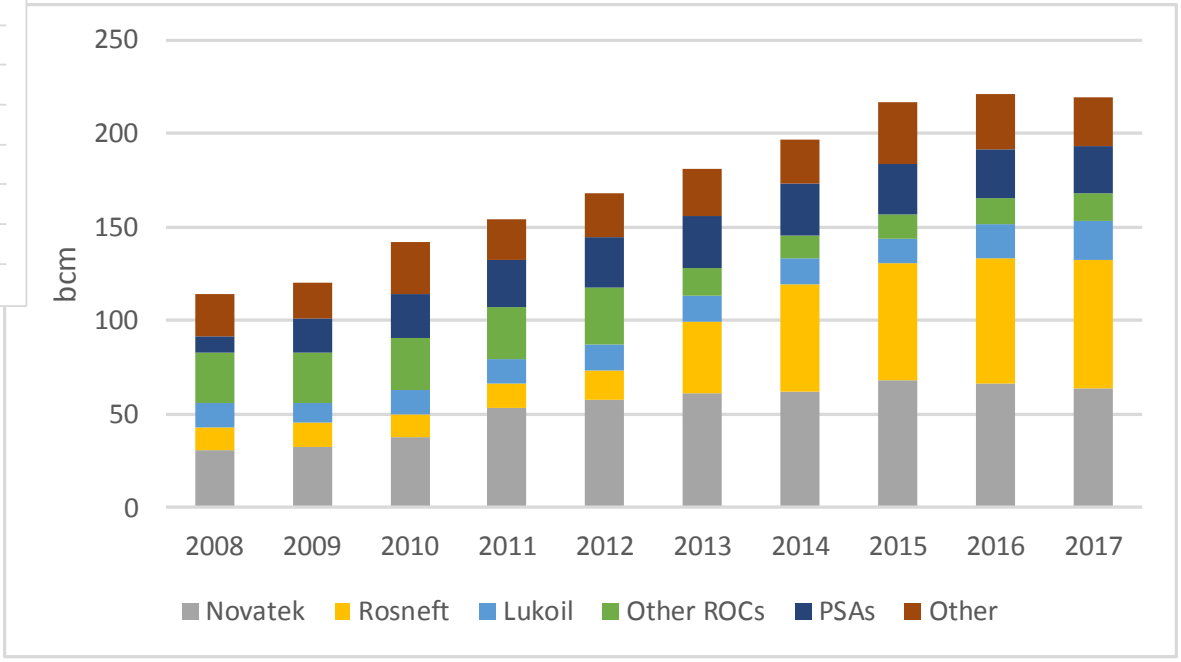
- A significant amount of gas is used for technical purposes
- Losses are also very large
- A triopoly of major gas companies has emerged – Gazprom is the largest, and controls the pipeline system, but it is no longer a monopoly

The "Independent" Sector has emerged

Share of Non-Gazprom Production

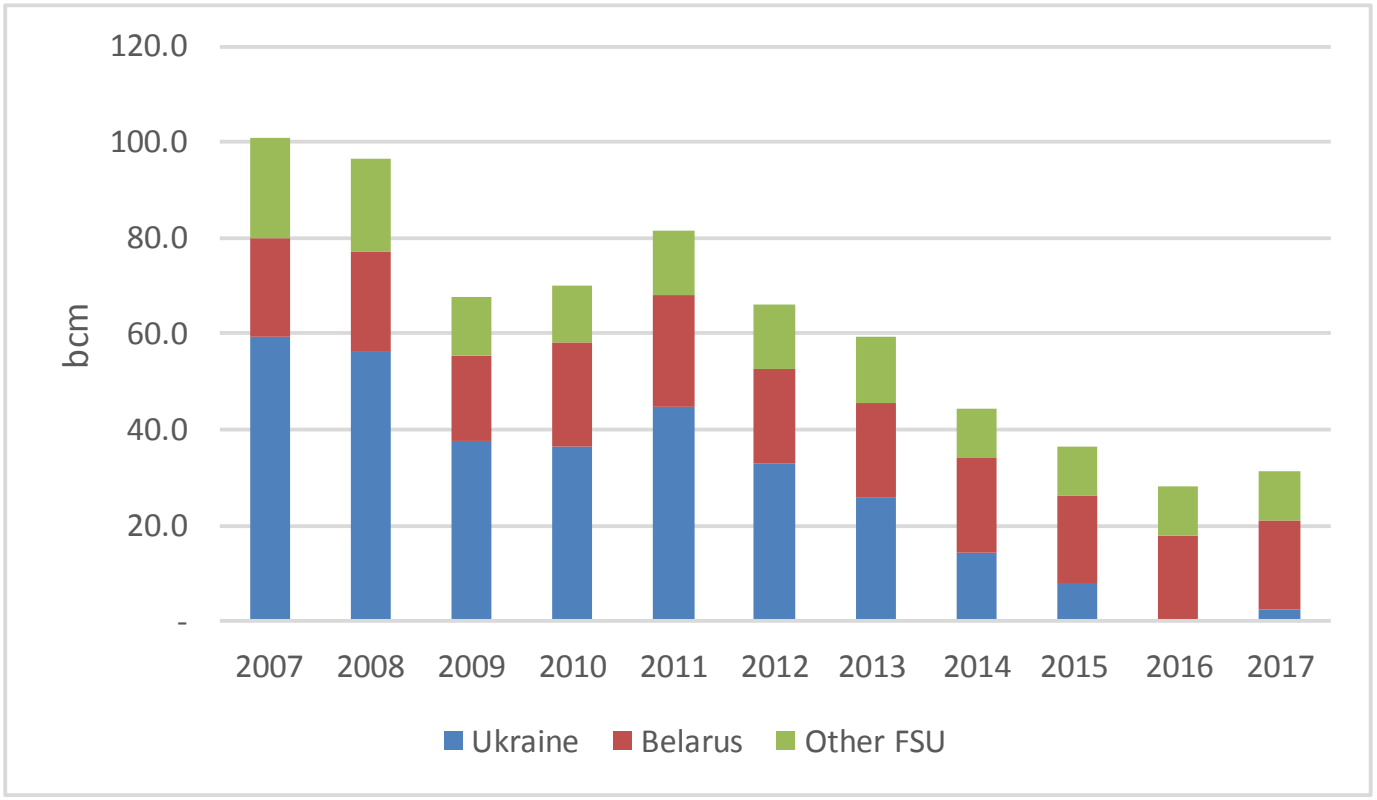


Non-Gazprom Gas Production



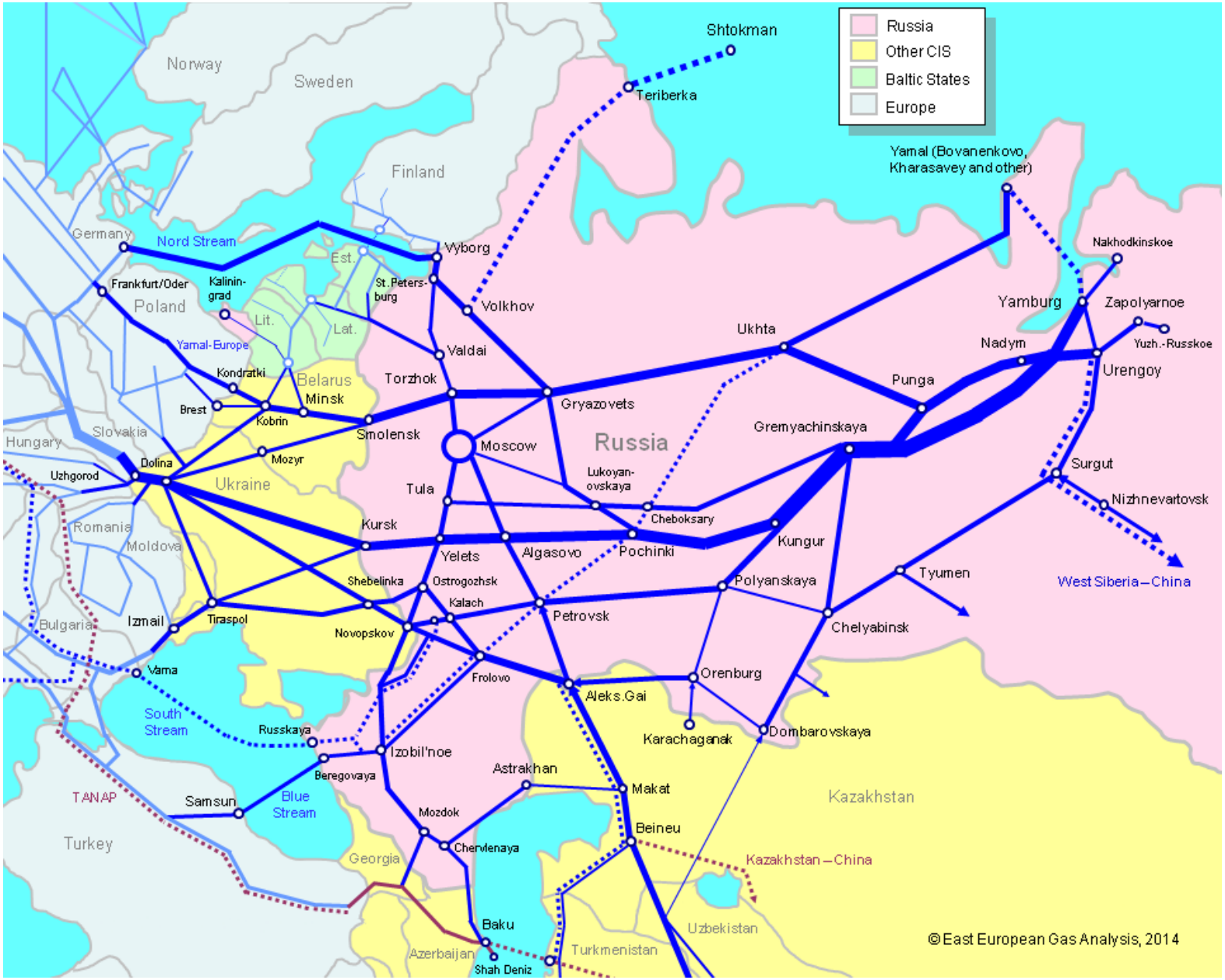
- Historically non-Gazprom producers only produced "associated" gas, which was essentially a waste product
- Now they have a market for this gas other than Gazprom and also produce natural "dry" gas
- Novatek and Rosneft have led the way in production growth and NGP output now accounts for over one third of the Russian total

Exports to FSU countries have collapsed



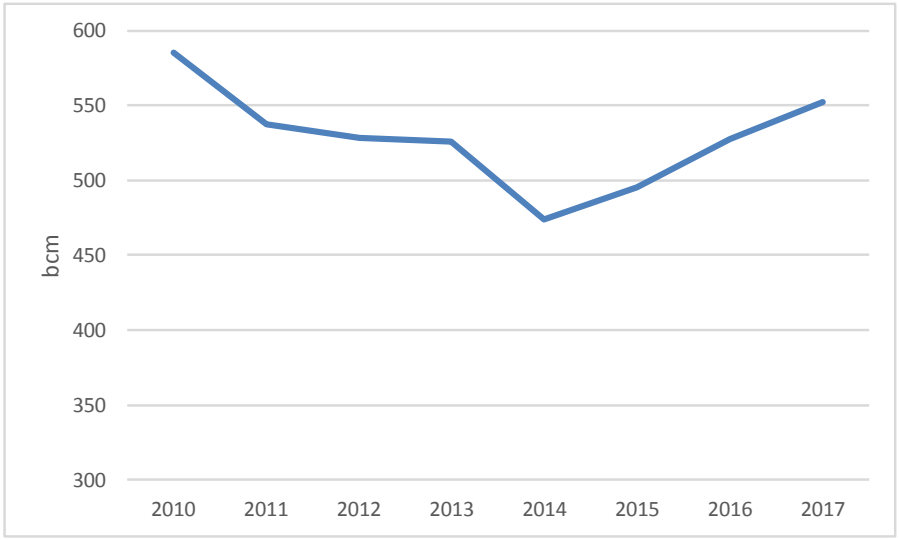
- Ukraine has managed to reduce Russian imports to zero since 2016
- Russia has lost one of its largest export markets, and is now exposed because it still transits gas to Europe through Ukraine
- The Soviet energy system is gradually unwinding, but the transition process has been long and painful

Russia's western gas pipeline network

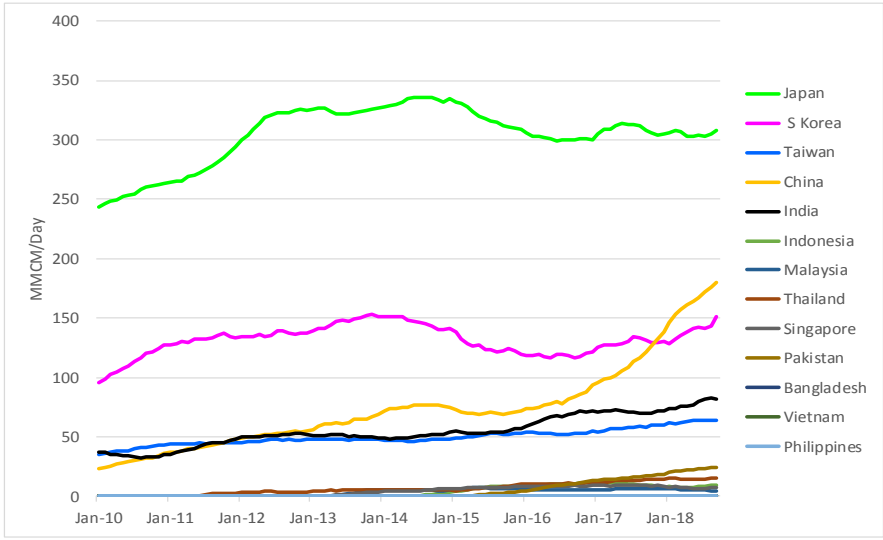


Gas demand is declining in Europe and growth has slowed in Asia

European gas demand rebounding from major post 2008 decline



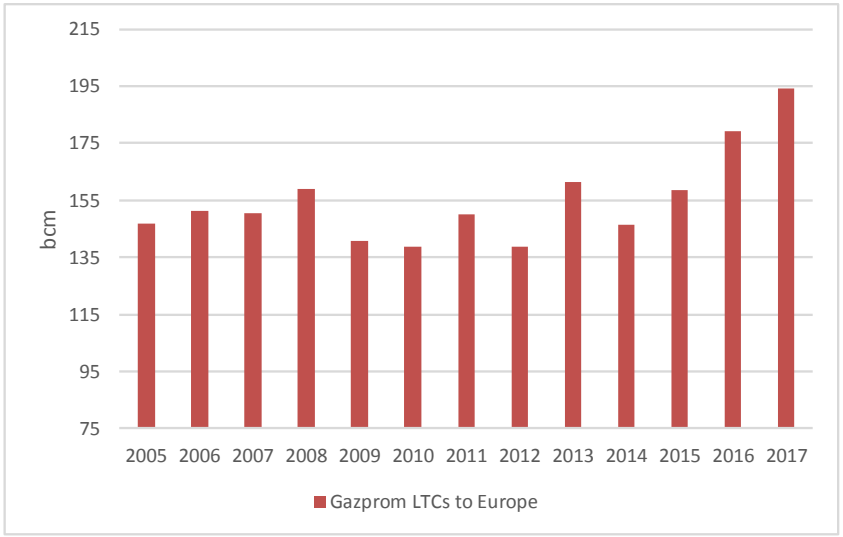
Asian gas demand – a varied picture



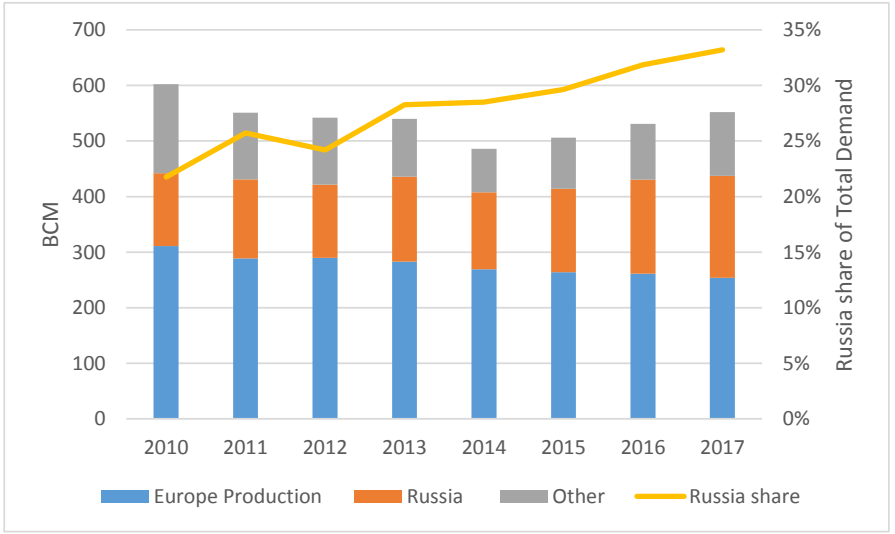
- Growth of renewables and cheap coal undermined demand in Europe, combined with an economic downturn
- However, environmental pressure and improving price scenario has helped to boost demand
- Demand growth in Asia is being driven by air quality issues in China
- Gas is the cleanest fossil fuel, but the economics of coal are still challenging the environmental case

Focus on European market will remain core Gazprom strategy for many years

Gazprom sales to Europe

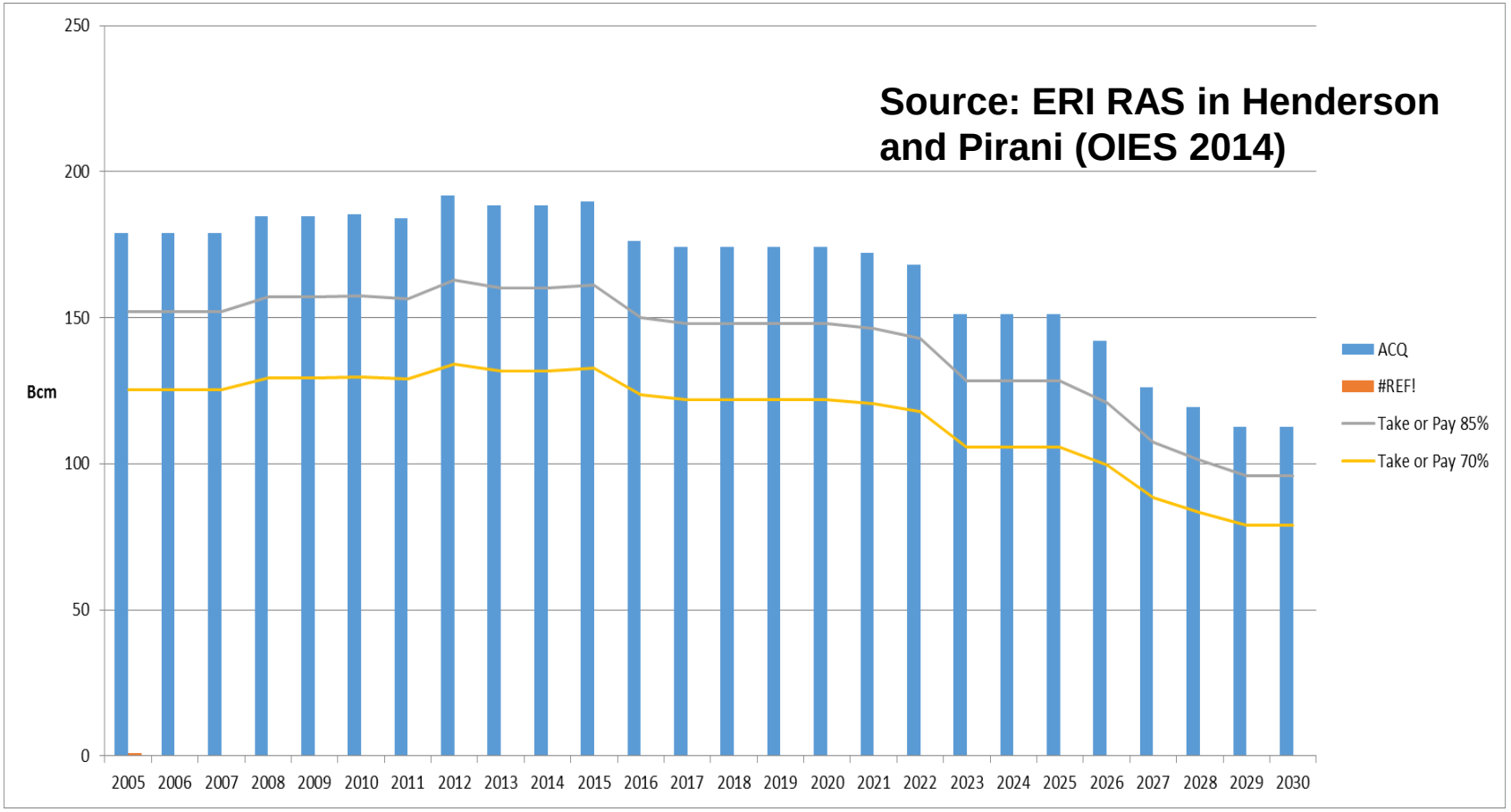


Gazprom market share in Europe



- **Gazprom deliveries to Europe have surged in 2016and 2017, to reach 194bcm, a post-Soviet record**
- **Much of this growth was driven by cold weather and by a lack of alternative supply to Europe**
- **Not surprising that Gazprom is focused on maintaining European market share at 30%+; it remains key revenue generator**
- **Uncertainty over political dimension is main doubt**

Gazprom's long term take or pay contracts with European customers to 2030



Even at 70% ToP, Gazprom's average annual sales exceed 100 Bcm/year until the mid-2020s

The 3rd Package and the GTM: the biggest impact is potentially on Gazprom

Number of borders crossed to reach a delivery point	Volumes, bcm/y
1	26
2	30
3	43
4	9

Source: Yafimava 2013

Gazprom's huge volumes need to cross multiple borders/jurisdictions before they reach delivery points - not comparable to any other supplier!

DG COMP Proceedings Against Gazprom: the April 2015 Statement of Objections

DG COMP's press release covered 3 issues:

- **Hindering cross border sales (territorial restrictions): Poland, Czech Republic, Slovakia, Bulgaria, Hungary, Latvia, Estonia, Lithuania – destination clauses found in some contracts (and removed)**
- **Alleged unfair pricing policy: "the specific price formulae ..have contributed to the unfairness of Gazprom's prices [and] seem to have largely favoured Gazprom over its customers" – relevant countries: Bulgaria, Estonia, Latvia, Lithuania and Poland**
- **Concerns on transport infrastructure: Bulgaria/South Stream (not going ahead); Poland/Yamal**

Settlement now reached with Commission, but some member states and Ukraine continue to object

Russian-European Relations in 2016-18

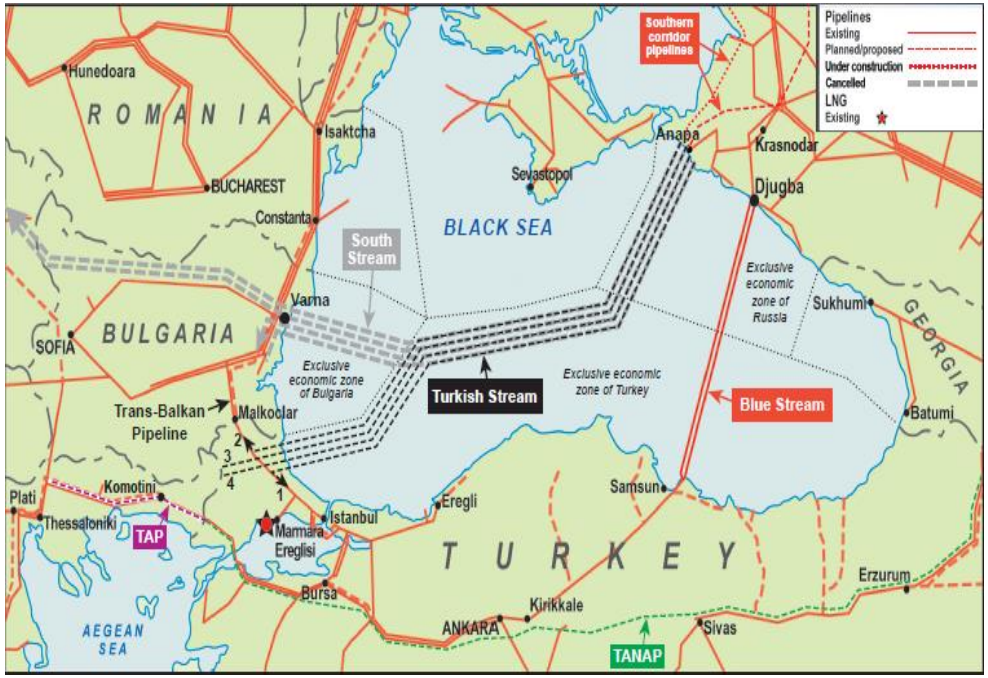
- Crisis in Russian relations with Europe
- Sanctions and counter-sanctions resemble a `trade war'
- Very difficult to conduct "normal commercial" gas relations in this environment or even to arrange meetings to discuss: DG COMP inquiry, OPAL, Nord Stream 2, general regulatory issues
- Hard to see relations "getting back to normal" even if Ukraine political situation settles down
- Russia unclear as to whether it wishes to continue using Ukraine transport system to transit gas to Europe
- 2019 a critical year as negotiations for a 2020 deal continue
  - Pressure on because of Ukrainian and EU elections

The Nord Stream Pipelines

Restrictions on onshore pipeline now removed

Gazprom using all available capacity to supply the key market in NW Europe

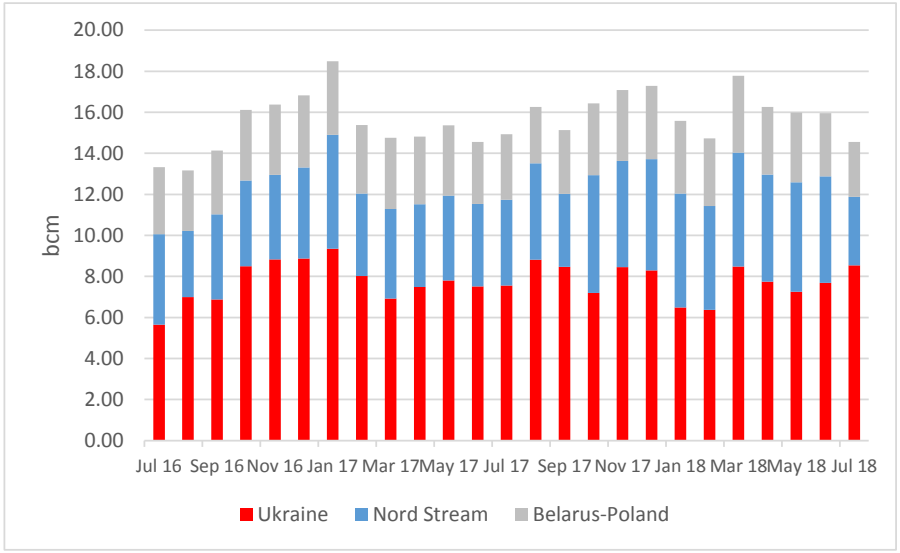
Black Sea Pipelines – 1, 2 or more?



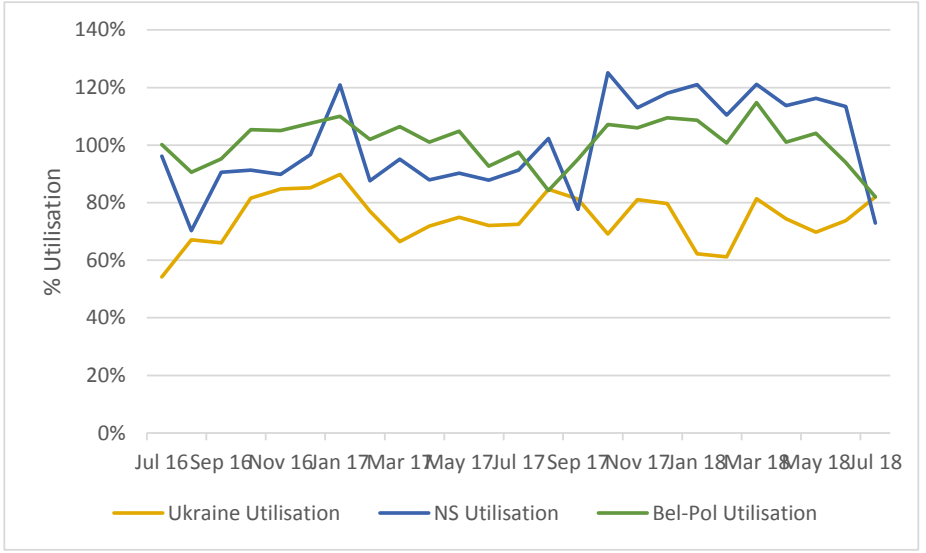
- South Stream to Bulgaria undermined by EU regulations and cancelled in December 2014
- Turkish Stream proposed as a replacement – up to 4 strings providing gas to Turkey and southern Europe
- Turkey-Russia relations have been volatile, but 2 pipelines are now progressing
- Key question is how will any new pipe interact with European market and EU politics

Russian export pipeline capacity is almost full, Ukraine provides flexibility

Russian gas exports to Europe by major route



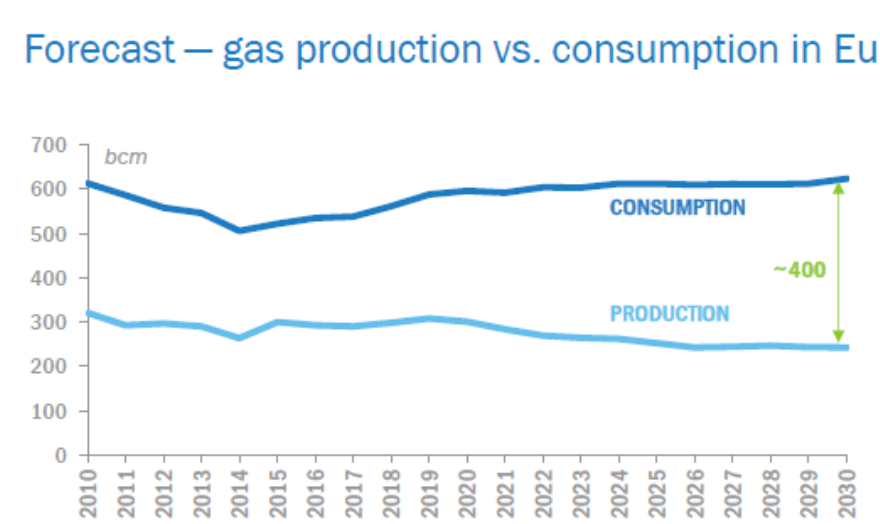
Capacity utilisation of major gas export routes



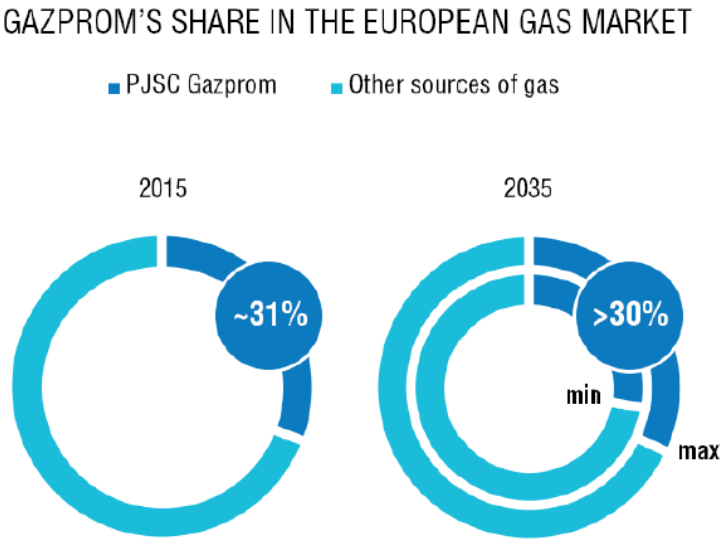
- **Nord Stream 1 and Yamal Europe pipelines are almost full, especially during winter demand peaks**
  - **Jump in Nord Stream utilization after OPAL ruling in September 2017**
  - **Capacity utilization for Nord Stream and Yamal over 100% since October 2017 (NS maintenance in July 2018)**

- **Ukraine provides increasing amounts of flexibility during cold weather**
  - **Utilisation reached 77% in November 2017 and March 2018, and 83% in July 2018 during NS maintenance**
  - **Monthly flows have varied between 6.4bcm and 8.8bcm in the past 12 months**

Gazprom export strategy to Europe based on growing import requirement



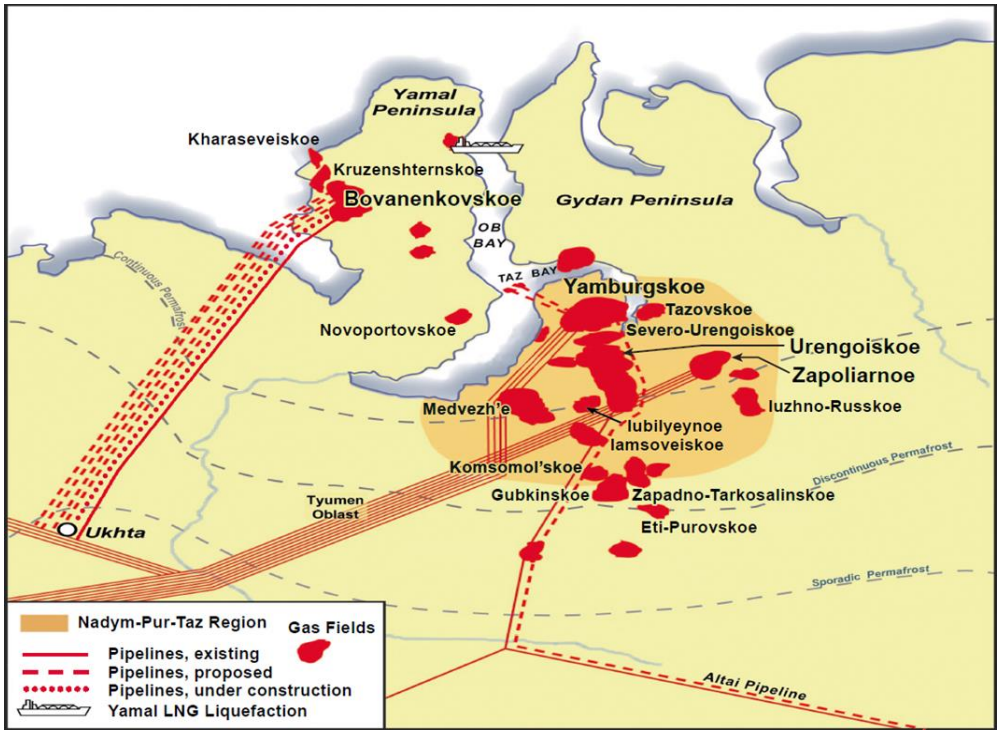
Source: Gazprom Investor Day, 2015



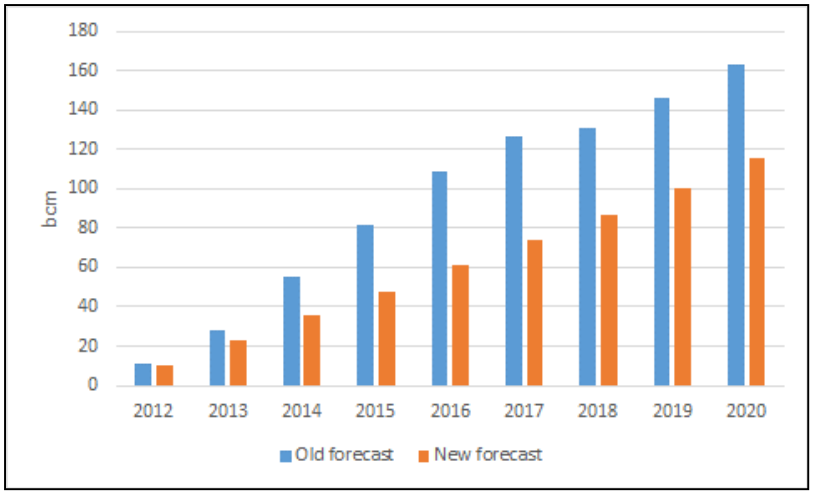
Source: Gazprom Investor Day, 2016

- **Gazprom believes, not surprisingly, that its place in the European gas market is relatively secure**
  - **European import set to rise**
  - **Indigenous production in long-term decline**
  - **Alternative sources of competitive gas are not abundant**
- **Target is to at least maintain market share, which implies some small growth in volumes**
- **What will be the reaction to increased availability of LNG in short-to-medium term?**

Gazprom's western production focussed on Yamal, but delays are driven by market forces



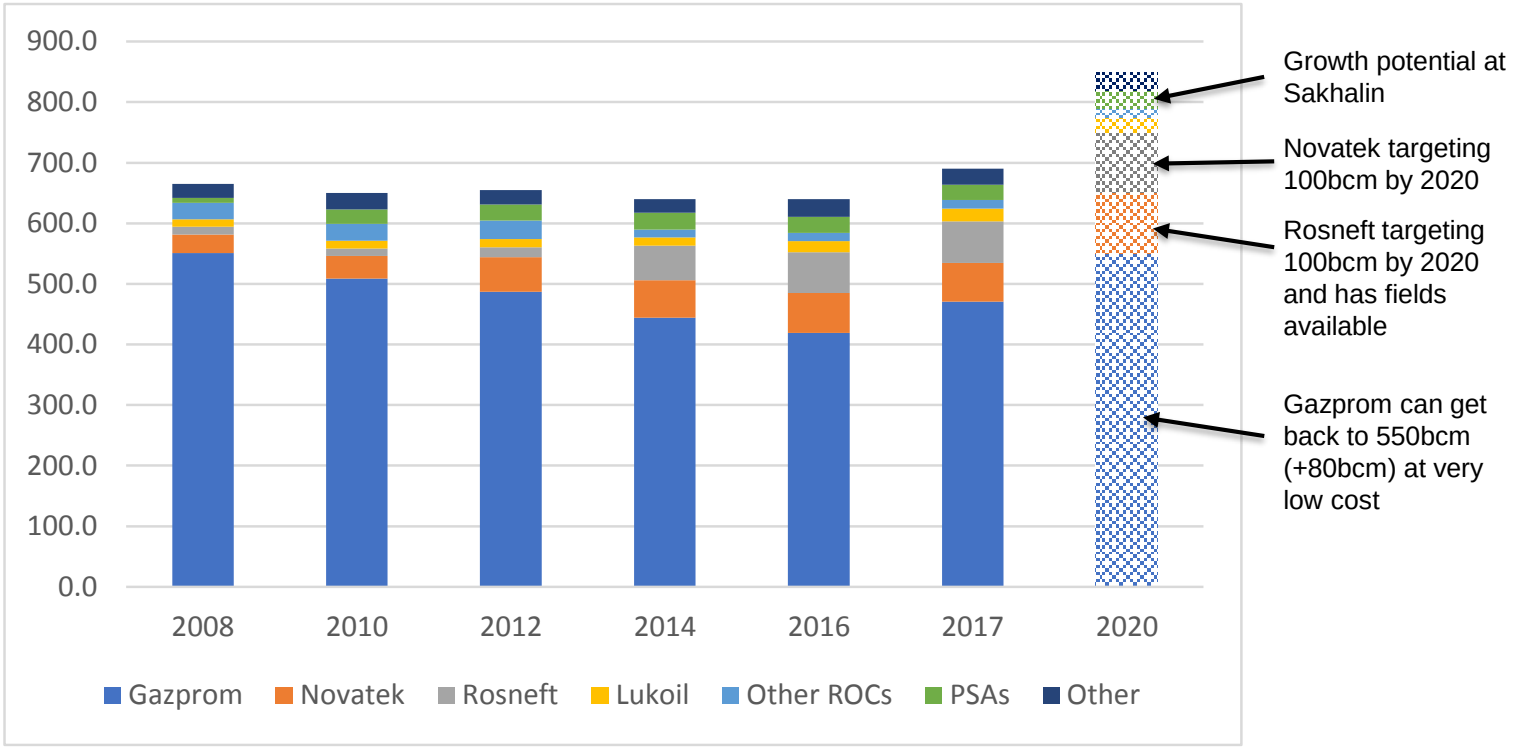
Delays in Yamal production



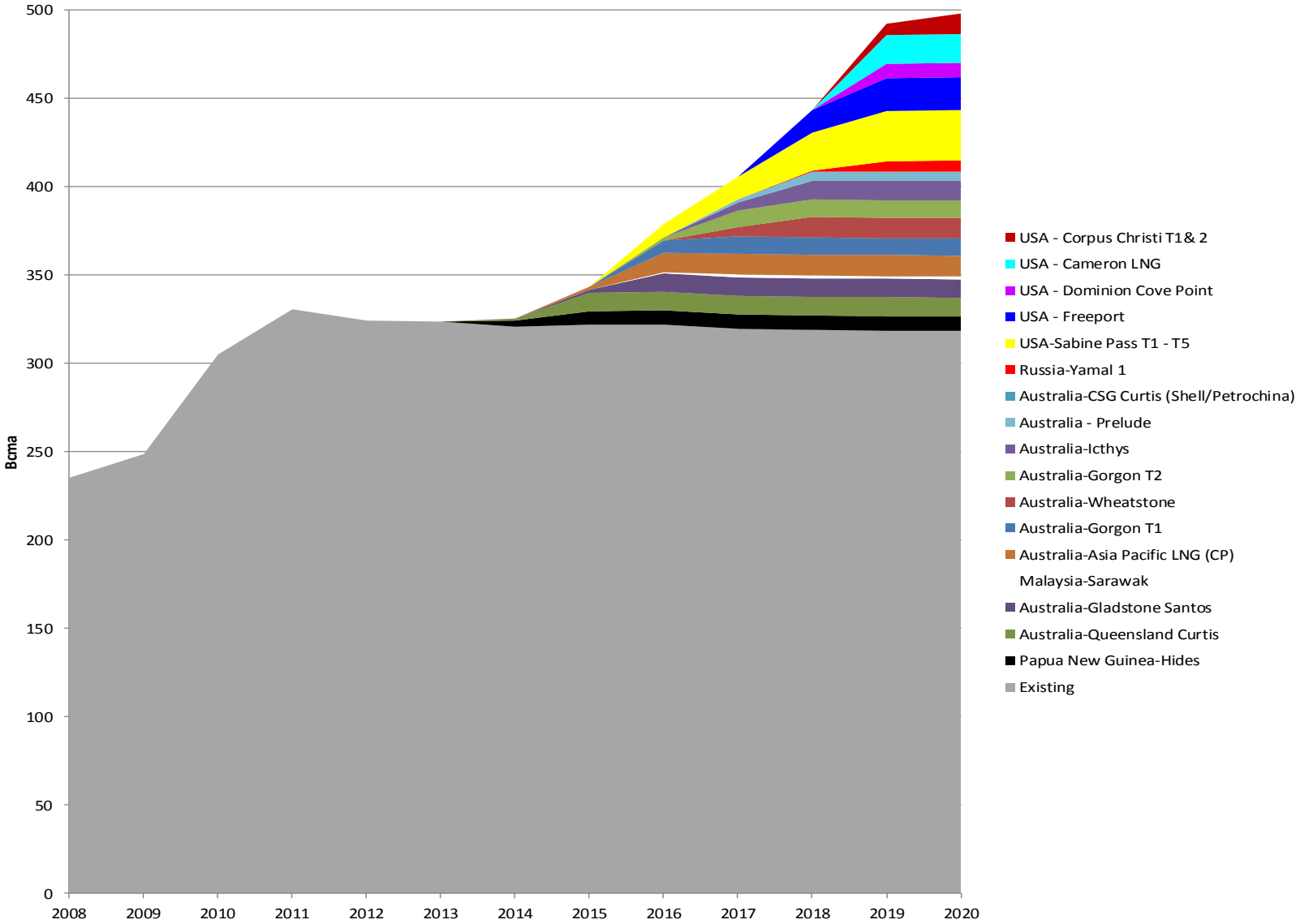
- Gazprom has seen its production profile shift away from its core West Siberian mega-fields
- Gazprom committed to development of Yamal peninsula in 2005/06, just before the economic crisis and impact of shale gas
- It is now stuck with this strategy, and is having to rein in production plans due to lack of demand
- However, Yamal is a long-term, low-cost resource

Russia's potential supply by 2020 – Gazprom has an 80bcm surplus available in the short-term and others have growth plans

Russia historic and potential gas production

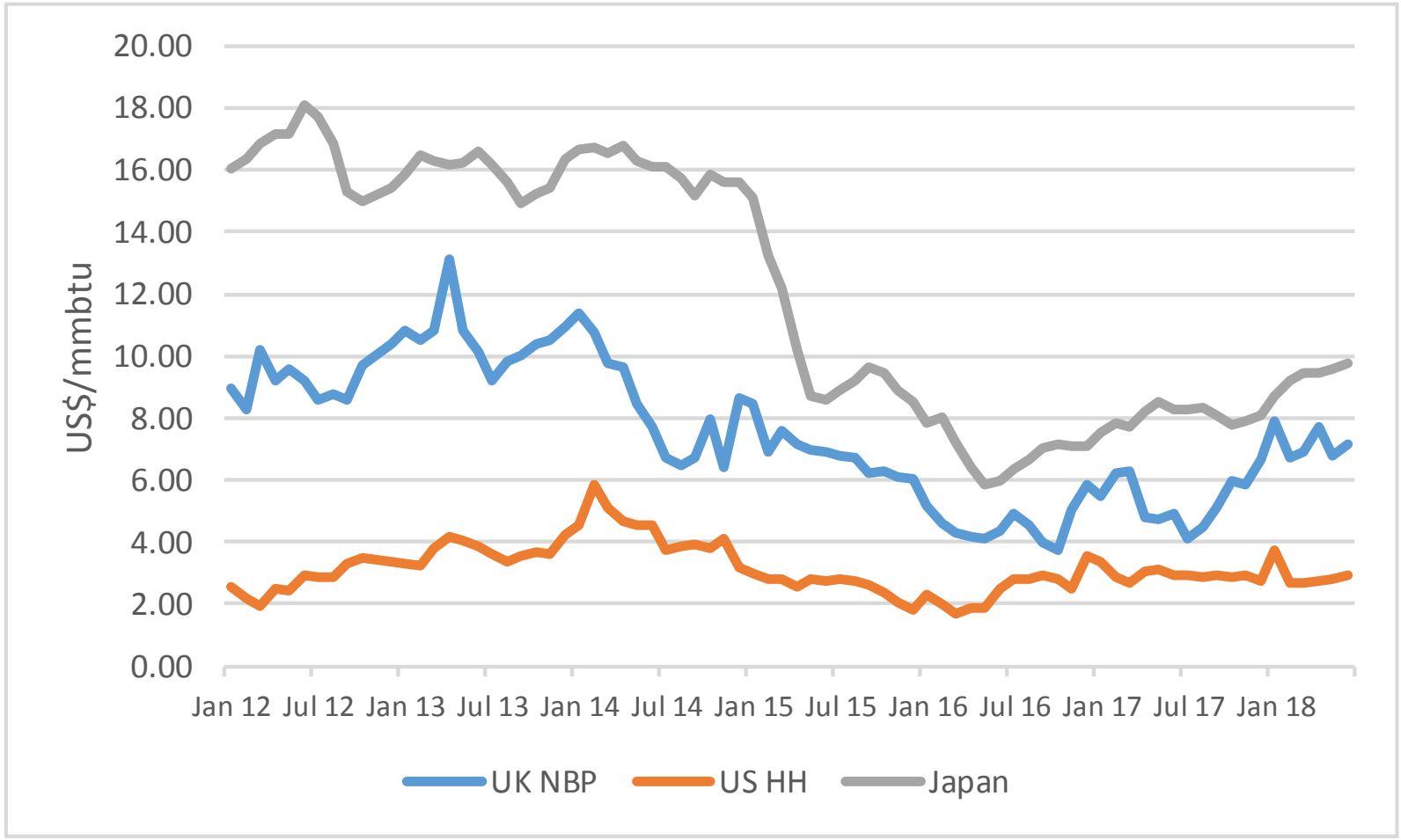


Meanwhile growth in LNG supply is about to explode



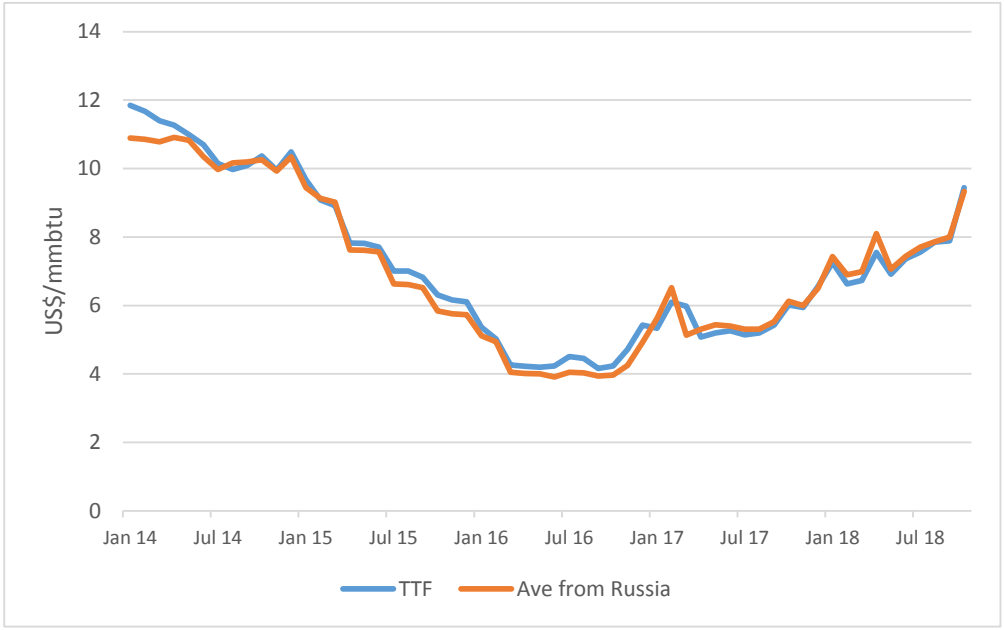
Gas prices are converging due to global oversupply and increased LNG trading

Global gas prices



Gazprom has adjusted its pricing strategy

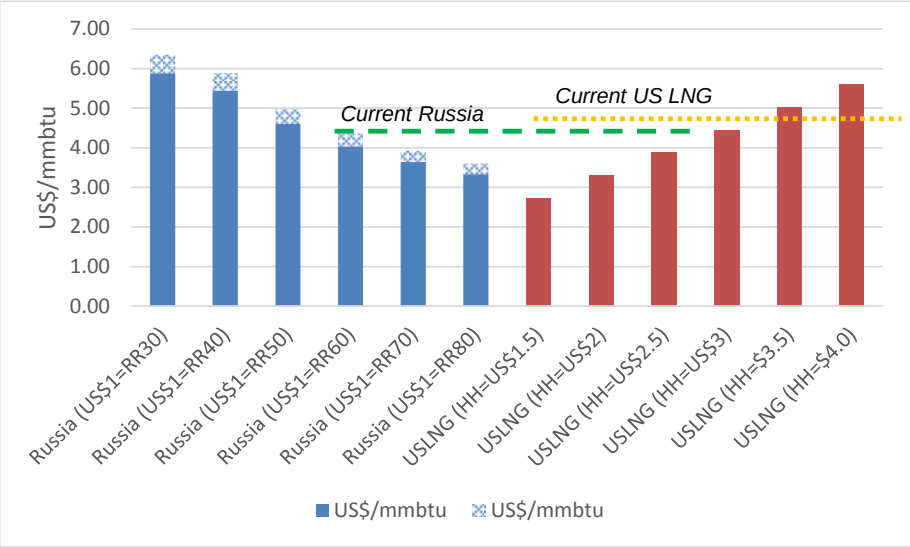
Russian gas price in Europe vs Spot Price



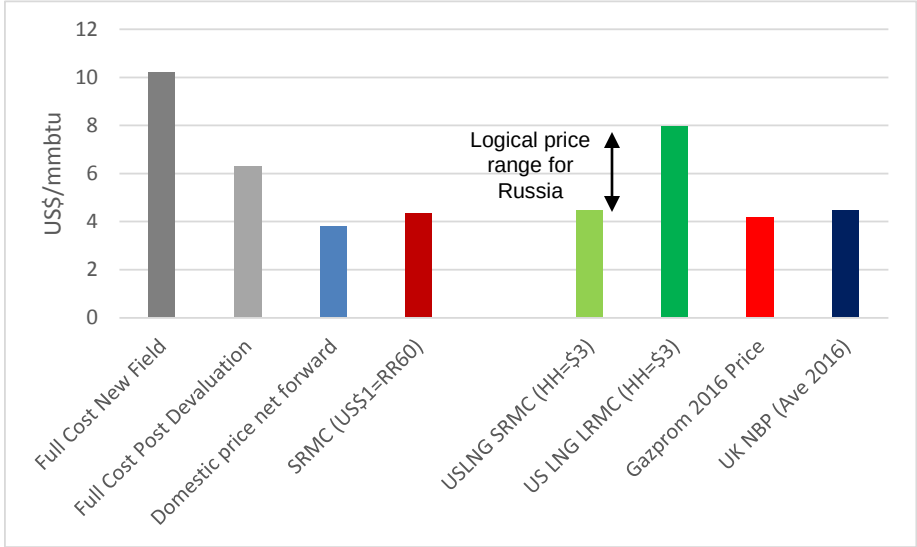
- Gazprom has demonstrated that it is prepared to shift towards market prices
- Price formation in long-term contracts may still be nominally linked to oil prices, but reality shows that actual prices are close to spot levels
- Renegotiation of contracts has introduced discounts, rebates and spot-linked pricing, and Gazprom is increasingly trading on European hubs
- Oil-linked price look set to remain competitive in 2017 despite recovery in oil price, although if LNG wave eventually arrives then a reaction may be required

Russian gas can be very competitive with US LNG in Europe

Russian pipeline gas versus US LNG at SRMC



Full comparison of Russian and US gas to Europe

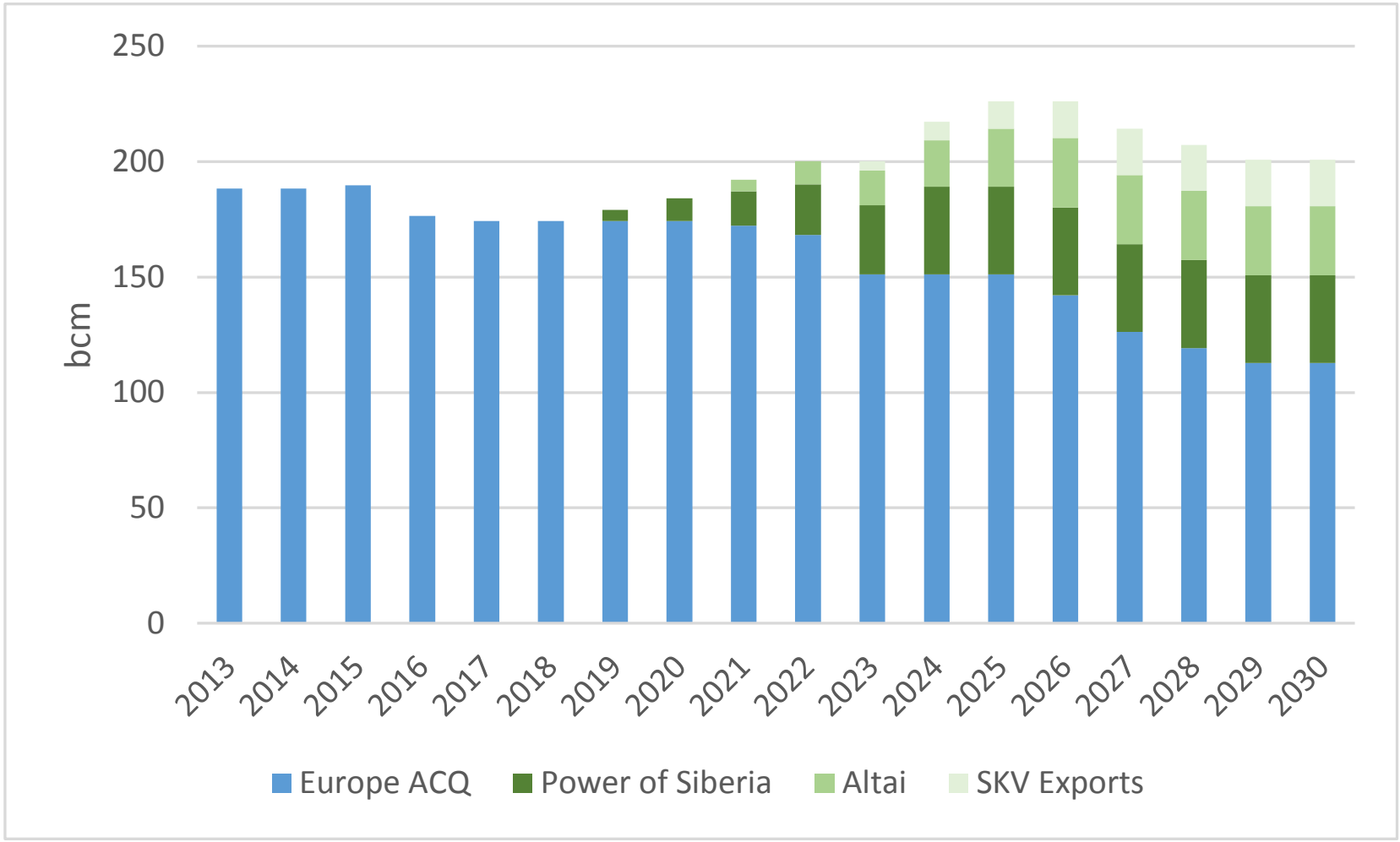


- On a short-run marginal cost basis (SRMC) the key variables are the US$/Rouble exchange rate and the price of Henry Hub gas
- At current levels Russian gas can compete with, and slightly undercut US LNG in Europe
- In the longer term, Russia would logically adopt a strategy to keep the European gas price between the short and long-run cost of US LNG - $4-8/mmbtu
  - Allow some US LNG to enter Europe but prevent new FIDs based on European economics

New field developments focused in East

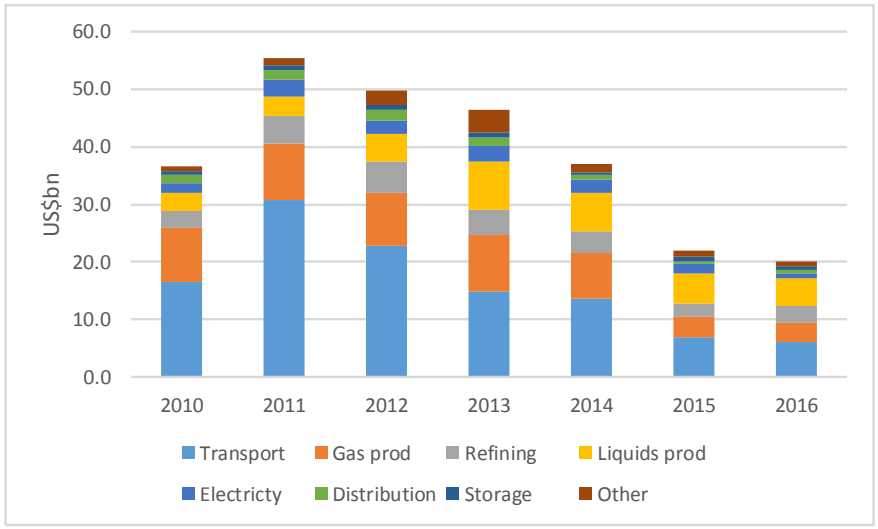
- Gazprom plans to develop the Chayanda and Kovykta fields in East Siberia, with a combined capacity of 50bcma
- Both fields are targeting the export market, now via pipeline to China rather than the previous pipe and LNG plan
- LNG now focussed on Sakhalin Island, although growth in doubt

Gazprom's Goal of a Balanced Export Portfolio

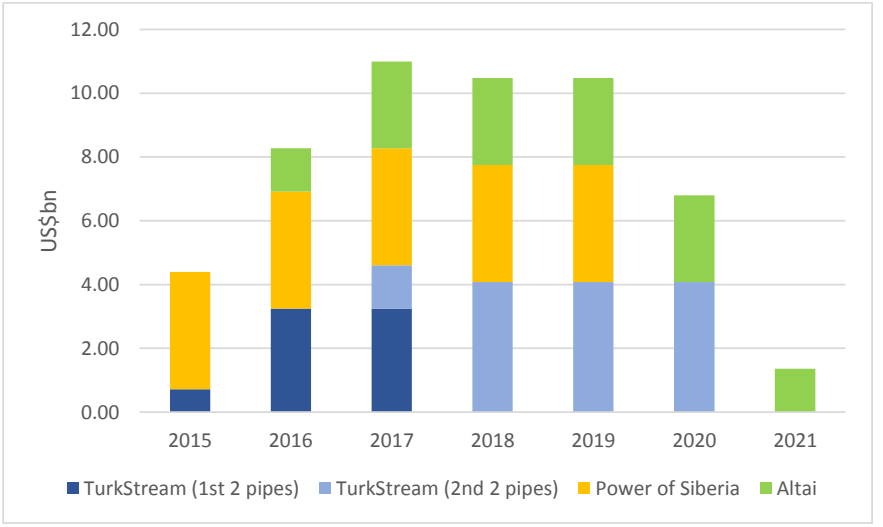


Can Gazprom afford all its new pipeline plans?

Gazprom has reduced spending on transport…



…but needs to increase it at a time of low gas prices

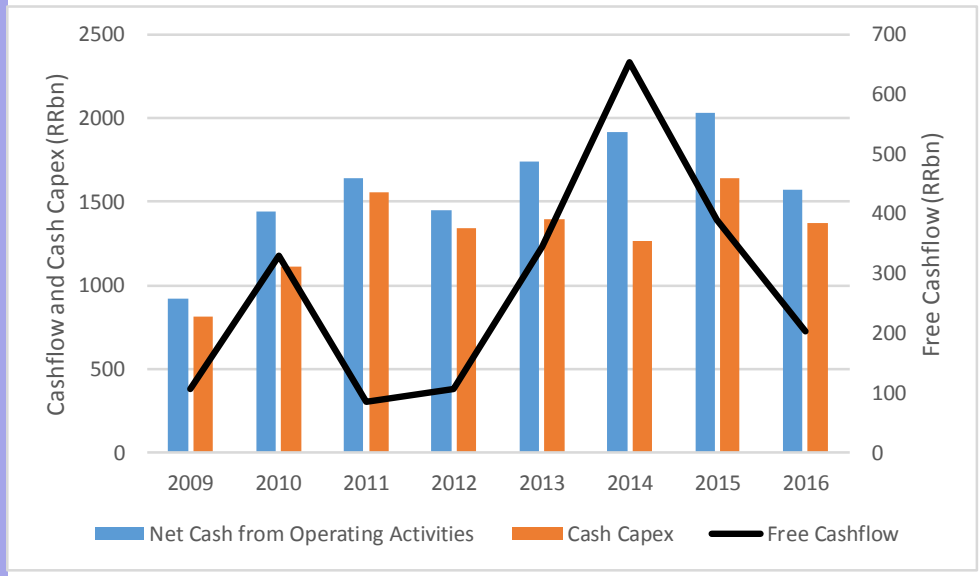


**Assumes 90% of capex will be Russian materials and labour and an exchange rate of RR60/$*

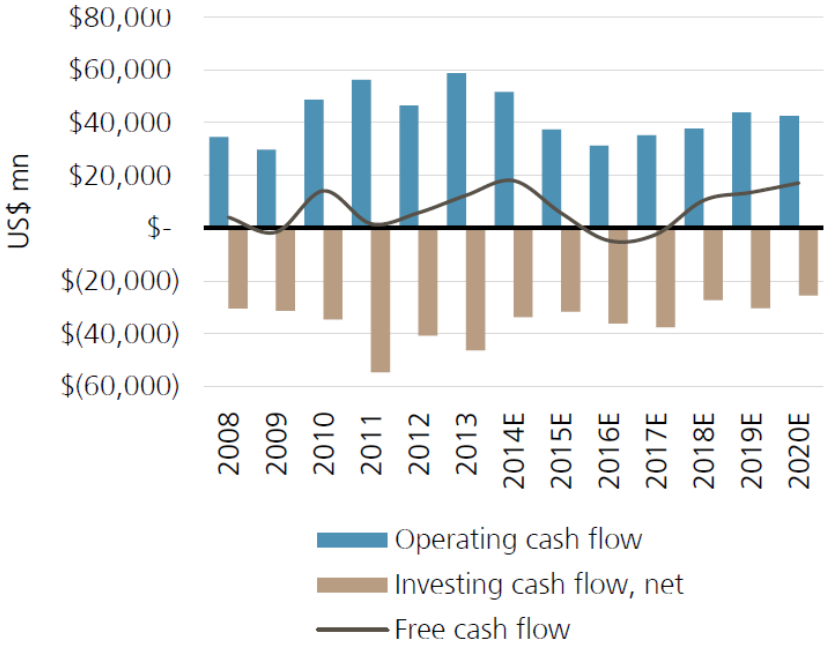
- **Gazprom has been forced to reduce its overall spending due to low gas prices**
- **However, peak capex for its three major new pipelines is likely to be c.$10bn p.a.**
- **How will it afford this given the impact of US sanctions?**

Gazprom capex turns cashflow negative in new price environment

Gazprom historic cashflow

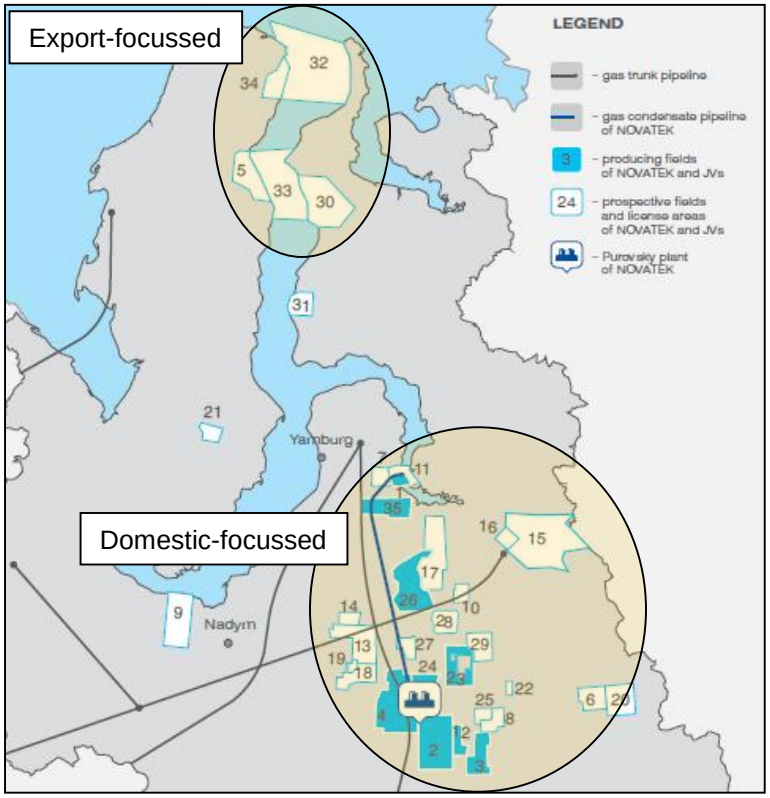


Free cashflow turns negative thanks to pipeline investments

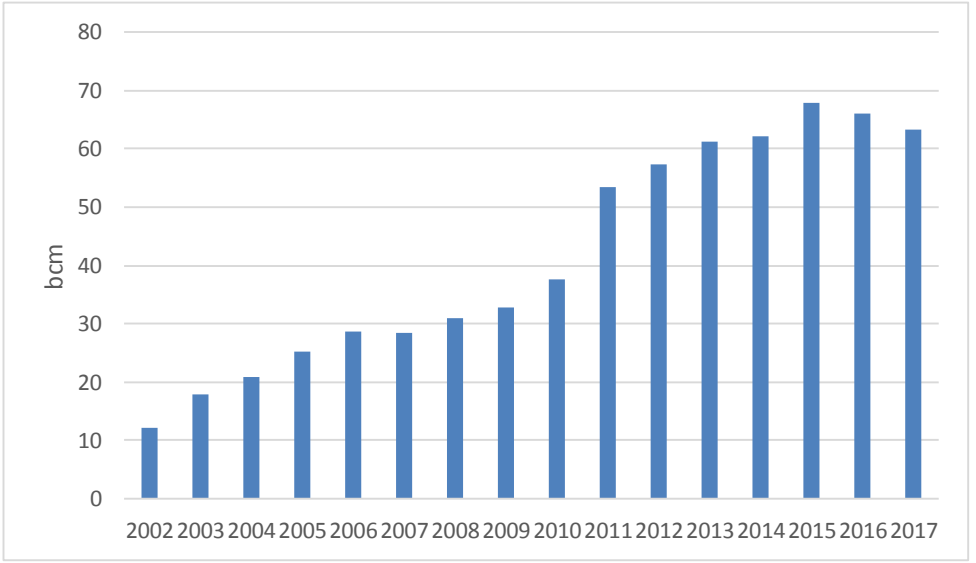


- From 2017 transport will again make up a large share as Turk Stream and Power of Siberia are built
- The impact of rouble devaluation should reduce costs in US$ terms, meaning total capex will average $30-35bn per annum
- Falling cashflow from lower prices and lower domestic revenues will mean that free cashflow could turn negative
- $20bn of capex for a second eastern pipeline would clearly worsen the situation

Novatek is a local gas company that now has global ambition based on significant growth



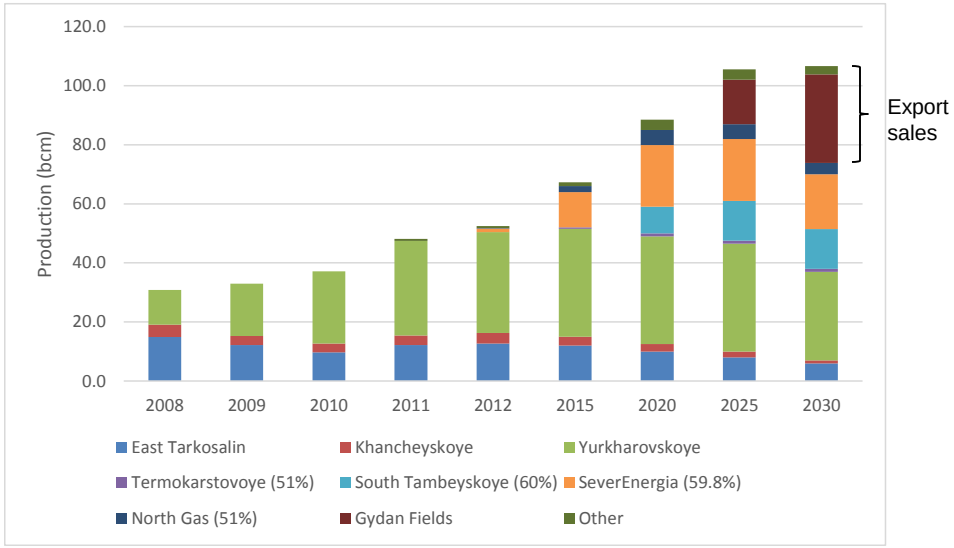
Novatek's gas production has doubled since 2008



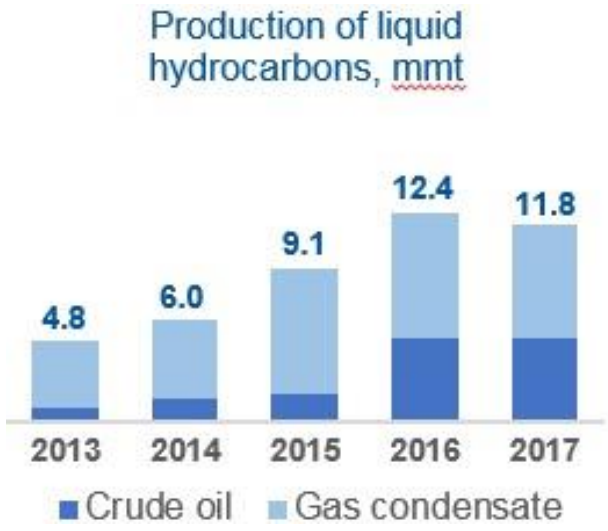
- **Novatek has benefitted from a focus on core NPT asset base**
- **Production has risen dramatically, mainly through organic growth (but also helped by recent acquisitions)**
- **Recent dip about to reverse thanks to development of a major new LNG project (Yamal LNG)**

Novatek's production continues to grow, but is becoming more liquids and LNG focussed

Novatek's gas production to become more export focussed



Novatek's expanding liquids output



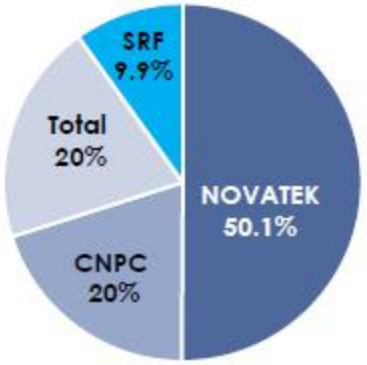
- **Novatek's gas output continues to grow rapidly, with a 100bcm target dependent on LNG exports**
- **Sales into the domestic market will peak by the end of the decade, with LNG exports becoming a core source of revenue**
- **Growing liquids production will also be a vital driver of company profits, especially as Severenergia output rises**
- **A key question for Novatek will be whether sanctions continue to undermine its LNG growth plans**

Yamal LNG came online in 2017

Project for construction of an LNG plant on the Yamal Peninsula:

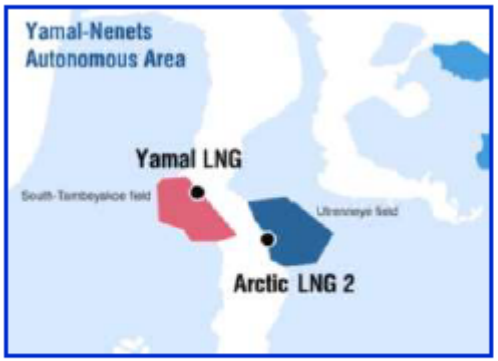
- 2P PRMS gas reserves of the South-Tambeyskoye onshore conventional field at 31.12.15 - **926 bcm**
- Liquefaction capacity - **16.5 mmt** of LNG per annum (3 trains)
- FID date - **December 2013**
- Capex estimate - **USD 27 bln**
- First production is scheduled for **2017**

Shareholders



- Project came online on schedule and on budget thanks to Chinese financing and support from French major IOC

Arctic LNG-2 appears to be more than a possibility

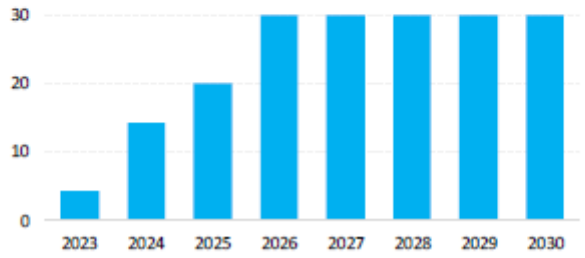


Utrenneye	Gas, bcm	Liquids, mmt
PRMS Reserves at 01.11.2017	784	37
Potential PRMS reserves addition by 2030	277	15

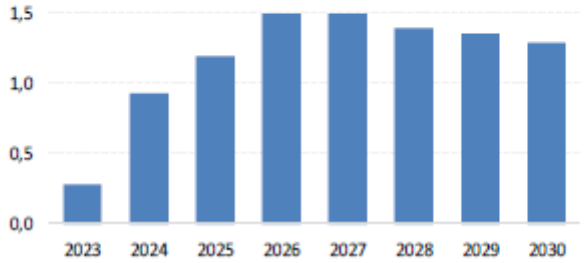
Jurassic layers development may increase gas reserves by 40%

Concept	▪ Utrenneye feeder field for Arctic LNG 2 ▪ New concept of LNG trains based on GBS platforms ▪ Three LNG trains at 6.1 mtpa each utilizing Linde liquefaction license ▪ GBS platforms built at LNG construction center (Murmansk) ▪ FEED in progress (expected completion late 2018)
Advantages	▪ Tax concessions approved per RF legislation, the same as for Yamal LNG ▪ Optimize and reduce CAPEX per ton of LNG liquefaction ▪ Low cost, onshore conventional natural gas ▪ Leverage existing infrastructure ▪ Minimize environmental impact

Natural gas production at Utrenneye field, *bcm*



Gas condensate production at Utrenneye field, *mmt*

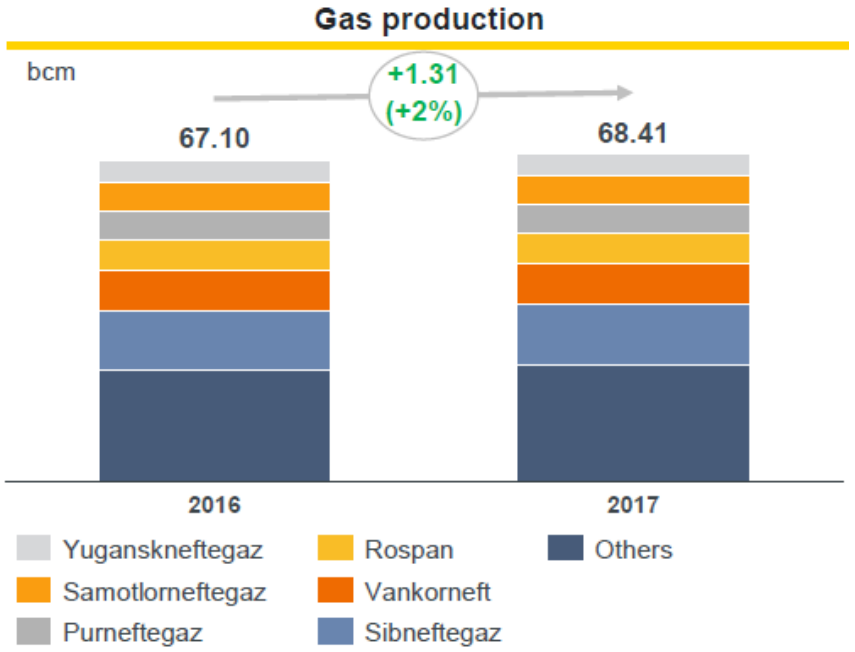


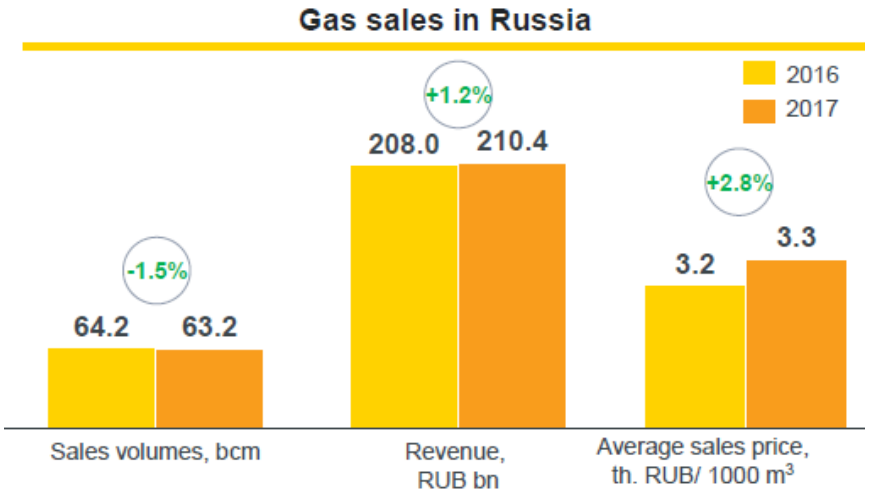
Rosneft has challenged Gazprom with a broad-based gas strategy

- Following the acquisitions of TNK-BP, Itera and Sibneftegas Rosneft has a broad portfolio of gas assets in Russia
- Total reserves are now approaching 7 Tcm, with West Siberia and Eastern Russia accounting for the majority
- Rosneft has challenged Gazprom in the western domestic market and also in the area of eastern gas exports

Rosneft gas output growing to meet contractual commitments

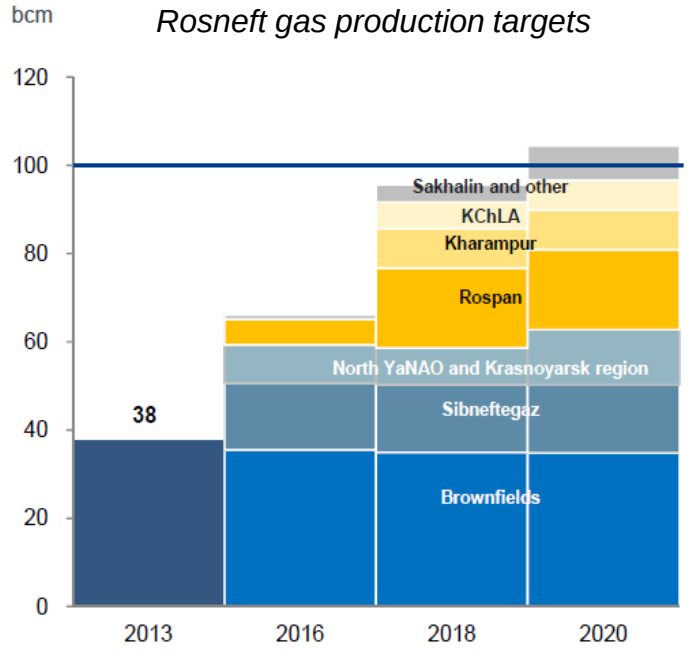
- Rosneft is under pressure to increase output in order to meet its contractual obligations
- In 2017 it claimed to have achieved this, and even to have sold some gas on the St Petersburg Exchange
- Development of the Rospan fields is underway, but will need to accelerate if Rosneft is to meet its output target of 100bcm for a full year
- The Kharampur gas field will also need to be prioritised is Rosneft is to avoid a supply crunch
- LNG plans appear to have gone backwards, with Sakhalin gas now more likely to be sold to Gazprom or via pipe to China



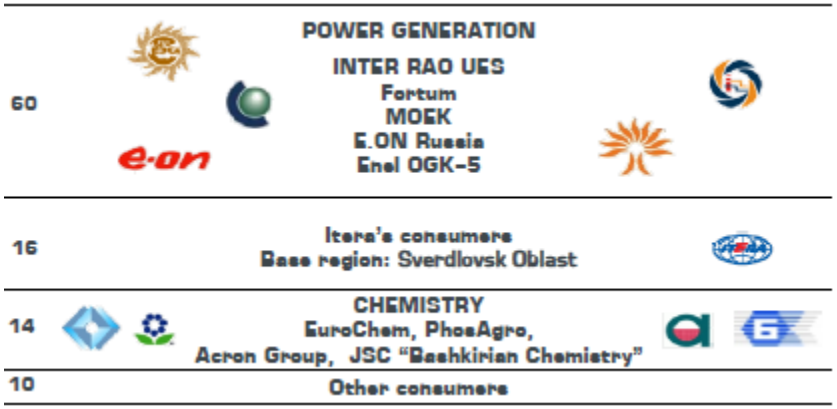


Rosneft: aggressive output targets backed up by contracts

Rosneft gas production targets



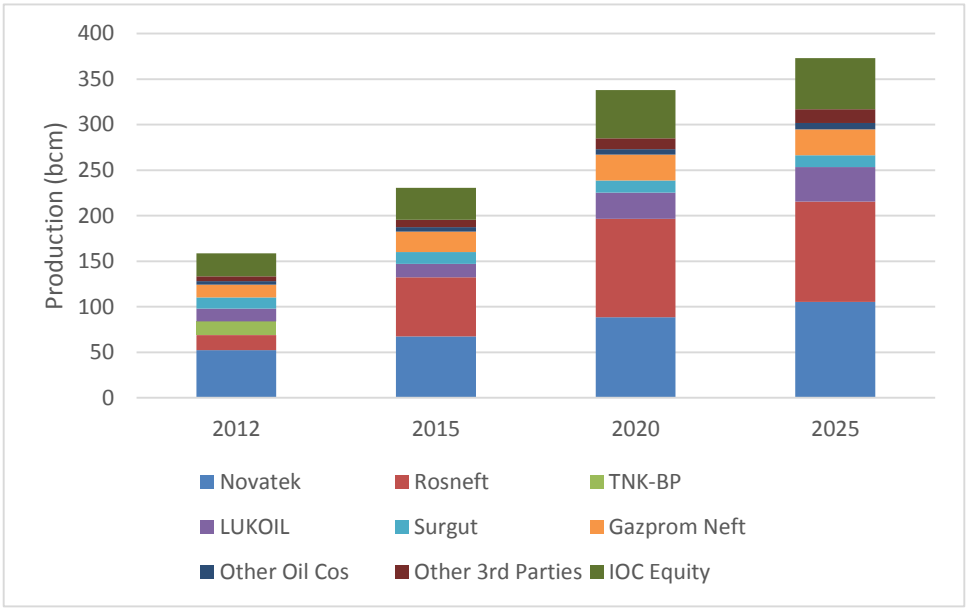
Split of contracts signed with industrial customers



- Rosneft aims to produce 100bcm by 2020
- It believes that it can have a domestic market share of 19-22% by that date
- A number of long-term contracts have already been signed to back up this claim, especially with power generators
- Questions over whether Rosneft has sufficient gas to meet demand, and also over prioritisation of export plans

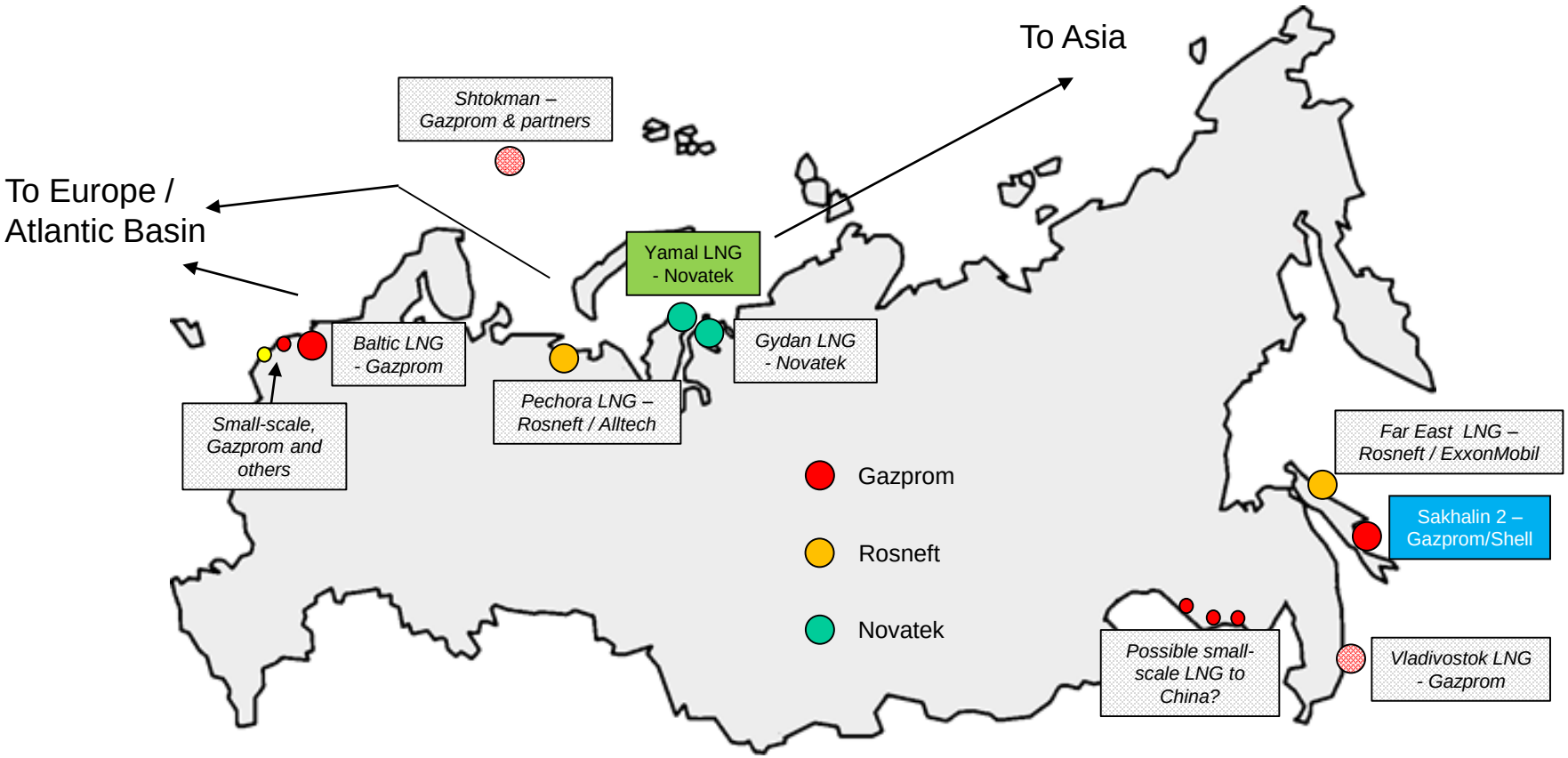
Conclusions on Independent Gas Supply

Potential Independent Gas Production in Russia



- **Independents could theoretically produce over 300bcma by 2020**
- **Their gas is generally lower cost than Gazprom's new developments in Yamal, giving a domestic competitive advantage**
- **Independents likely to have as much as 60% of domestic market by 2020**
- **Limited exports of LNG can provide a first entry into global markets which could expand further if political support is maintained**

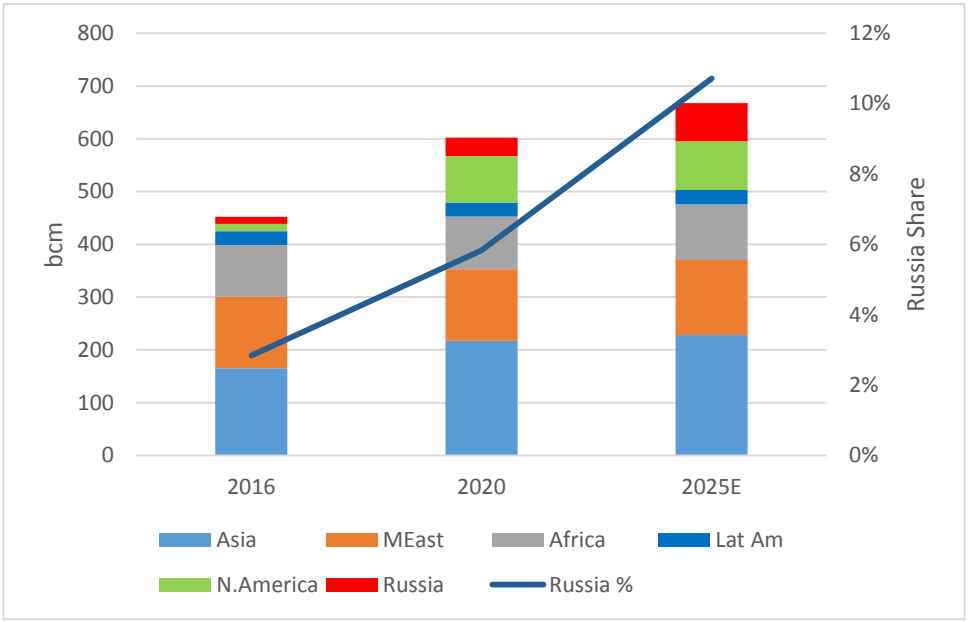
Russia's LNG Projects – Slow-burning progress



- Eight major LNG projects have been proposed in Russia, with a total potential capacity of over 100mtpa
- However, only one is producing (Sakhalin 2) while one is under construction (Yamal LNG)
- Russia now has the opportunity to exploit the hiatus in global LNG projects to develop new production for the early to mid-2020s, when the market is likely to re-balance
- Small-scale projects as well as global scale developments can provide increased flexibility

Russian LNG in a Global Context

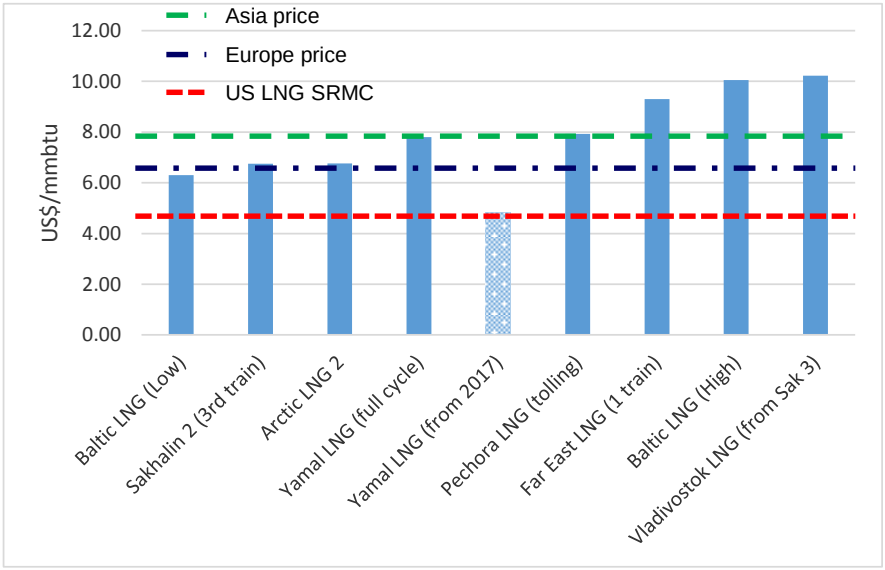
Estimated growth in global LNG supply



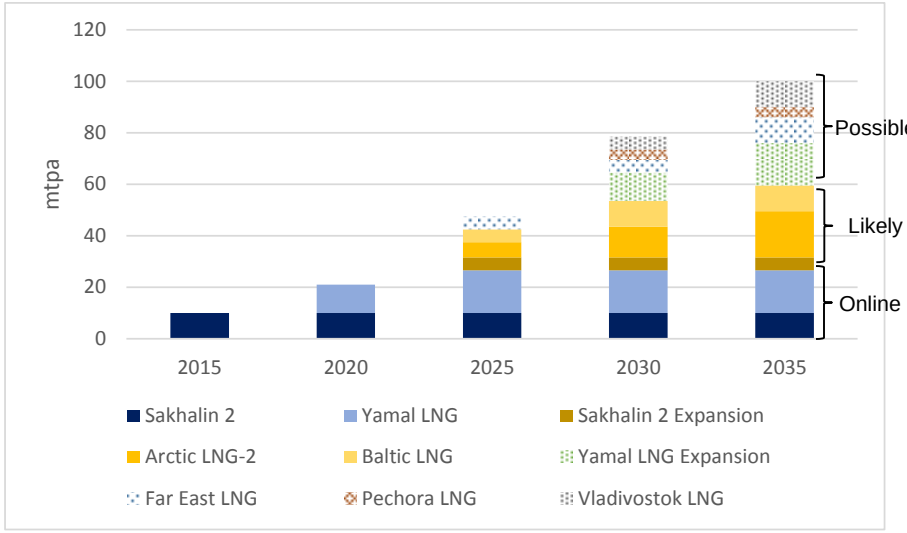
- Russia currently accounts for around 3% of global LNG capacity
- Gazprom has historically targeted a 14% market share of global LNG market by 2030
- Potential for Russia as a whole to reach a share of over 10% by 2025, although Gazprom may not be the leader by then
- Longer term future will depend on competition with other forms of fuel in the global energy economy

Russia's LNG prospects undermined by economic reality

Breakeven economics of Russian LNG projects compared to gas prices

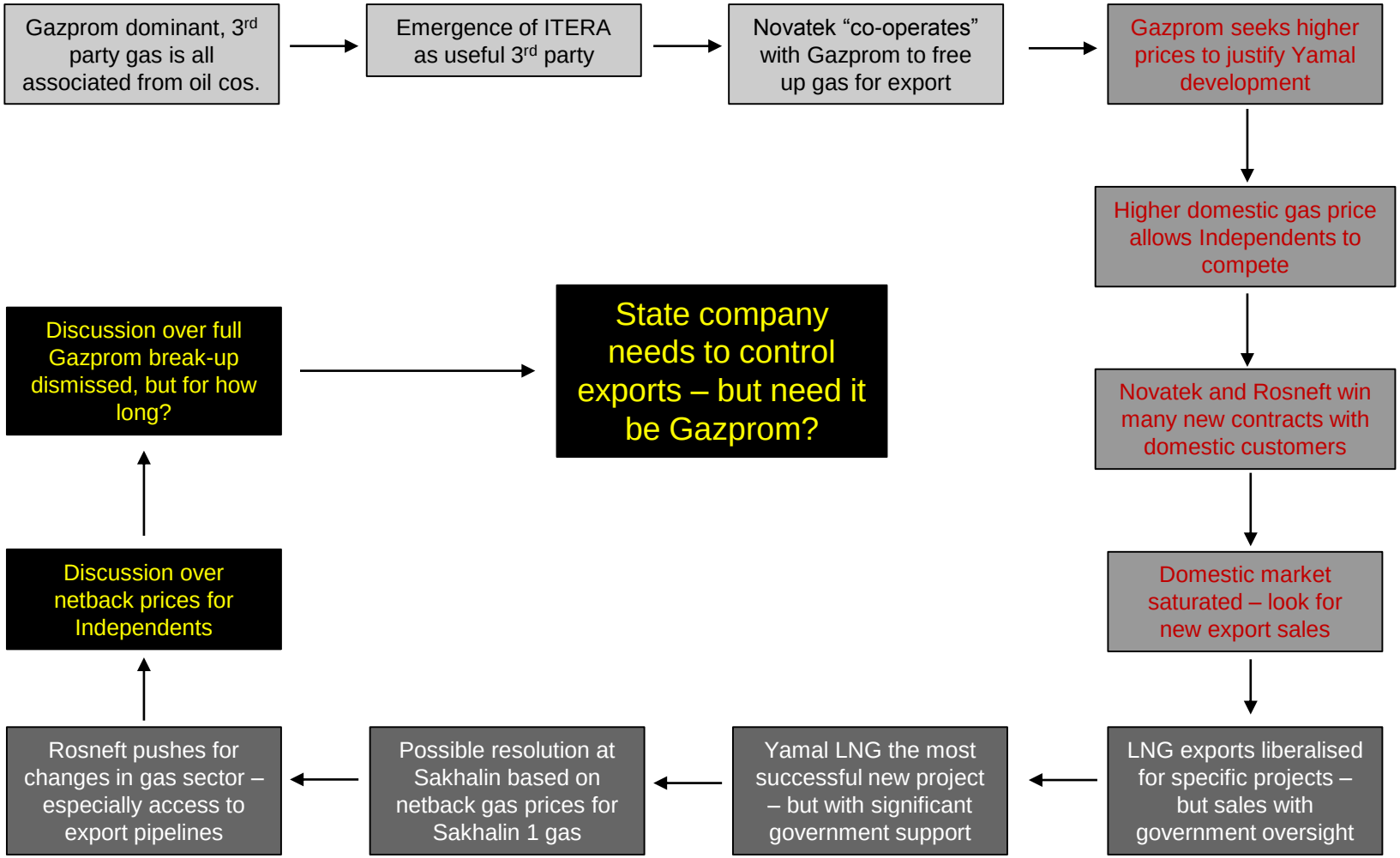


Outlook for Russian LNG projects



- **Recent rise in gas prices supports some Russian LNG projects, but a number remain too expensive to be realistic below $8/mmbtu**
- **Expansion of Sakhalin 2 and Novatek's Arctic LNG-2 appear realistic , and Yamal LNG can certainly cover its cash costs**
- **Further development of Russia's LNG plans will depend upon cost control and partnership**
- **Arctic LNG-2 could be the next project to proceed to FID, although Sakhalin-2 expansion is the most logical next project**

Is LNG part of a logical progression in the Russian gas sector?



Gazprom remains a favoured state entity, but global market conditions may force radical change involving gradual introduction of new players

Conclusions

- The Russian gas sector is undergoing significant change, and is having to respond to domestic and international pressure
- In the FSU, political reasons have caused a decline in exports
- In Europe, political and commercial reasons have put Gazprom under greater pressure, although it has responded
- Gazprom's overall role in Russia is declining, but it remains the main exporter by pipeline
- Novatek and Rosneft are increasing their share of the domestic market, and are also challenging Gazprom in the LNG market
- It may be the case that Gazprom's dominant position as gas exporter to Asia and Europe could also be challenged
- Russian gas is competitive in both markets, but the Russian government needs to decide if it needs to diversify its exporting options
- Russian gas will remain a vital part of the global gas system, if it is marketed in a commercial rather than a political fashion

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