

## Argus White Paper: Western Europe braces for wave of LNG

### Higher LNG receipts could test Europe's capacities

Western Europe could struggle to cope with LNG imports returning to their 2011 highs even if gas prices drop low enough to completely displace coal-fired generation.

European LNG sendout climbed in April to the highest since December 2012 following slow receipts during the winter.

Rising global liquefaction capacity could continue to boost deliveries to Europe, providing it is not offset by new demand from premium importers.

Higher consumption by China and India combined with new importers such as Egypt, Jordan and Pakistan in recent years had mostly absorbed the increase in supply, contributing to European receipts remaining slow in 2016.

But Egypt plans to become a net exporter again, while higher Chinese gas production and slower consumption growth could limit further increases in LNG imports. And India has removed LNG subsidies, which could cause imports to stall.

Even slower LNG demand growth from premium markets could result in producers offloading more cargoes in Europe if they cannot find more profitable destinations.

### Suppliers' dilemma

An increase in European LNG imports could leave other suppliers with two choices.

Trying to maintain market share could push down European prices enough to encourage gas to displace coal from the generation mix, and the stronger demand could largely offset the increase in supply.

Or pipeline gas suppliers — such as Russia's Gazprom, Norway's Statoil and Algeria's Sonatrach — could turn down production and exports to

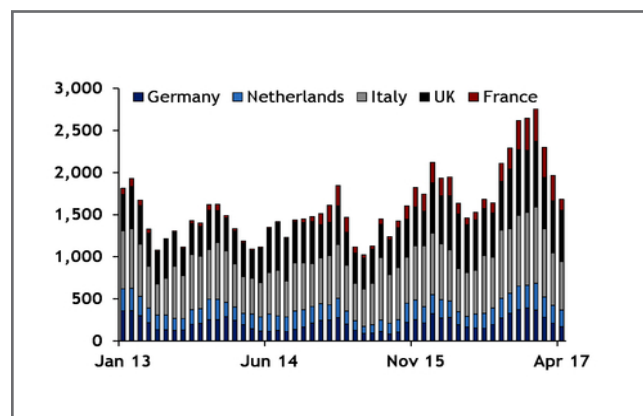
Europe, which could offer some support to prices.

Power sector gas burn had already climbed last year to the highest since at least 2011. The UK has led the increase in gas consumption as coal has been almost completely displaced from the generation mix.

And above-average European gas stocks in April 2016 following a mild winter had pushed TTF prompt prices down to levels that were competitive with older coal-fired units in the second half of last year.

French nuclear restrictions also bolstered power sector gas consumption in September-December.

Western Europe's power sector gas burn climbs *GWh/d*



### Gas to displace coal

TTF prompt prices could again have to drop enough for gas to further displace coal if there is a substantial increase in European LNG receipts.

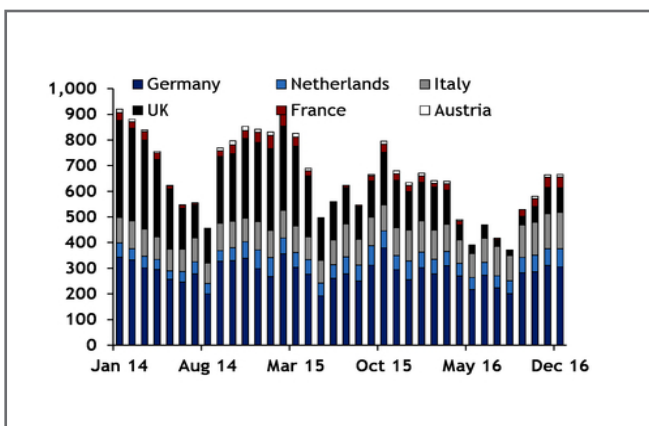
Coal-fired generation in western European countries with liquid gas hubs — Germany, the Netherlands, the UK, France, Italy and Austria — was about 543 GWh/d last year. The region would need almost 400 TWh/yr more supply to be able to fully displace coal — depending on the efficiencies of the gas-fired plants used and assuming enough capacity is available.

This would require European LNG sendout to almost double from the 1.2 TWh/d in 2016 and other sources of supply to remain broadly similar.

Regasification was last this high at almost 2.3 TWh/d in 2011 with a peak of 2.8 TWh/d in May of that year. European LNG receipts tumbled later in 2011 and over the following years because of stronger northeast Asian demand, particularly after Japan closed nuclear capacity following the Fukushima disaster.

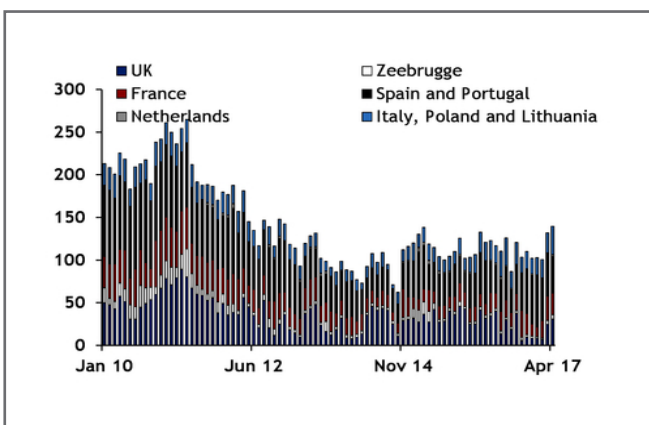
Western Europe's coal-fired generation

GWh/d



Europe's LNG sendout still below 2011 high

mn m<sup>3</sup>/d



#### System constraints

Europe's ability to absorb any increase in LNG receipts will be limited by pipeline and regasification capacity.

France will have to take much of any increase in LNG imports, at least in the summer, while the UK could mostly only accommodate more cargoes in the winter.

The Gate terminal is the only facility closely connected to the Netherlands and Germany, which are the two countries with the most potential to raise consumption.

Dunkirk starting this year could boost sendout by 375 GWh/d compared with 2016, if it ran at capacity all year. And Montoir sendout was less than 50 GWh/d in 2016, nearly 275 GWh/d below its previous monthly high.

The Fos-sur-Mer terminals could boost sendout by over 140 GWh/d compared with 2016, although operator Elengy is considering the future of the smaller 4mn t/yr Fos Tonkin terminal.

But France could only account for a small increase in gas-fired generation by displacing coal, particularly compared with the Netherlands and Germany.

An increase of almost 800 GWh/d of French sendout — if terminals were operating close to capacity throughout the year — would require a substantial redirection of flows.

Pipeline exports to Italy could increase by over 200 GWh/d, although this could just displace Russian and Algerian pipeline gas. Italy has more scope for gas to displace coal from the generation mix than France, but also has long-term contract obligations in excess of consumption.

Increasing backhaul at Obergailbach, where flows into France were 240 GWh/d in 2016, would allow more gas to be redirected into Germany.

But turning down flows into France at Taisnières would leave more gas in Belgium, which could put more strain on Zelzate and Eynatten to get supply into Germany and the Netherlands.

The UK has ample spare LNG import capacity, but coal-fired generation has already been pushed out of the mix. And the Interconnector provides the only source of flexible demand, with limited room for flows to the continent to step higher during the summer.

A substantial increase in LNG imports could crash NBP summer prices if the Interconnector reaches full capacity. And firms delivering through the Interconnector could be competing for capacity at

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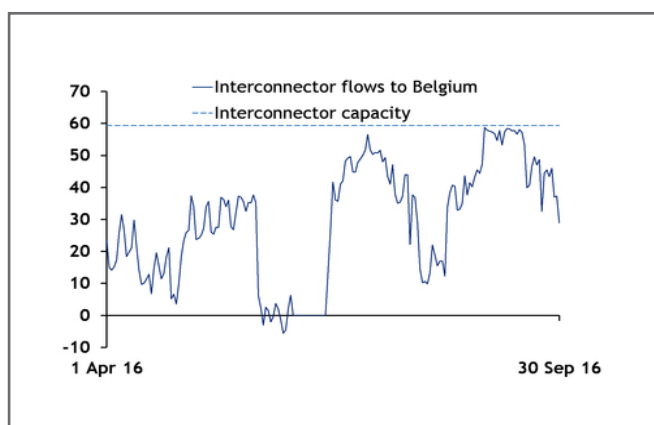
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Zelzate and Eynatten to get the gas into Germany and the Netherlands.

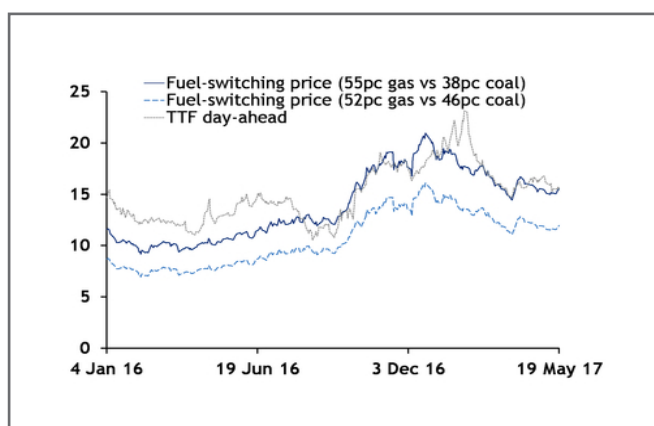
But the UK could easily take more LNG in winter, which could result in the Interconnector flipping to exports to the continent from imports during the 2016-17 heating season.

Higher deliveries to the UK — and to some extent France — could result in prices diverging at different hubs, especially if flows through the links between them come close to capacity.

Interconnector flows tested capacity last summer *mn m<sup>3</sup>/d*



TTF day-ahead at top of fuel-switching range *€/MWh*



### Global gas: Egypt's production to provide turning point

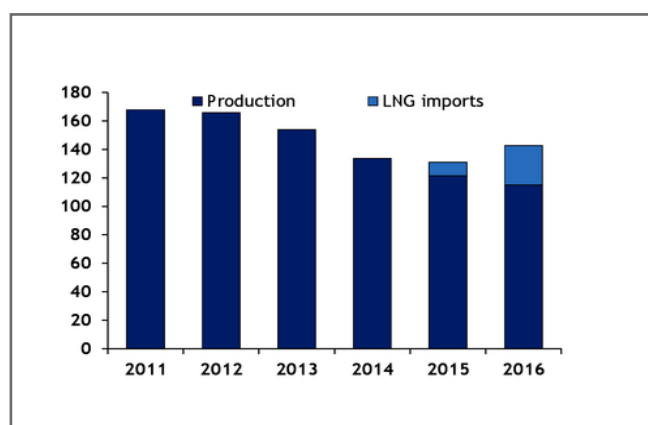
Egypt reducing its LNG imports as new production ramps up could result in growing demand from premium markets no longer being able to match the increase in global supply.

Global liquefaction capacity has risen in recent years and is scheduled to continue accelerating as new projects start.

Egypt — along with India, China and Pakistan — has led demand growth since 2013, which has contributed to European LNG receipts stagnating.

But Egypt plans to become a net exporter again by 2019, with new gas production coming on stream and little sign of any substantial domestic demand growth. Egypt has two largely idled LNG liquefaction facilities — the 7.2mn t/yr Idku and 5mn t/yr Damietta plants. Both facilities were shut down in 2013-14 after a rapid decline in gas production forced feedgas to be redirected to the domestic market, but Idku recommenced exporting cargoes last year. The facility has loaded one cargo so far this year.

Egyptian gas supply *mn m<sup>3</sup>/d of gas*



### New fields

Commissioning at the 141bn m<sup>3</sup> West Nile Delta started in March, while the 850bn m<sup>3</sup> Zohr field is scheduled to come on line at the end of this year.

The 42.5bn m<sup>3</sup> Atoll field, where there are other discoveries under appraisal, is scheduled to start in 2018.

West Nile Delta's plateau production is expected to reach 34mn m<sup>3</sup>/d, which alone could be almost enough to halt LNG imports.

Zohr output is expected to rise to 34mn m<sup>3</sup>/d within 4-5 months of starting and 81mn m<sup>3</sup>/d by the end of 2018.

Atoll phase one output is expected to reach 8.5mn m<sup>3</sup>/d in the first half of 2018, while phase two of West Nile Delta is scheduled for 2019.

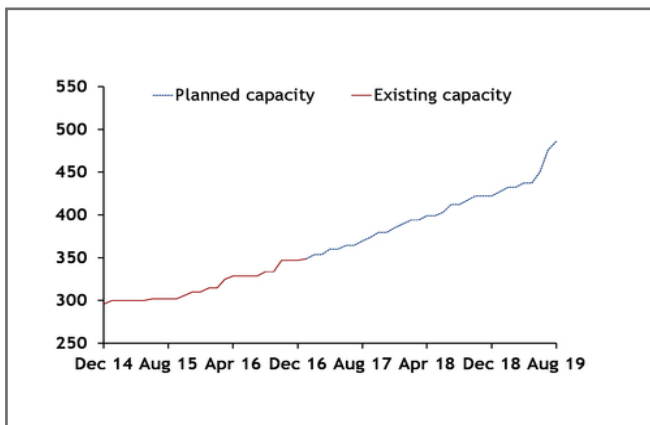
The new production will partly be offset by the decline of older projects. Egyptian output has fallen by an average of 7.2pc/yr in the past five years, although there was only a 5.3pc drop in 2016.

Egypt's aggregate production could climb to almost 220mn m<sup>3</sup>/d by the end of 2018 — assuming combined offtake from Zohr, West Nile Delta and Atoll of 123.5mn m<sup>3</sup>/d — and a decline in existing output similar to recent years.

This would be more than enough to halt LNG imports and resume exports, even if domestic consumption rises. The Egyptian oil ministry cancelled a tender for a third LNG floating storage and regasification unit (FSRU) last year because it was no longer needed. The Egyptian petroleum ministry said it could even start exporting LNG again from its idle plants within two years if gas production timelines are met.

Planned global liquefaction capacity

mn t/yr



#### Little demand growth

Egyptian gas consumption edged higher last year, but was still slightly below its 2012 peak. And there may only be limited room for further increases, barring a jump in economic activity.

Fertiliser output has been much closer to capacity in the past two years after limitations to gas supply in 2014 had curbed production. Gas shortages had also limited steel production in 2015.

But the sharp devaluation of the Egyptian pound last year reduced investment, with construction

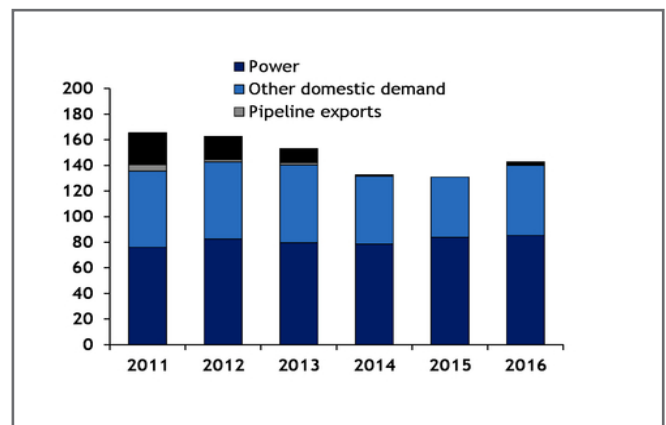
programmes put on hold. Steel producers do not appear to be having gas supply shortages, although that is partly driven by lower demand.

A proposed reduction in the gas price for steelmakers could bolster consumption if it makes Egyptian mills more competitive globally, although this would have only limited effect on gas demand — at least in the short term.

Power sector gas demand has edged higher in recent years, although growth has been slow.

Egyptian gas demand

mn m<sup>3</sup>/d of gas



#### Egypt to reduce LNG imports

The start of production from West Nile Delta could reduce Egypt's LNG imports this year. State-owned Egas has secured over 100 LNG cargoes to be delivered this year, but the company is already in discussions to delay some deliveries from this year to 2018, market participants have said.

Egypt imported about 14.5mn m<sup>3</sup> of LNG in 2016 — judging by vessel size — having only started imports in April 2015. Only China has recorded a greater rise in LNG imports since 2013, with much of the increase coming last year.

Egypt halting imports or even resuming exports could leave suppliers with more cargoes to offload in Europe, barring an increase in demand from other premium markets.

Pakistan and Bangladesh each plan to install three new FSRUs. Pakistan's second FSRU is scheduled to be installed by the middle of this year. Its other projects have international backers including Shell, ExxonMobil, Total and Qatargas.

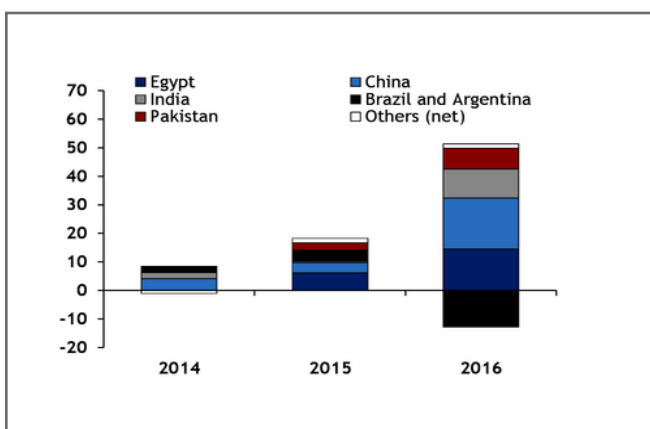
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And India is expanding its LNG import capacity, while Chinese LNG receipts and gas consumption have continued to climb over the past year.

But it would take a substantial increase in demand from these countries over the next two years to offset planned growth in liquefaction capacity if Egypt resumes net LNG exports. More than 30 FSRU projects have been proposed, with over 70mn t/yr of LNG import capacity, but it is unlikely that all will be built and fully utilised.

Change in LNG imports since 2013 *mn m<sup>3</sup> of LNG*



### Global gas: Chinese gas output to drive LNG to Europe

An increase in Chinese gas production could contribute to more LNG cargoes heading to Europe, even if ambitious output targets are missed.

Gas production has climbed in the last two months, although LNG imports have also risen this year because of higher consumption.

Output of 12.2bn m<sup>3</sup> in April was up from 10.6bn m<sup>3</sup> a year earlier and the 15.3pc rise was the sharpest since a 27.9pc year-on-year hike in March 2012.

China aims to raise production to 170bn m<sup>3</sup> this year from 136.7bn m<sup>3</sup> in 2016, but is expected to fall short of this, with 140bn-150bn m<sup>3</sup> a more realistic figure. Output was up by 6.1pc on the year in January-April, well behind the 24.4pc target.

Higher production could result in a slowing of the pace of LNG imports, especially as consumption has only edged up this year after a substantial increase in 2016.

Demand rose to 652mn m<sup>3</sup>/d in the first quarter from 623mn m<sup>3</sup>/d a year earlier. The 4.6pc rise in the first quarter followed a 12.5pc jump over the whole of 2016 compared with 2015.

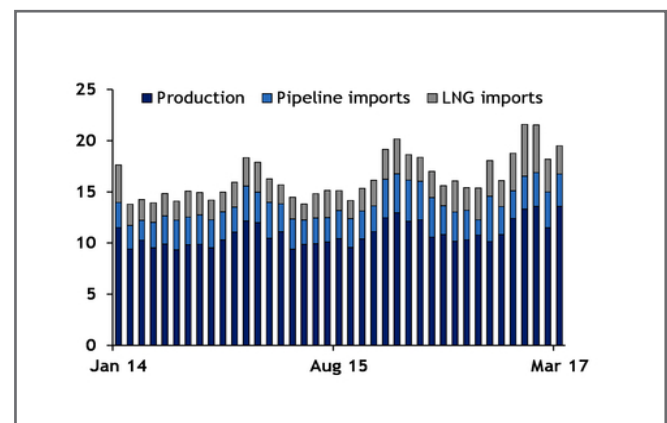
Higher Chinese LNG imports in 2016 drew cargoes away from Europe, even as global liquefaction capacity rose. Stronger demand from China, Egypt and India largely offset the increase in global supply, resulting in European receipts stagnating.

Chinese LNG receipts were up in the first quarter, but imports could drop if the ambitious output target is met.

Production of 170bn m<sup>3</sup> this year would lead to lower imports, even if factoring in a demand hike matching last year's 12.5pc, which would take consumption to 234bn m<sup>3</sup>, and see imports falling to 63.7bn m<sup>3</sup> from 71.1bn m<sup>3</sup>.

But if output over the full year were to rise by the 6.1pc in January-April, the total would come to just 145bn m<sup>3</sup>. And then a small rise in consumption — similar to the 4.6pc in the first quarter — would lift imports to 72.4bn m<sup>3</sup>.

China supply sources *bn m<sup>3</sup> of gas*



### Pipeline plans

China plans to boost pipeline deliveries this year, targeting a 30pc rise in flows through the West-East Pipeline (WEP) to 60bn m<sup>3</sup>.

WEP links the producing region of Xinjiang in west China to major population centres in the south and east. It also handles central Asian gas imports.

Flows climbed for much of winter 2016-17 — aside from a drop in February — but this might have been driven by domestic production growth, rather than



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higher imports from central Asia.

China's pipeline imports slipped to 111mn m<sup>3</sup>/d in the first quarter from 128mn m<sup>3</sup>/d a year earlier, reflecting slower Turkmen receipts.

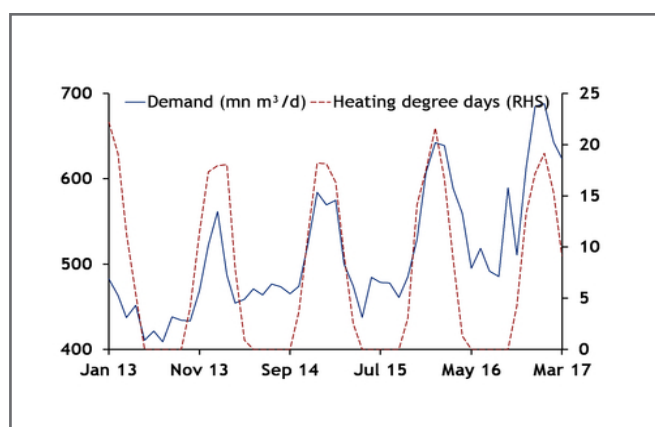
LNG receipts rose during winter, driven by particularly strong gas consumption in December-January.

Higher demand was mostly the result of factors other than weather. Overnight temperatures in Beijing of 3.2°C in March were up on 3°C for the same month last year, but demand climbed to 624mn m<sup>3</sup>/d from 589mn m<sup>3</sup>/d.

China plans to expand its network over the coming years, although some pipelines will be filled with gas produced from coal.

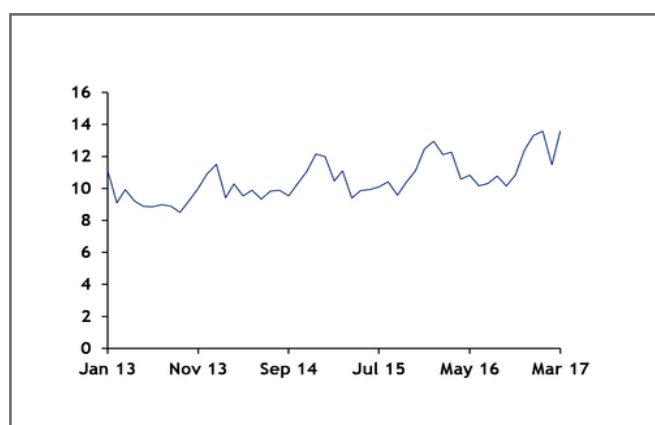
And firms are working on projects to replace coal with gas to curb pollution — particularly in Beijing — that could continue to boost gas consumption.

Gas demand rises despite milder weather



China's gas production edges up

bn m<sup>3</sup>



### Global market

Slower Chinese LNG import growth could be enough to trigger an influx of cargoes to Europe. Chinese receipts rose to 65.5mn m<sup>3</sup> of LNG in April 2016-March 2017 from 48.5mn m<sup>3</sup> a year earlier, equivalent to almost an extra 64 Q-Max cargoes.

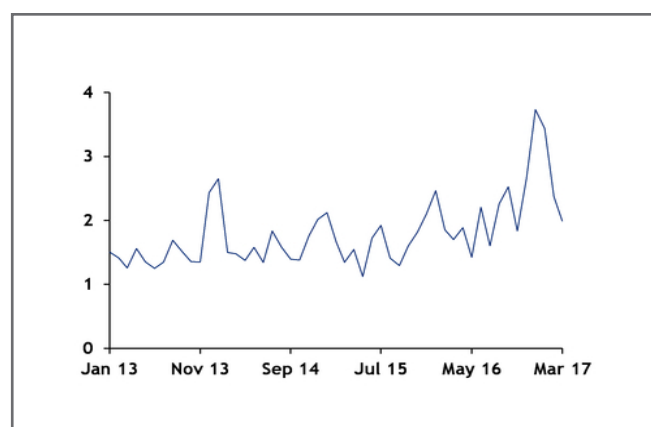
The increase in deliveries to China was broadly similar to the UK's total LNG imports, with 66 tankers carrying up to 15.4mn m<sup>3</sup> arriving in April 2016-March 2017.

Global liquefaction capacity is expected to keep rising over the coming years. The increase in supply over the past few years has so far been met by stronger demand in premium markets, mostly from China, Egypt and India.

But rising gas production in China and Egypt, along with India cutting subsidies could leave little standing in the way of a wave of LNG hitting Europe.

Chinese LNG imports spiked during winter

mn t



### Crude cut extension could boost Europe's gas supply

The proposed nine-month extension to oil production cuts could result in an increase in European gas supply.

Firmer crude prices have typically supported European forward gas markets because of the higher import costs from oil-indexed contracts.

But Algeria — and potentially Russia — may seek to sell more gas to Europe to offset lower oil output.

Russia, Saudi Arabia and other countries have supported extending global crude production cuts beyond the initial six months.

And Algeria had already backed the plan alongside Iraq.

#### Raising revenues

Lower oil production could encourage state-owned companies such as Sonatrach or Gazprom to increase gas exports to try to offset any lost revenue.

But the main increase in European gas supply could come from Algeria needing less gas for enhanced crude recovery if oil production cuts are extended.

Gas output — excluding injections needed for oil recovery — already stepped up at the end of last year as crude production cuts were agreed. And Italian imports from Algeria climbed at about the same time, following the annual renegotiation of Eni's long-term contract with Sonatrach.

Algeria had struggled to balance rising domestic consumption along with stagnating production in 2014-15.

Sonatrach agreed with Italian importers — most notably Eni — to temporarily reduce contractual volumes with a big drop in Transmed flows from April 2013.

Global LNG prices opened a substantial premium to European hubs following Japan's Fukushima nuclear disaster in 2011.

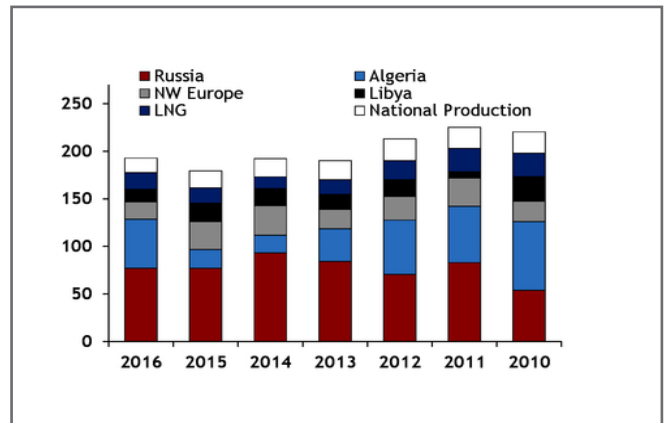
Sonatrach had an incentive to turn down pipeline exports to ensure maximise supply to liquefaction facilities in order to supply premium markets outside Europe. Eni's obligations with Algeria's state-owned Sonatrach have dropped to as low as 5bn m<sup>3</sup>/yr in recent years from the initial 19bn m<sup>3</sup>/yr because the Algerian firm "preferred to sell it as LNG", Eni's chief executive Claudio Descalzi said earlier this year.

Italian importers were also keen to agree reductions in Algerian receipts. Italy has contractual obligations exceeding consumption, which slipped with weak economic growth following 2008 and the expansion of renewable capacity.

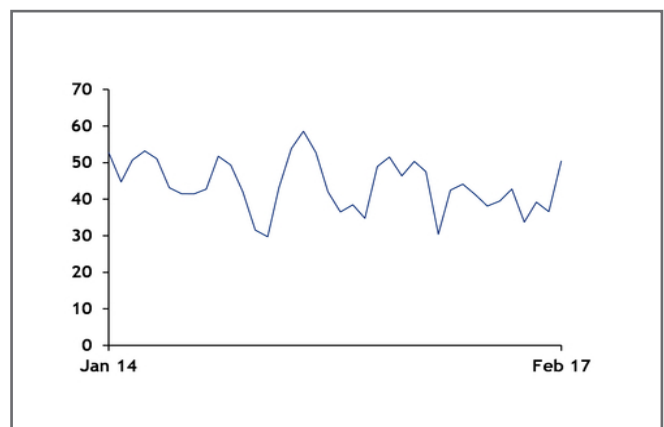
Eni had make-up gas to take on its long-term contracts with Gazprom and the temporary Algerian reductions since April 2013 have allowed the firm to make up ground on its commitments.

Italy supply stack

mn m<sup>3</sup>/d

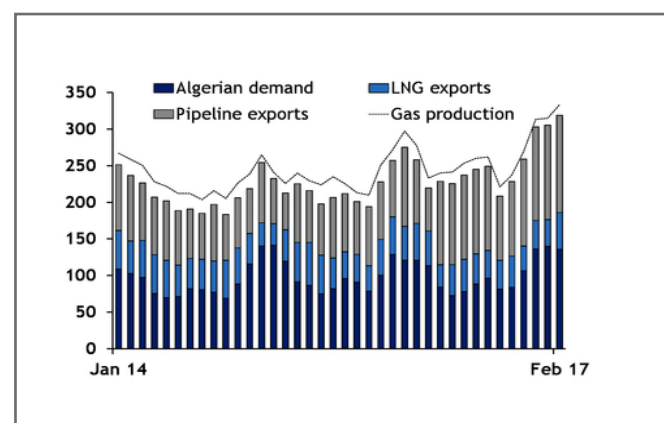


Algerian LNG exports remain below previous peak mn m<sup>3</sup>/d of gas



Algerian pipeline exports rise with production

mn m<sup>3</sup>/d of gas



### Algeria increases pipeline exports

Algeria has increased pipeline deliveries since 2014, but supply to its liquefaction facilities has been below its previous highs. Global LNG prices have tightened their premium to European hubs with more global supply coming on stream, mostly in Australia and the US.

Algeria has also restored its “historic production capacity”, while the In Amenas processing plant has returned to full capacity.

But the biggest increase in gas output coincided with the drop in oil production at the end of 2016.

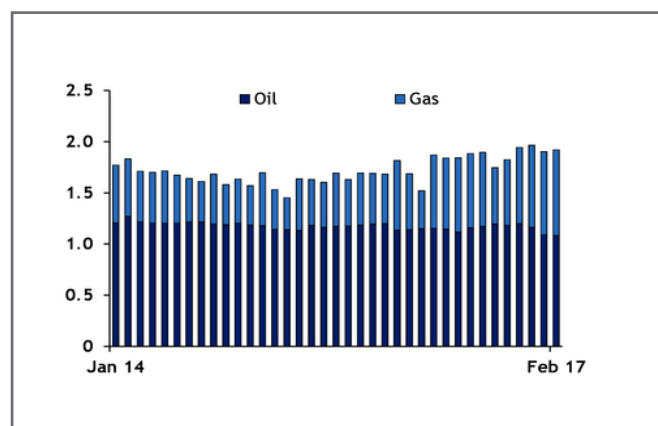
Algeria has used its higher production to increase pipeline exports to Italy, where demand has recovered from its 2014 lows. An increase in economic growth — albeit with economic output still well below its potential — combined with dry weather limiting hydroelectric generation has boosted demand.

Continued higher consumption could allow Italy to buy more Algerian gas while Eni continues to make up ground on its Russian obligations with some prepaid gas still to take.

Hydroelectric stocks have dropped to the lowest in recent years, which could boost consumption in 2017, but a return to wetter weather would stall demand growth.

Algerian gas output steps up as oil falls

mn boe/d



### Higher LNG exports

Italy could struggle to cope with Algerian imports rising further if gas consumption stops rising.

Algeria could deliver more gas to its liquefaction facilities, which operated below capacity last year. Gas flows to LNG terminals of 41.3mn m<sup>3</sup>/d in 2016 were below the previous monthly high, which was 58.6mn m<sup>3</sup>/d in May 2015.

An increase in loadings at Arzew and Skikda could result in more LNG deliveries, particularly to France if there are few opportunities to ship to premium destinations outside Europe.

### Long-term contract renegotiations

Algeria pushing to increase gas exports may also change Sonatrach’s leverage during contract renegotiations.

Firmer oil prices may make Algeria more reluctant to agree on a permanent move to hub-indexation in its long-term contracts. But Eni secured a PSV-related formula for this gas year, although hub prices have mostly been above the cost of crude-linked gas.

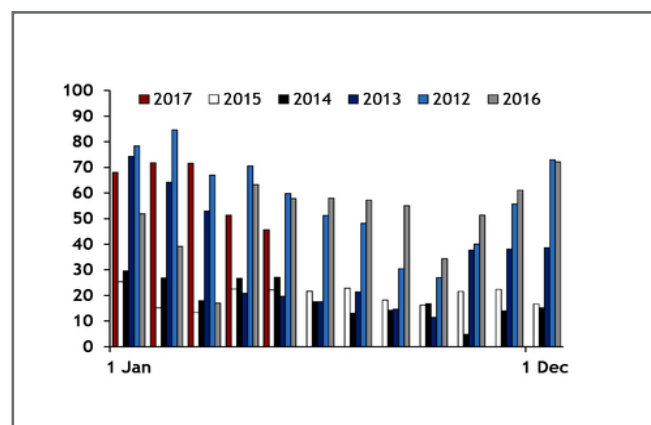
Hub-indexation is a key aspect for the renewal of Algeria’s long-term contracts, which are to expire in 2019, Eni chief executive Claudio Descalzi said earlier this year.

Enel had also expressed its preference for a move to hub-indexation, which the firm says it has agreed in principle with Sonatrach.

Sonatrach has said it is “open to any proposal mutually beneficial”.

Transmed flows

mn m<sup>3</sup>/d





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