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Analysis

ARGUS WHITE PAPER

Ukraine and Germany: Winter 2017-18

Ukraine could help the European gas system balance this winter with above-average inventories giving the country the flexibility to turn down imports at times.

Imports could respond to changes in European hub prices by reducing purchases from the EU if NCG prompt markets spike. And a drop in European exports to Ukraine might help offset lower German stocks heading into this winter.

This special feature from *Argus European Natural Gas* takes a forward view at Ukrainian and German gas market dynamics during winter 2017-18.

Highlighted contents:

- Ukraine winter outlook: Stocks provide flexibility
- Ukraine's European integration
- German winter outlook: Demand to drop
- German gas supply to stay strong

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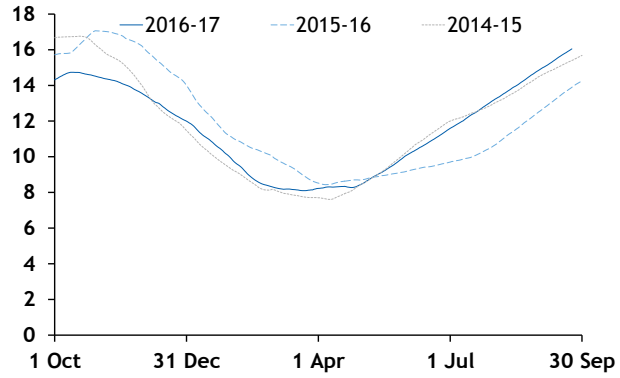
Ukraine winter outlook: Stocks provide flexibility

Ukraine could help the European gas system balance this winter with above-average inventories giving the country the flexibility to turn down imports at times.

Gas stocks were just above 16.1bn m³ on 24 September compared with less than 14bn m³ a year earlier. Inventories were already the highest since late 2014 and there was still time to add more to storage before the heating season begins in mid-October.

Ukrainian stocks higher than in recent years *bn m³*



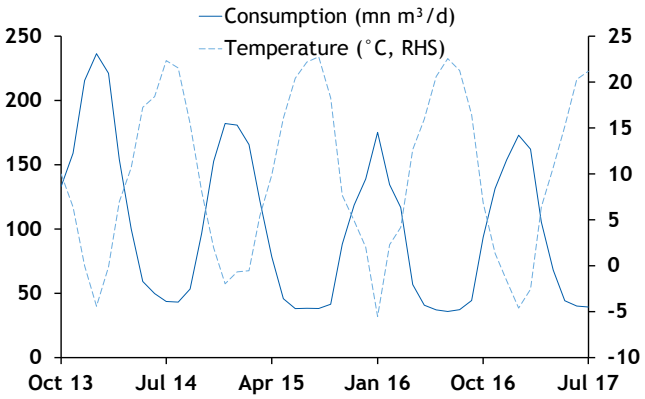
An increase in production this year combined with a continued decrease in weather-adjusted consumption could further dent Ukraine's import demand, assuming temperatures close to the seasonal norm.

Demand decline slows

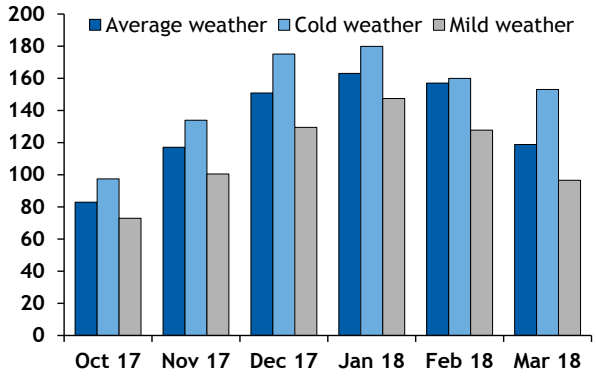
Ukrainian consumption has decreased in recent years, but the decline has slowed this year even when adjusting for weather.

Aggregate gas demand was up in January-July, although that was largely driven by cooler weather in the second quarter.

Consumption has declined in the past few years



Winter demand scenarios *mn m³/d*



Consumption will be 132mn m³/d in the 2017-18 winter, assuming temperatures in line with the seasonal norm and the same correlation with weather as a year earlier. This would be down from 137mn m³/d a year earlier, when the weather in Kiev was slightly colder than average.

Demand climbs to almost 150mn m³/d in the event of a cold winter with temperatures on par with the lowest for each month in the past five years. But it would drop to 112mn m³/d using the highest temperatures for each month in the past five winters.

Supply flexibility

Ukraine could have more supply options this winter with more in storage and the possibility of Russian deliveries restarting.

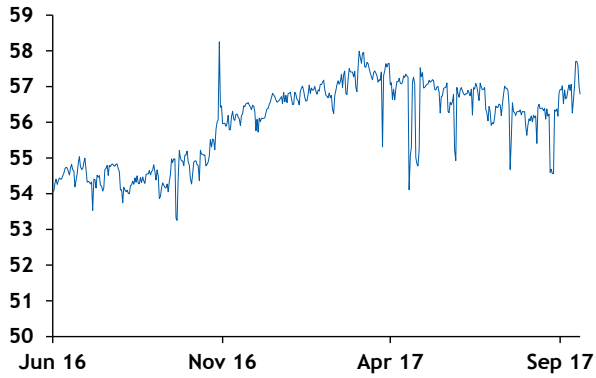
Ukrainian production has edged higher this year, mostly driven by state-owned Naftogaz subsidiary Ukrgazvydobuvannya.

Production has held close to 57mn m³/d this month, which would be up by less than 1mn m³/d from October 2016-March 2017 if maintained this winter.

Output of 57mn m³/d and consumption of 132mn m³/d — assuming temperatures in line with the seasonal norm — would require 74.6mn m³/d from storage or imports.

Stocks could be just below 16.5bn m³ by 1 October — including 4.7bn m³ of cushion gas assuming injections over the rest of this month broadly in line with recent days. This could provide 46.7mn m³/d of supply this winter, based on inventories of 8bn m³ on 1 April — in line with Naftogaz's target for the end of the 2016-17 winter.

Ukrainian production edges higher *mn m³/d*



Naftogaz sought to preserve some stocks for the end of last winter in case of a late cold spell. Entirely depleting inventories down to the cushion gas can also limit the scope to meet consumption as withdrawal capacity falls with lower stocks.

But higher withdrawals — taking stocks close to the 4.7bn m³ of cushion gas — would be possible if needed.

Import demand

Withdrawals of 46.7mn m³/d would leave just under 28mn m³/d that needs to be met with imports, based on the average-weather scenario. Imports could be just 8.7mn m³/d with the mild weather scenario and 46.2mn m³/d in the event of cold weather.

Ukraine has more than enough import capacity from Europe for the 46.2mn m³/d required in a cold winter. Combined flows to Ukraine at the Slovak, Hungarian and Polish borders were 49.3mn m³/d in the 2016-17 winter.

Deliveries at Budince on the Slovak border, where the majority of imports arrive, were close to capacity of just over 40mn m³/d throughout last winter.

Lower inventories at the start of last winter than in previous years gave Ukraine little scope to reduce imports from Europe to ensure meeting demand, with Russian receipts remaining at zero.

Aggregate deliveries rarely moved much from their range of almost 50mn m³/d even during periods when European hub prices spiked, pushing up the cost of imports.

The higher stocks this year could give Ukraine more flexibility to turn down imports during periods when European hub prices are higher.

Reduced receipts in the first quarter

There could be some incentive to maintain quick imports in the fourth quarter and reduce flows if possible in the second half of the winter. NCG fourth-quarter 2017 prices hold a discount to the first-quarter 2018 contract.

Keeping inventories as high as possible heading into January would also allow Ukraine to ensure it had enough supply to meet consumption in the event of a late cold snap without Russian gas. This could encourage delaying much of the stockdraw to the first quarter by maintaining high imports in October-December, even if NCG prompt prices climb to a premium to forward contracts.

Ukraine's demand for gas from Europe could also fall in the second half of the winter if Russian deliveries restart.

Naftogaz and Gazprom ended talks over the details of their 2009-19 supply contract without agreement following an arbitration ruling.

The court decided that the contract should include a revised pricing formula and take-or-pay terms, but that the two firms should discuss the details. The court will decide on the exact adjustments to the supply contract by the end of November if Naftogaz and Gazprom do not reach a deal.

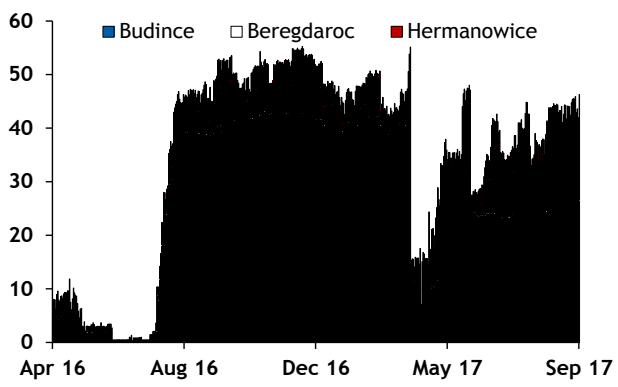
Russian roulette

But Russian deliveries to Ukraine may not start immediately after the court's ruling in November, some market participants have said.

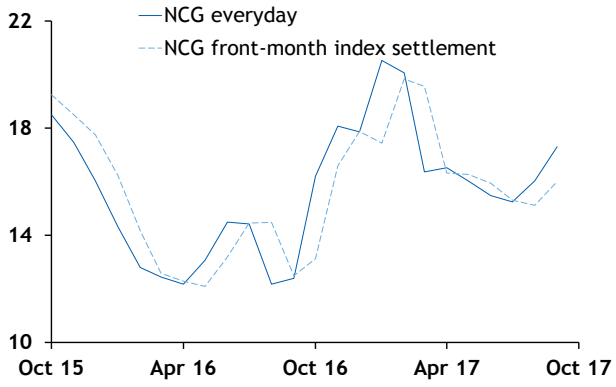
The firms were far apart in their opening negotiating positions and there is a possibility that one of the parties may not accept the final ruling, some said.

The court's decision can only be appealed on procedural grounds, but further disagreements may delay the restart of flows.

Imports from the EU near capacity last winter *mn m³/d*



NCG prices spiked last winter *€/MWh*



Ukraine's European integration

Ukraine's flexibility to reduce imports from the EU — especially if Russian receipts restart — could test its integration with European markets.

Ukrainian importers have typically bought gas for the month ahead — or secured it even earlier — rather than adjusting flows at short notice.

But the above-average stocks could provide the opportunity to turn down flows in response to price spikes, which would effectively provide more flexibility for European hubs.

Daily changes in Ukrainian imports have been most common at the Hungarian border, where flows have often ramped up towards the end of each month.

German winter 2017-18 outlook: Demand to drop

The power sector provides much of Germany's demand-side flexibility this winter with NCG and Gaspool prices remaining close to the support level at which gas is competitive with coal.

Gas-fired generation steps up to offset weak heating demand in the event of mild weather, while coal burn rises if cold weather boosts gas consumption.

Heating demand

German weather-adjusted heating demand rose last winter, driven by lower energy prices.

Demand from homes and small businesses is 1.75 TWh/d in October 2017-March 2018 with temperatures in Essen in line with the seasonal norm, based on the correlation last winter. It would be over 140 GWh/d lower using the same correlation from the 2015-16 winter.

Each 1°C drop in temperature adds just over 115 GWh/d to deliveries to homes and small business. Demand from these consumers drops to 1.38 TWh/d in a mild scenario with temperatures in line with the lowest for each month in the past four years. And it increases to 1.89 TWh/d when using the coldest month over the same period.

Industrial consumption to drop

Industrial consumption, which includes the power sector, drops this winter if temperatures are in line with the seasonal norm.

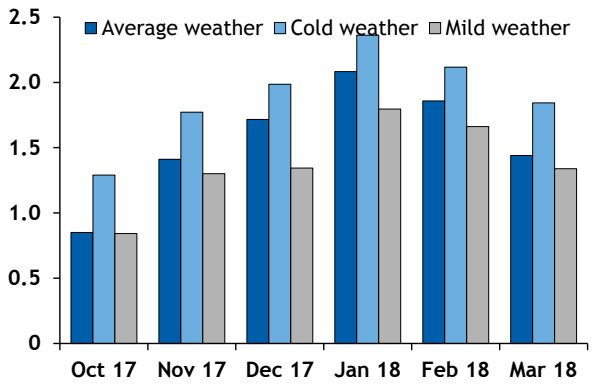
Industrial demand had stayed in a similar range in recent years before jumping last winter. This was only partly driven by colder weather in October-January, but also an increase in power sector gas burn.

Gas-fired generation of 183 GWh/d in October 2016-March 2017 was up from 128 GWh/d a year earlier and was the highest since at least the 2010-11 winter.

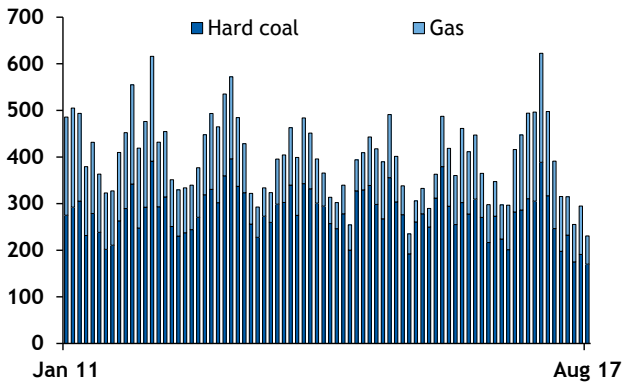
But the decrease in nuclear generation that drove last winter's increase in gas burn is not expected to be repeated.

A number of reactors halted in the first quarter of 2017

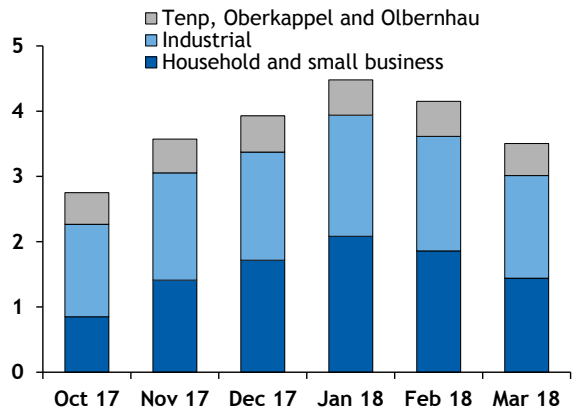
German heating demand scenarios *TWh/d*



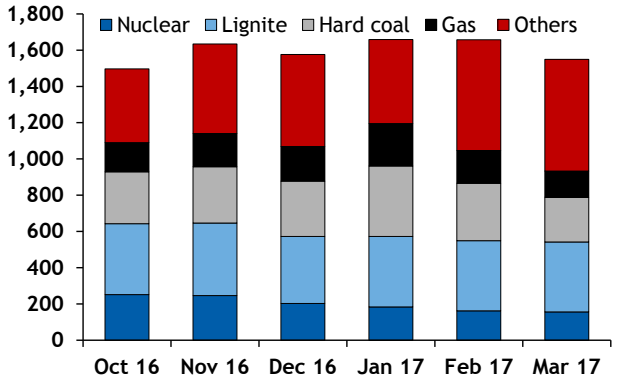
German fossil-fuel generation in decline *TWh/d*



Winter 2017-18 base case demand scenario *TWh/d*



German nuclear generation dropped in 1Q17 *GWh/d*



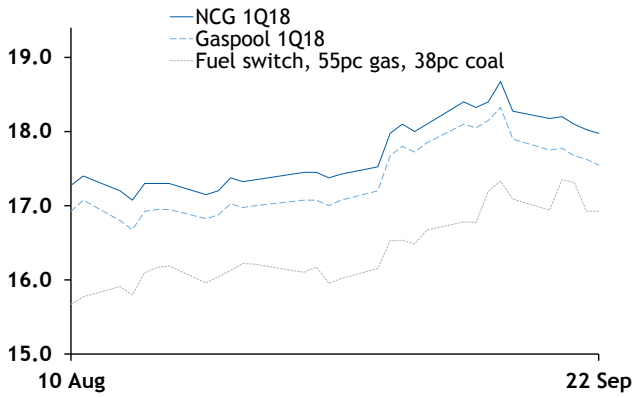
as operators chose to delay refuelling to early this year to avoid the nuclear fuel rod tax, which expired at the end of 2016.

Nuclear generation slipped to 167 GWh/d in January-March 2017 from almost 250 GWh/d a year earlier.

But output from the Gundremmingen B plant is scheduled to start ramping down over the coming months ahead of its closure at the end of the year. This could limit the increase in nuclear generation and the drop in power sector gas burn this winter.

And several coal-fired units with a combined capacity of more than 4GW have shut down or moved outside the wholesale market and into the grid reserve this spring and summer, which means that Germany's available coal-fired plant capacity is at a long-term low this winter.

NCG and Gaspool 1Q18 vs. fuel-switching price *€/MWh*



Power sector provides demand flexibility

Gas-fired generation could also step up if it displaces coal from the power mix. NCG and Gaspool front-winter prices are close to levels that would bring average gas-fired plants into competition with older coal-fired units.

RWE will even restart its mothballed 355MW gas-fired Gersteinwerk G unit, with just 39.4pc efficiency, in November-March because it expects to have some running hours this winter.

It would only require a small movement in gas prices relative to coal markets to encourage switching between fuels. But the cost and time of ramping up and down plants remain factors in the pace and scale of any shift between fuels, at least at short notice.

And power sector gas demand could even decline if gas only displaces coal for some of the winter. NCG and Gaspool prompt prices were at levels that pushed some coal out of the generation mix for much of last winter, mostly in the fourth quarter of 2016.

And combined gas and coal-fired generation have been in decline because of the growth in renewable output in recent years.

Gross exports

German exports — at Wallbach, Oberkappel and Olbernhau — are in line with the four-year average in the winter 2017-18 outlook.

But there could be a shift in supply with less going to Italy this winter and more gas being exported to Austria and the Czech Republic.

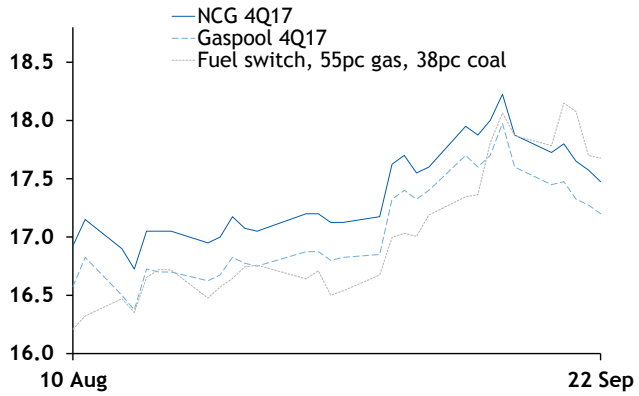
Austrian and Czech stocks are below average, which could boost demand for imports from Germany. But they could also offset lower inventories with higher Russian receipts, particularly with Austrian near-curve prices testing crude-linked import costs.

Oberkappel flows to Austria were much lower in the 2016-17 winter than in previous years, and even reversed towards Germany at points. Deliveries to Austria could be higher this winter given the lower stocks, although it will also depend on the country's heating demand.

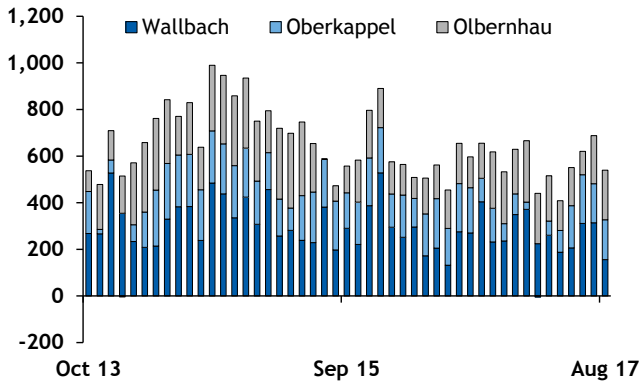
But exports to Italy via Transitgas could be lower than a year earlier. Tenp maintenance is scheduled to limit delivery capacity into Transitgas throughout the winter.

That said, any decrease in Tenp flows to Transitgas may not result in a substantial change in German supply. Much of the gas sent to Italy via Tenp and Transitgas is deliv-

NCG and Gaspool 4Q17 vs. fuel-switching price *€/MWh*



Selected German exports by point *GWh/d*



ered from the Netherlands and any drop in gross flows at Wallbach could be at least partly offset by a decrease at Bocholtz.

But any reduction in Italy's Transitgas import demand would still leave more supply in northwest Europe as a whole. Italy's Russian and Algerian receipts are expected to be strong this winter, which could reduce demand for gas from northwest Europe.

Algeria has targeted raising production and exports from late 2017 or early 2018, which would require higher deliveries to Italy.

And Italian power sector gas burn could also be lower this winter than a year earlier, providing French nuclear availability is as high as scheduled. This could also reduce demand for gas from northwest Europe.

Eynatten flows to stay strong

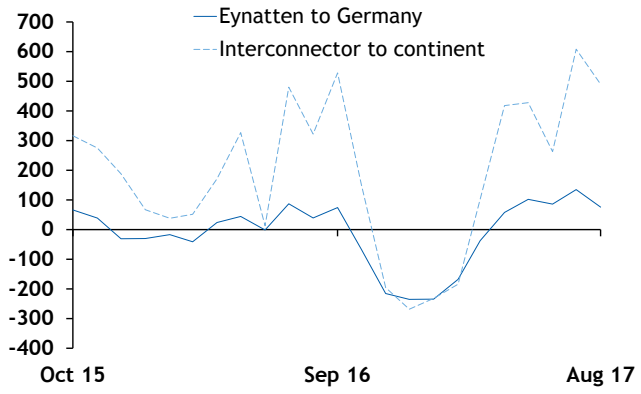
German exports at Eynatten could remain quick this winter compared with most previous years because of Rough remaining off and low LNG receipts. Deliveries would be lower in the 2017-18 winter than a year earlier using the UK winter 2017-18 outlook scenario with average weather and LNG sendout because of a drop in Interconnector flows.

But UK LNG receipts appear likely to be slow in October — similar to last winter — with few Qatari Q-Max and Q-Flex tankers heading towards Europe.

And northeast Asian LNG markets have expanded their premium to European hubs over the past week, which could draw supply away from Europe. This has increased the possibility of South Hook sendout being towards the lower end of the range in the UK winter outlook scenarios.

Low South Hook sendout would require brisk German exports at Eynatten to feed deliveries on to the Interconnector.

Interconnector drives Eynatten flows *GWh/d*

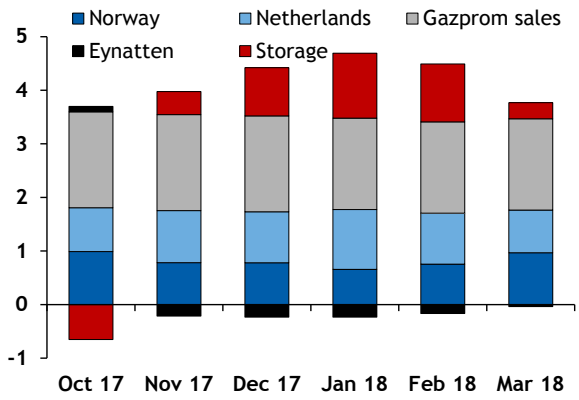


German gas supply to stay strong

Germany has less gas in storage at the start of this winter, but brisk imports and lower gross exports could leave more supply for the power sector to burn this winter in a scenario with average heating demand.

Gas was able to compete with coal at times last winter

German base case supply *TWh/d*



because of record high stocks along with brisk imports from Norway and Russia. Norwegian and Russian receipts are expected to be strong again this winter. And stocks are above average, although still well below last year's record highs heading into the heating season.

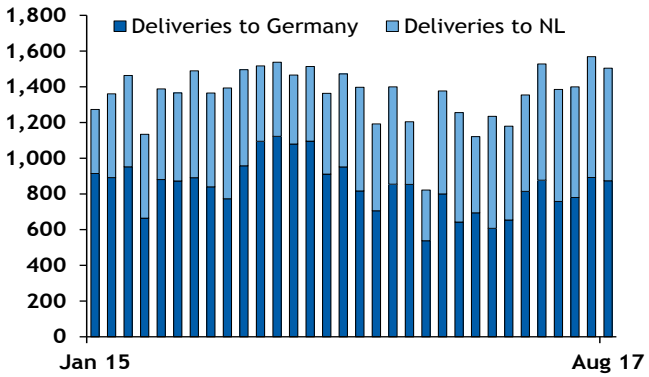
Norwegian supply

Aggregate Norwegian production has climbed in recent years, driven by new compressors at Troll and higher output from the country's smaller, non-flexible fields. This has boosted deliveries to the Netherlands and Germany even during periods when Norway is maximising flows to premium markets in northwest Europe.

TTF and NCG contracts delivering this winter — aside from the October market — have held a discount to most neighbouring hubs. This offers an incentive to again minimise flows to Emden and Dornum for much of the winter.

Imports from Norway in the winter 2017-18 outlook are in line with deliveries a year earlier. This results in brisk receipts in October and March, but lower imports in November-February when flows are diverted to the UK.

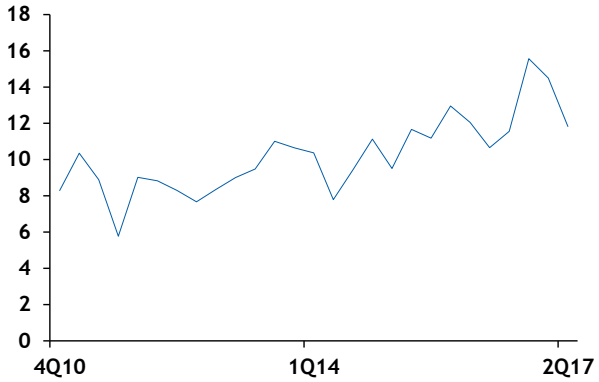
Dutch and German imports from Norway *GWh/d*



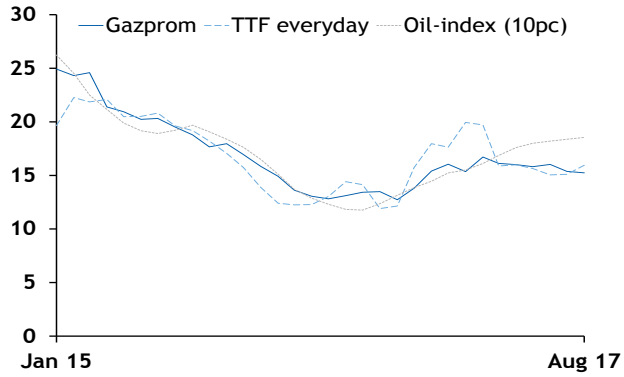
Russian receipts

Russian state-controlled Gazprom's sales to Germany reached a record high in the fourth quarter of 2016 and were only slightly lower in January-March.

Gazprom's sales to Germany *bn m³*



TTF everyday above Gazprom price last winter *€/MWh*



NCG front-winter prices have climbed towards oil-indexed levels, encouraging strong nominations by firms with crude-linked contracts. But Gazprom has increasingly moved towards hub-linked pricing in recent years, at least in northwest Europe.

This could result in strong German imports from Russia even during periods when NCG and Gaspool prompt markets are below oil-indexed prices.

Gazprom has targeted record sales of 190bn m³ to Europe, excluding the Baltic states, and Turkey in 2017. This would be up from the previous high of 178.3bn m³ in 2016.

Deliveries in January-August were on track to reach 190bn m³, but sales would still need to remain strong in the fourth quarter to meet the firm's target. This could result in similar sales to German firms as in October-December 2016, although the country's physical Russian imports would also depend on how much gas is backhauled in central Europe for resale to other countries such as Ukraine.

But European exports to Ukraine could be lower because of the country's higher stocks this year, declining consumption and rising production.

Dutch imports to depend on heating

German imports from the Netherlands will largely depend on heating demand. The majority of gross Dutch deliveries are low-calorie supply, and with Germany's limited quality conversion capacity there is little flexibility to adjust receipts because of changes in the weather.

But German production — mostly low-calorie — is in decline, while low-calorie stocks are below average heading into the winter.

German weather-adjusted low-calorie imports from the Netherlands may need to be slightly higher than in previous years to offset the drop in production and lower stocks.

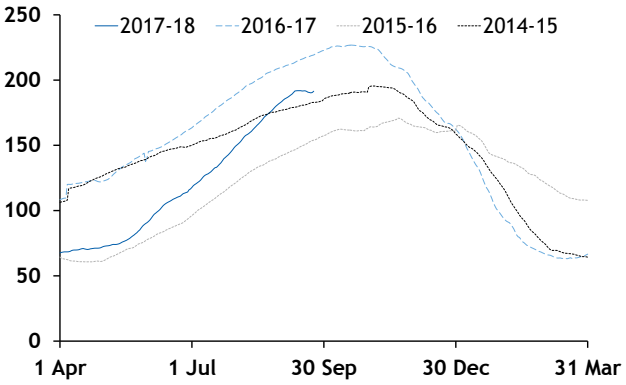
Storage to provide Germany's balance

Storage will continue to provide Germany's supply flexibility, although there may also be some scope to adjust imports from Gazprom depending on the spread between hub prices and the cost of Russian supply.

German stocks are on track to start the winter below last year's record high. Inventories were just over 191TWh on 23 September, 27.8TWh lower than a year earlier but still 6.1TWh above the three-year average for the date.

But there is still enough in storage to meet last winter's strong withdrawals. There was still almost 67TWh left in sites on 1 April 2017, despite a higher stockdraw than in any previous winter.

German stocks below last year's high *TWh*



Last winter's quick withdrawals were partly driven by colder weather than in most recent years. But the stockdraw was also higher than in previous winters, even during periods when temperatures were similar.

Stocks could end winter above average

German inventories are higher than a year earlier at the end of the winter because of lower withdrawals, given the supply-demand balance in the winter outlook.

The stockdraw is less than 100TWh over the winter given temperatures in line with the seasonal norm, but lower industrial gas consumption. This is down from 138TWh a year earlier, excluding withdrawals from German facilities connected to the Dutch system. The aggregate German stockdraw — including to the Netherlands — was

157TWh last winter.

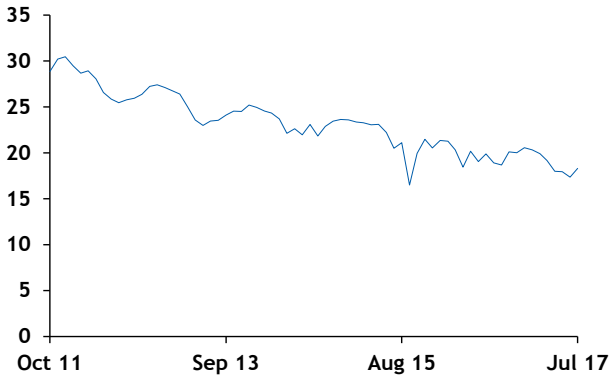
Withdrawals of just over 100TWh — once adding in the stockdraw to the Netherlands — would be more in line with previous winters. Less than 50TWh was pulled from storage — including to the Netherlands — during the mild 2015-16 winter. But more than 120TWh was withdrawn in the 2014-15 heating season as Gazprom delivered less than nominated for much of the period.

But capacity holders could seek to avoid low withdrawals this winter, even if the weather is mild. German withdrawals have typically shown a close correlation with temperature, although there is some flexibility to lift the weather-adjusted stockdraw.

NCG and Gaspool prompt prices could slip to levels that encourage gas to displace coal from the generation mix to boost demand and try to prevent weak withdrawals. Prompt prices could still retain a wide premium to the summer 2018 contract even if slipping to fuel-switching levels because of the coal-curve's backwardation.

Hard coal-fired generation was just over 310 GWh/d last winter, broadly in line with previous years. But this could come under pressure in the event of a mild winter and competition from gas.

German production in decline *mn m³/d*



German withdrawals last winter *GWh/d*