



Are German gas storages regaining importance as flex- providers in Europe?

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Are German gas storages regaining importance as flex-providers in Europe?

(1/2)

- The German transmission and storage infrastructure was expanded significantly. While the relatively insignificant indigenous German production has further declined, flows from and to Germany have drastically increased.
- On the other hand, the marketing of storage capacities for operators has been increasingly difficult due to the narrow summer-winter spread which is a benchmark for the marketing of storage services.
- Despite high filling levels in October 2016 we saw the lowest stock levels of the European and German gas storages in February 2017 since European-wide recording was conducted by Gas Infrastructure Europe.
- In Germany the market operators NCG and Gaspool had to make use of established specific balancing tools to enhance the security of supply.
- We identified multiple drivers in this winter, which in sum led to these low stock levels.
 - The winter of 2016/17 until February 2017 was colder than the winter of 2011/12, where the last critical situation was observed.
 - Shut-downs of nuclear power plants in France triggered higher gas-fired power generation in Europe.
 - The partial outage of the high-capacity storage Rough lead to shortages in the UK.
 - Furthermore, the production cap in the Dutch Groningen production field induced fundamental changes for gas flows and storages.

Are German gas storages regaining importance as flex-providers in Europe?

(2/2)

- In this presentation we will describe the drivers for this development in the winter of 2016/17*.
- We will analyze whether this situation is unique for the winter 2016/17* or if it reflects fundamental developments in the German and European gas market.
- Whenever data available, for reference, we will compare this winter with data from the winter 2011/12 (where the last critical situation was observed).
- Our analysis will show that German gas storages are regaining importance as a provider of flexibility in Europe.
- However, further developments have to be considered and analyzed before the conclusion can be drawn that storages have seen the end of the dry spell.

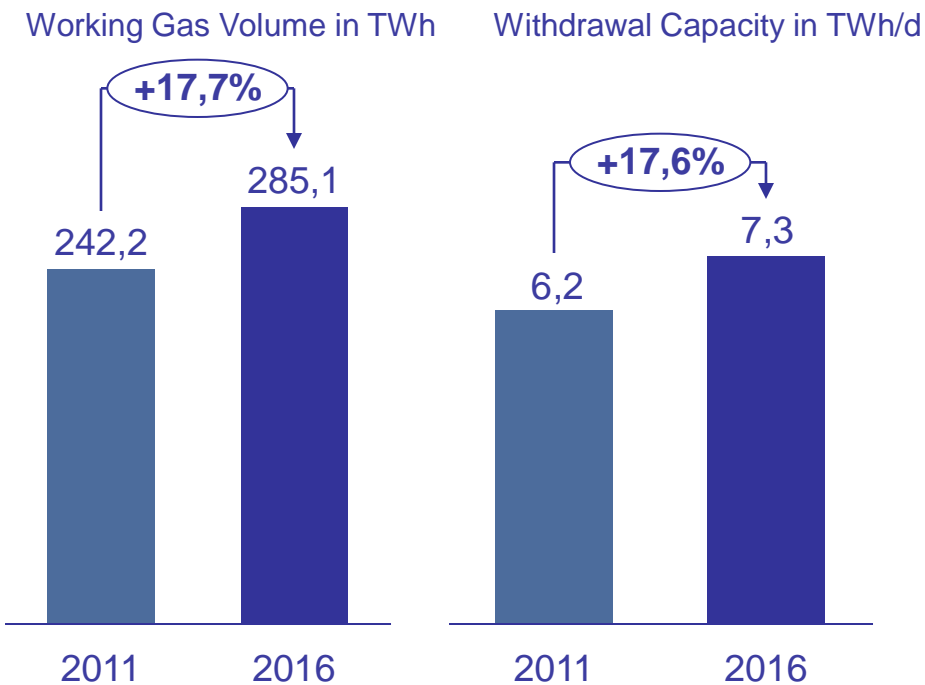
**Data for the time between October 1st 2016 until the end of the cold snap on February 13th 2017*

Agenda

- 1 Situation of gas storages in February 2017
- 2 Specific circumstances of the winter 2016/17
- 3 Fundamental changes impacting gas storages
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Since 2011 the transmission and storage infrastructure has expanded significantly in Germany

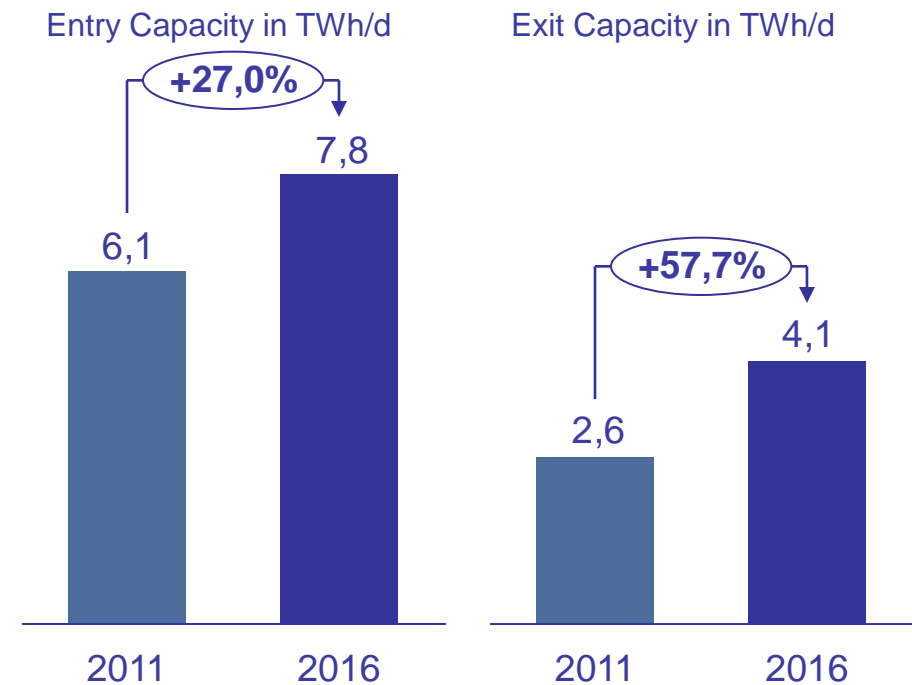
German Gas Storages*



Source: LBEG, GIE, ENTSO-G

*Including 50% of Austrian gas storages Haidach and 7 Fields. Half of the capacity of these two storages is dedicated to the German gas market.

German Cross-Border Capacities*

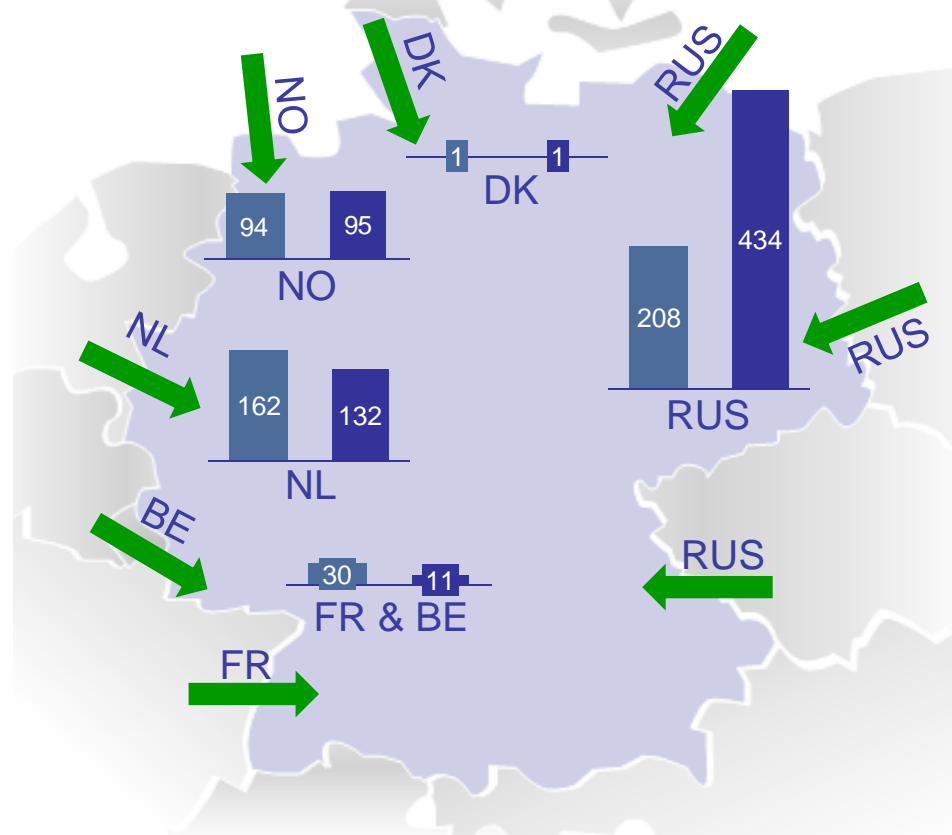


*technical max. capacities

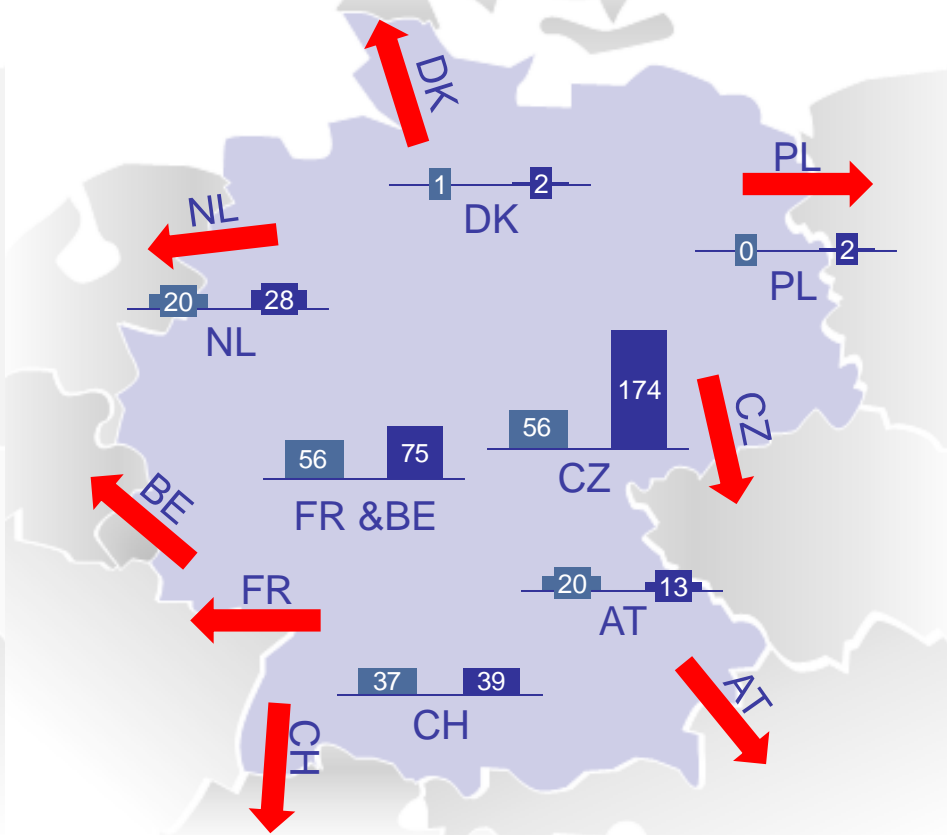
Gas flows during winter months* from and to Germany have significantly increased in recent years. Today more gas remains in the German system.

1

Entries in TWh



Exits in TWh



Source: ENTSO-G, TEAM CONSULT Analysis

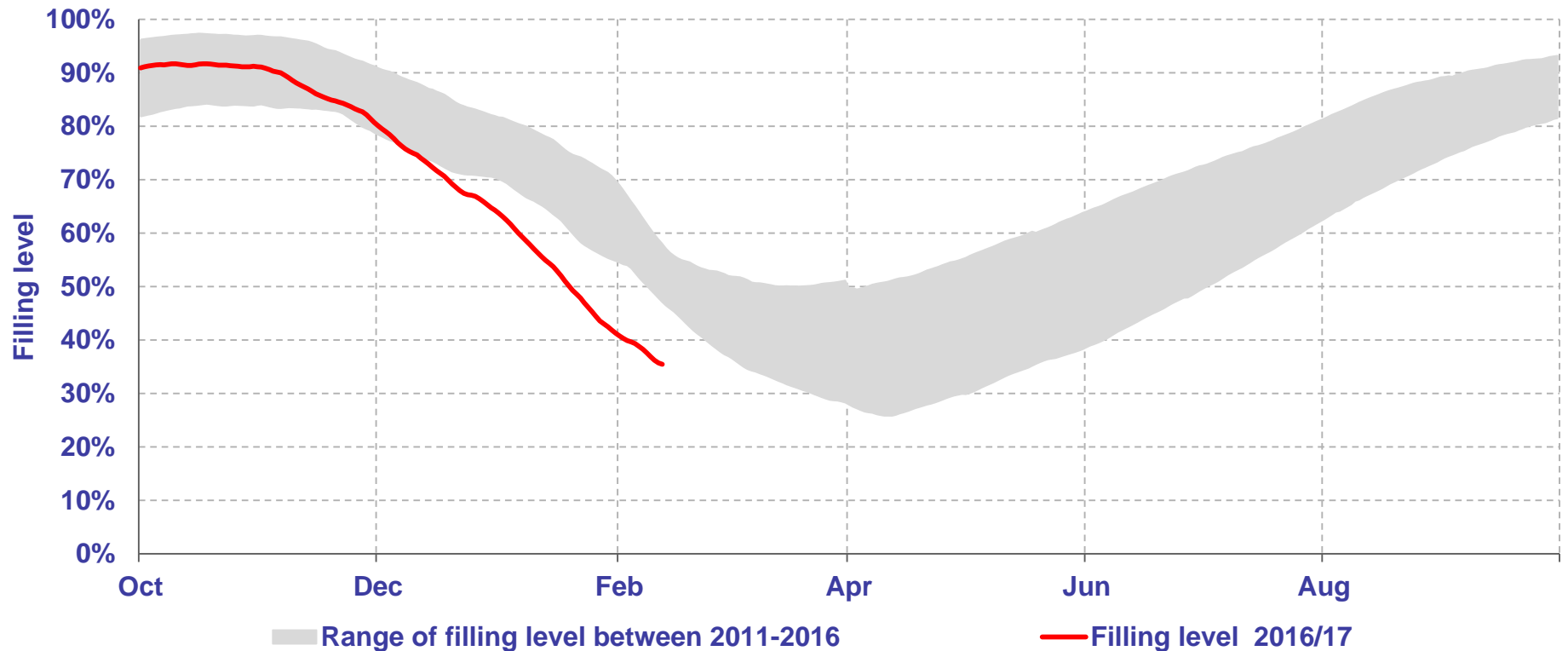
* In the time between October 1st and February 13th

■ 2011/12 ■ 2016/17

February 2017 saw the relatively lowest gas storage filling levels since European-wide recording

1

Gas Storage Filling Levels in EU 28



Source: GIE, TEAM CONSULT Analysis

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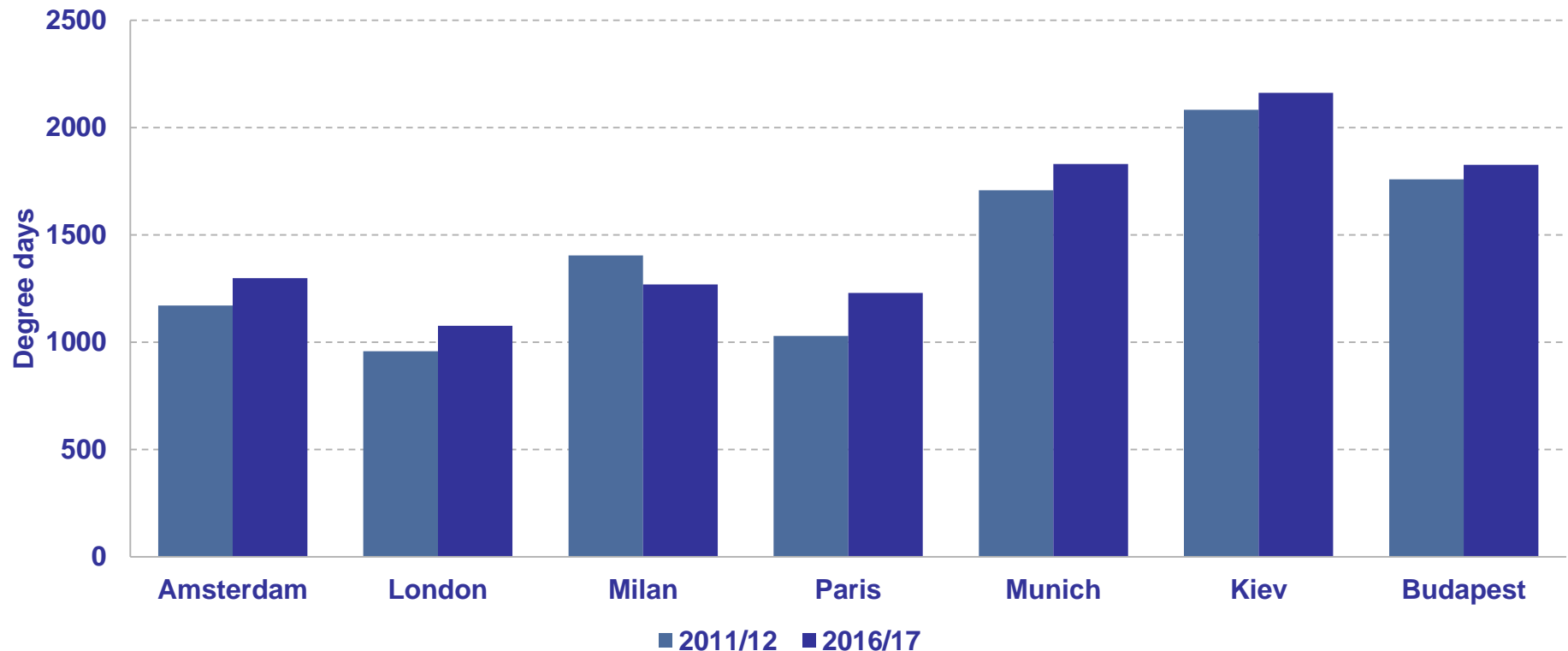
2 Specific circumstances of the winter 2016/17

- a. Low temperatures in key European consumer markets
- b. Increased gas demand in the power sector
- c. Gas shortages in the UK market
- d. Stimulating price differentials on the German hubs

2a

The winter of 2016/17 was in many parts of Europe colder than the winter of 2011/12, which saw the last critical storage situation

Sum of Degree Days between October 1st and February 13th*



Source : DWD, ECAD, Weather Underground , TEAM CONSULT Analysis

* higher number of degree days implies colder temperatures on average

Agenda

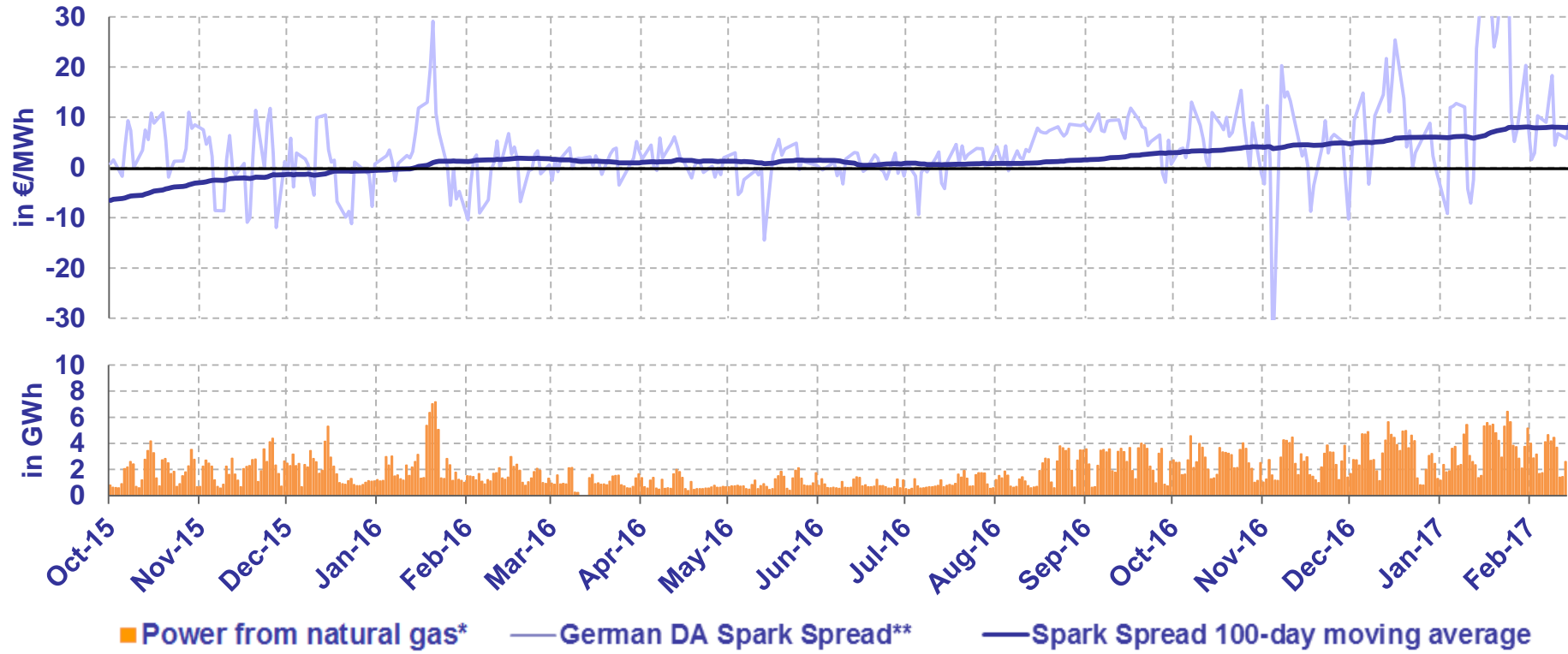
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2b

Due to increased demand from France, attractive spark spreads and low levels of renew. generation the utilization of German gas fired power plants improved

Development of the German DA Spark Spread vs. Generation from Natural Gas

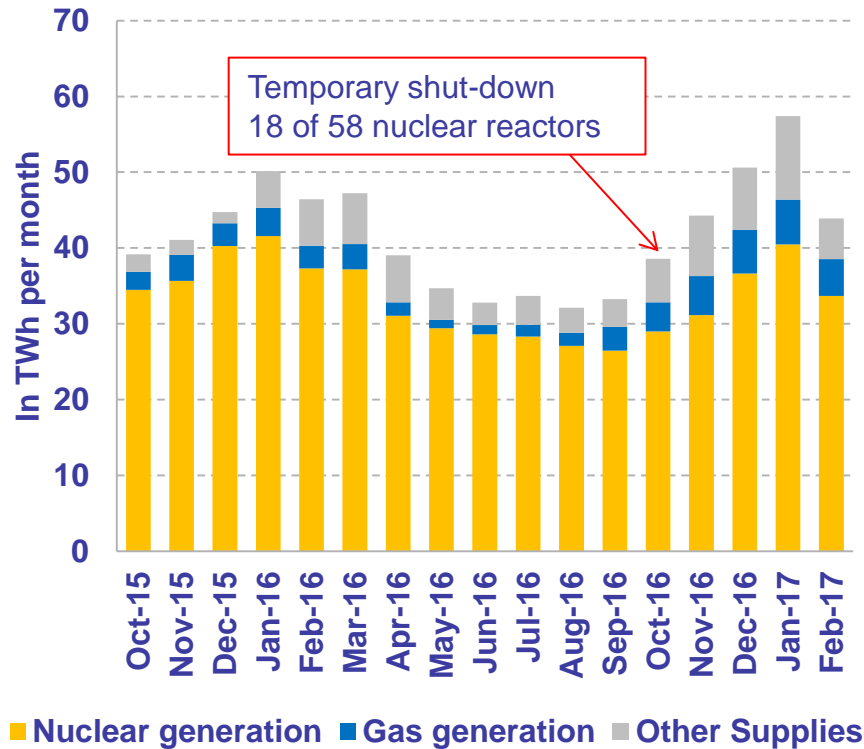


Source: ICIS Heren, ENTSO-E, TEAM CONSULT Analysis

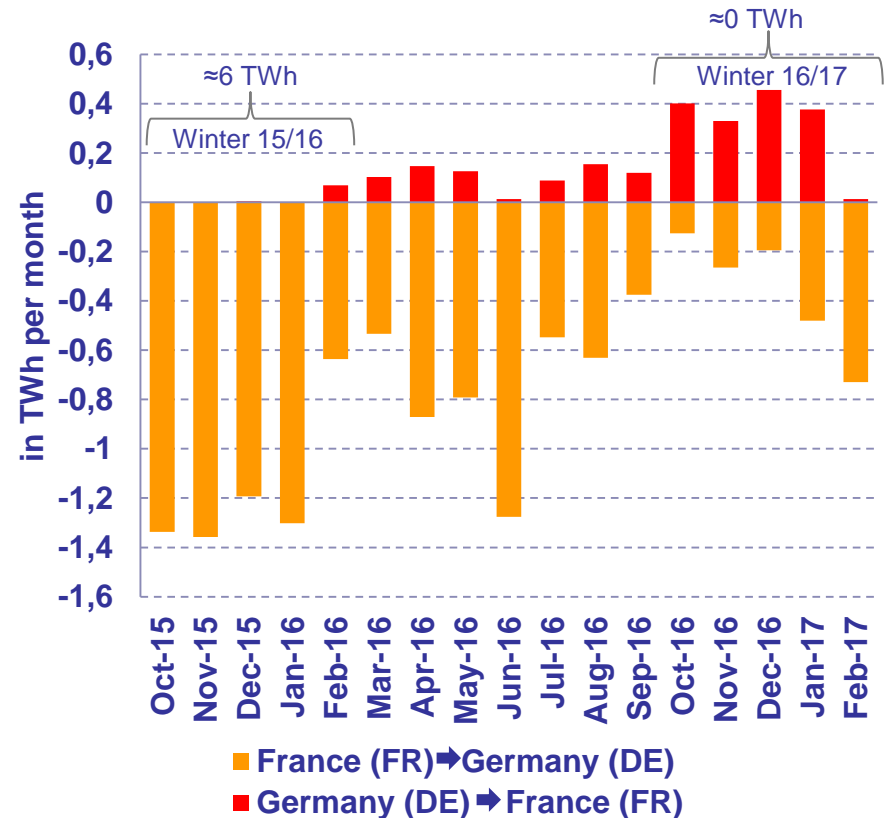
*only power plants >100 MW **peaks above 30 €/MWh and -30 €/MWh are not shown for better readability

Shut-downs of nuclear power plants in France led to a reversal of the power import-export balances and a higher utilization of gas-fired power in France

Nuclear and Gas Generation in France



Power Flows between FR and DE

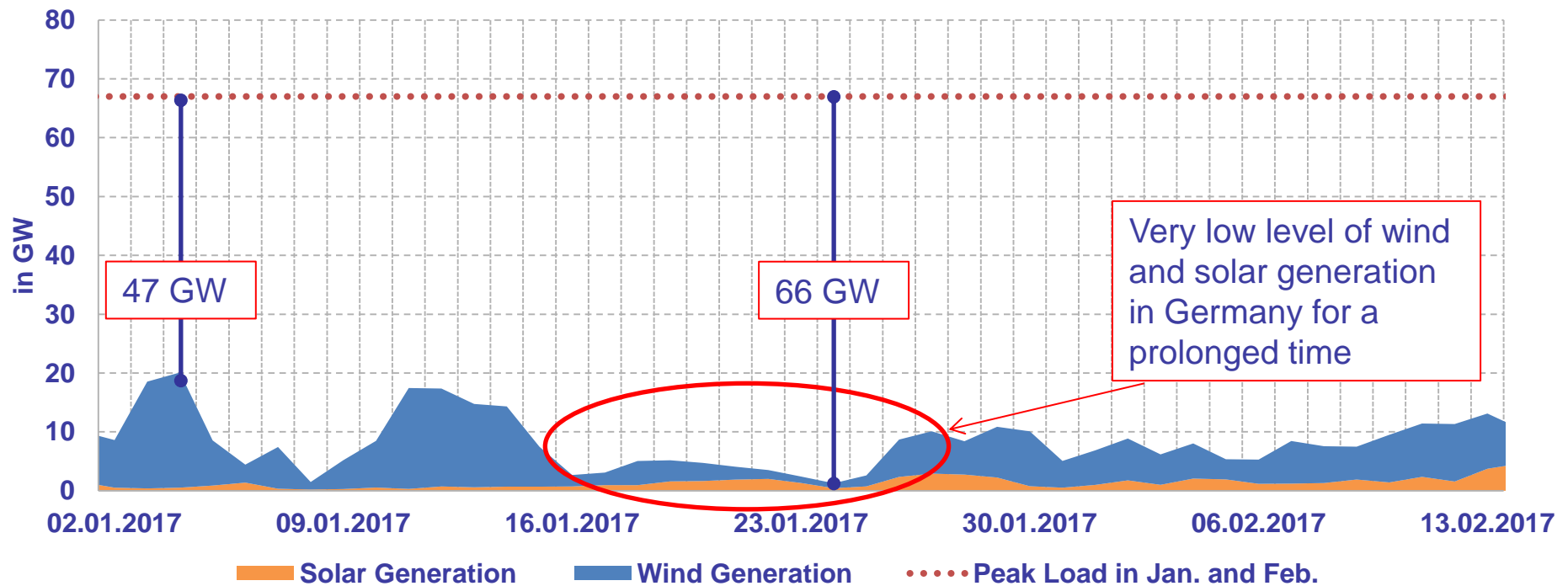


Source: ENTSO-E, TEAM CONSULT Analysis

2b

Low levels of wind and solar generation in January had to be compensated mainly by conventional generation sources incl. gas-fired power plants

Generation Wind and Solar and Peak Load in Germany in Jan. and Feb. 2017



Source: EEX, Fraunhofer ISI, TEAM CONSULT Analysis

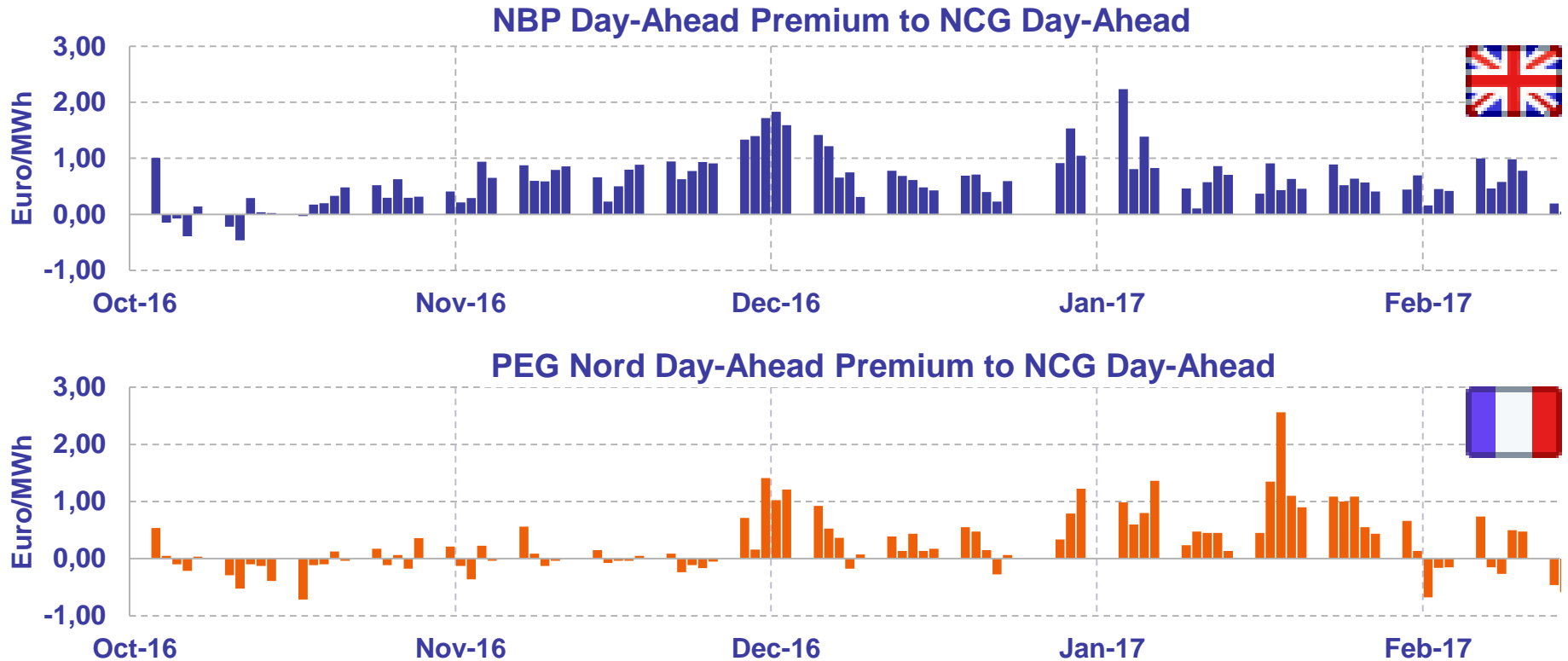
Agenda

2 Specific circumstances of the winter 2016/17

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2c

Prices for the day-ahead product on NBP and PEG Nord were consistently above NCG indicating higher shortages in the UK and French gas markets

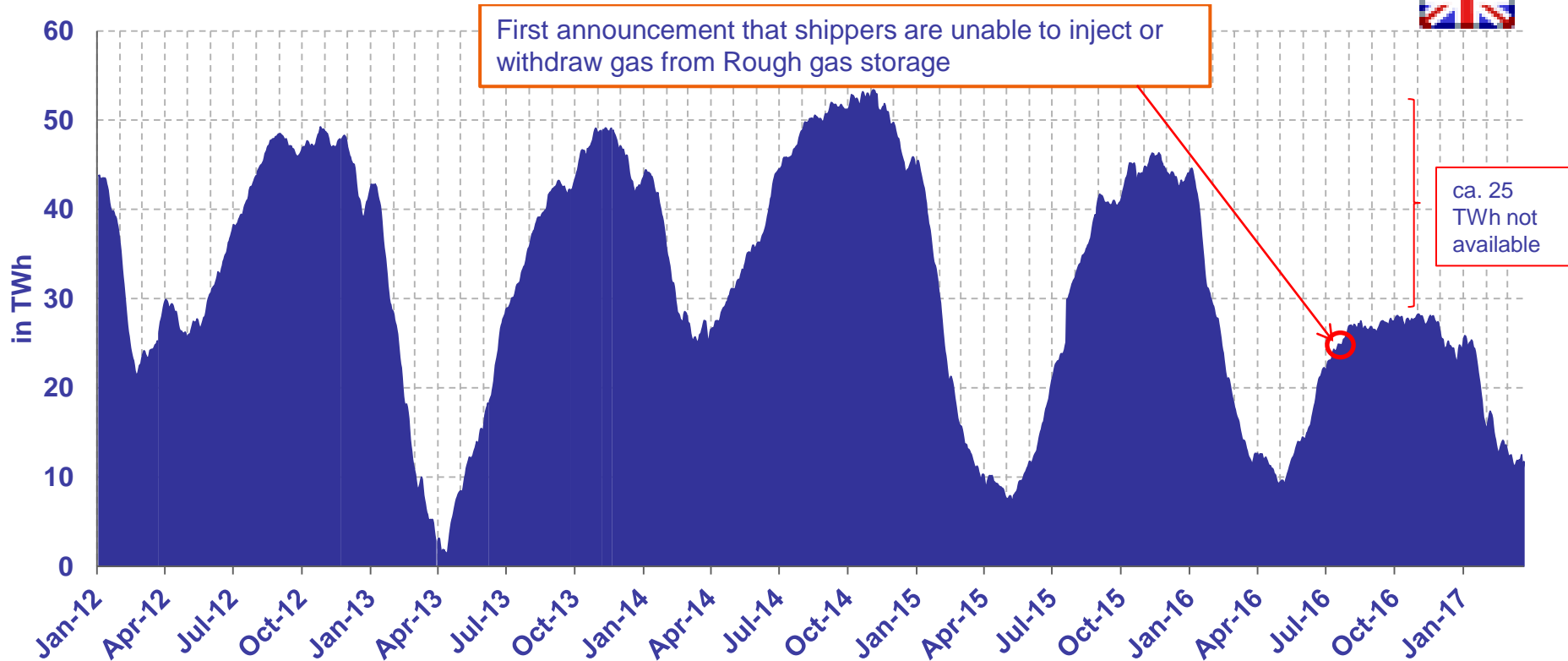


Source: ICIS Heren, TEAM CONSULT Analysis

2c

The shortages in the UK were also caused by partial outage of Rough gas storage, which accounts for about 70% of total working gas volume in the UK

Stock Level of Gas Storages in UK since 2012



Quelle: National Grid, TEAM CONSULT Analysis

Agenda

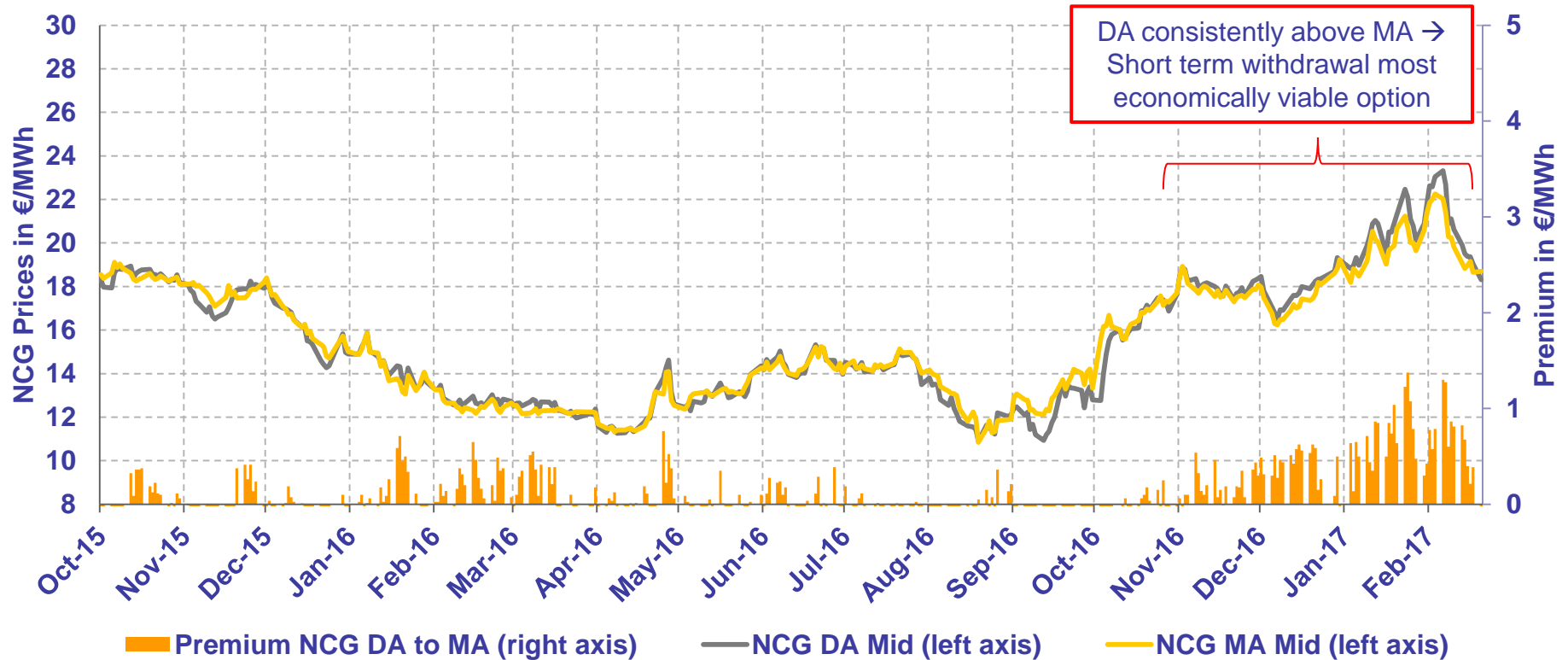
2 Specific circumstances of the winter 2016/17

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2d

During the current winter prices at NCG for the day-ahead product were consistently above the month-ahead product

Prices on NCG Hub for Day-Ahead and Month-Ahead



Source: ICIS Heren, TEAM CONSULT Analysis

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Fundamental changes impacting gas storages

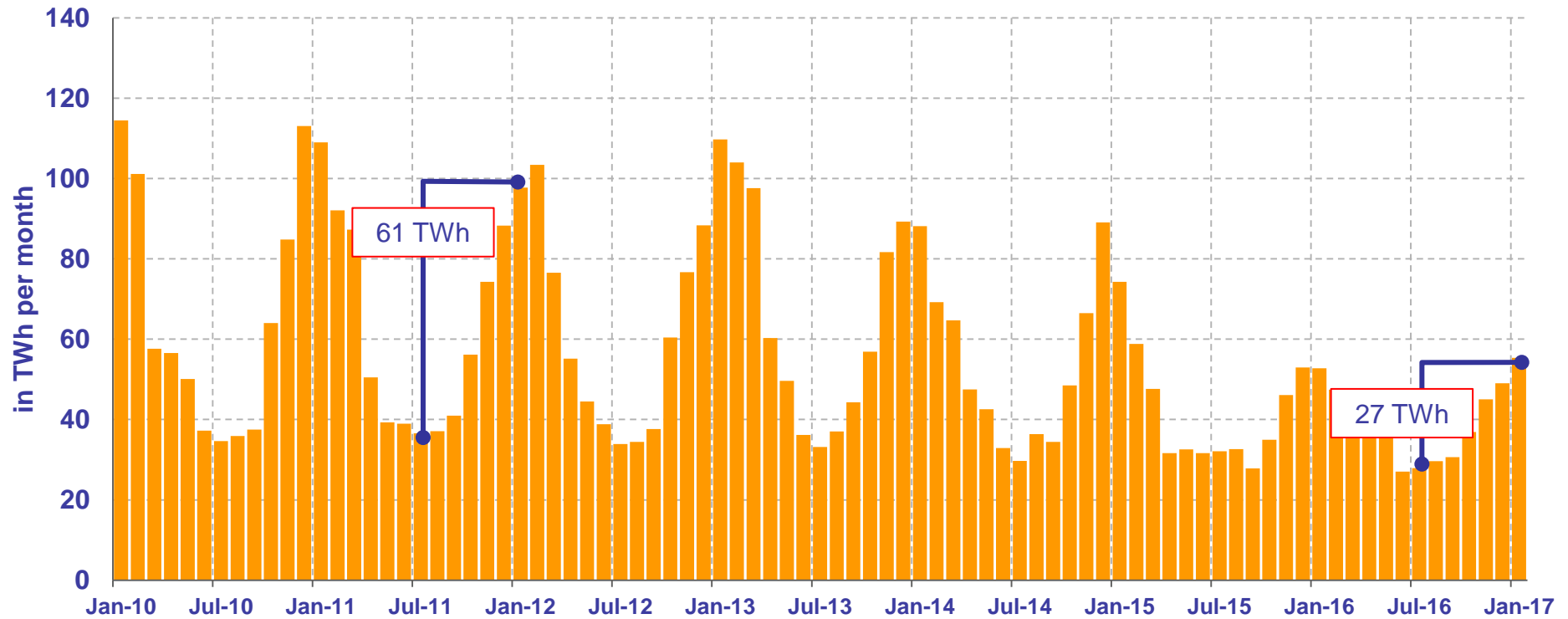
3

- Historically the Netherlands and parts of Germany have consumed low calorific gas (L-gas) mainly produced in the Dutch Groningen field.
- This gas had a quite flexible profile because it was very close to consumer markets and there was little need for structuring through storages.
- This situation has changed as the production from the Groningen field was permanently reduced.
- The Netherlands as a traditional flex-provider to Germany (mainly L-gas) loses its ability to provide flexibility from indigenous production. The Netherlands fulfill their contractual obligations to provide L-gas to Germany by importing high calorific gas (H-gas) from other sources and converting it to L-gas.
- However, this additional H-gas has to be structured further through storages as H-gas production sources are located farther away from consumption centres.

3

Lower production and flexibility from the Groningen field leads to a less flexible profile of the Dutch production

Production profile of the Netherlands

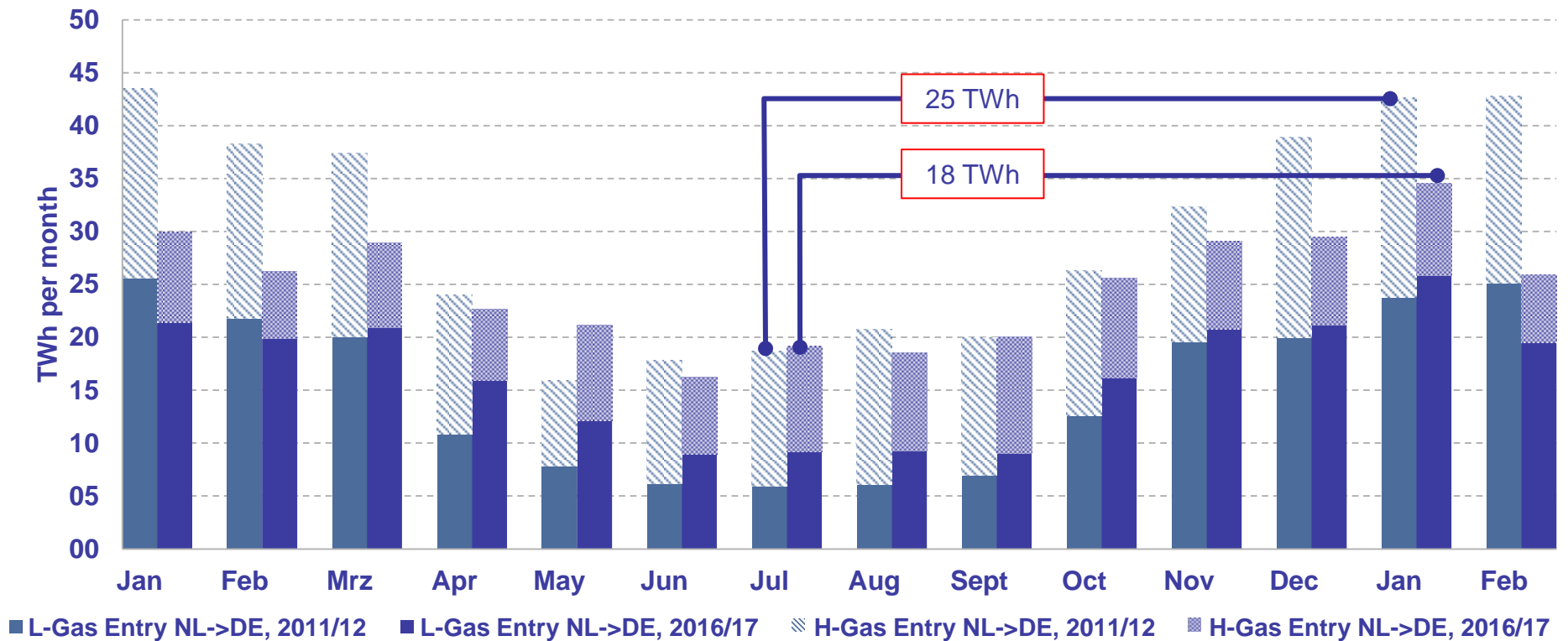


Source: IEA, TEAM CONSULT analysis

3

The Netherlands still provides a seasonal export structure to Germany by converting H-to L-Gas. Although the structure is not as high as in the past.

H and L-Gas Flows from Netherlands to Germany, Comparison 2011/12 to 2016/17

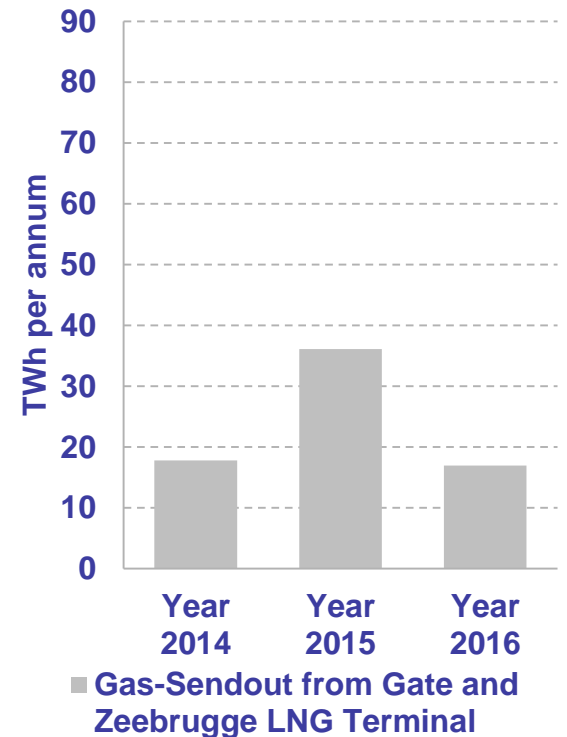
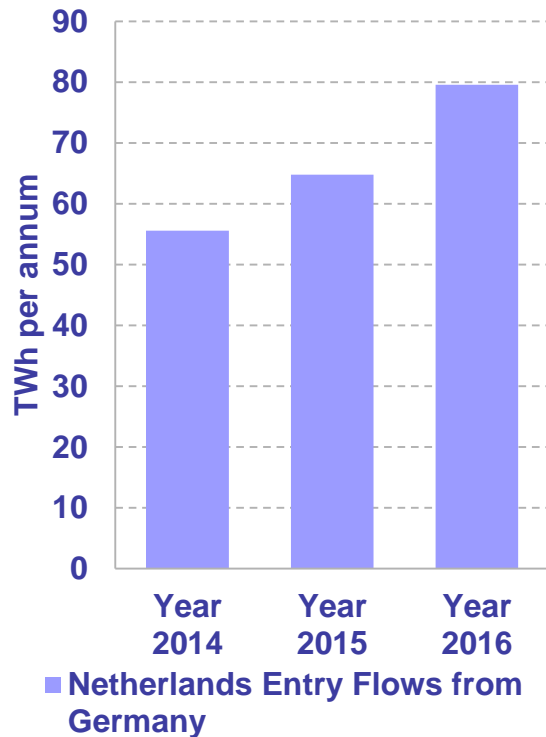
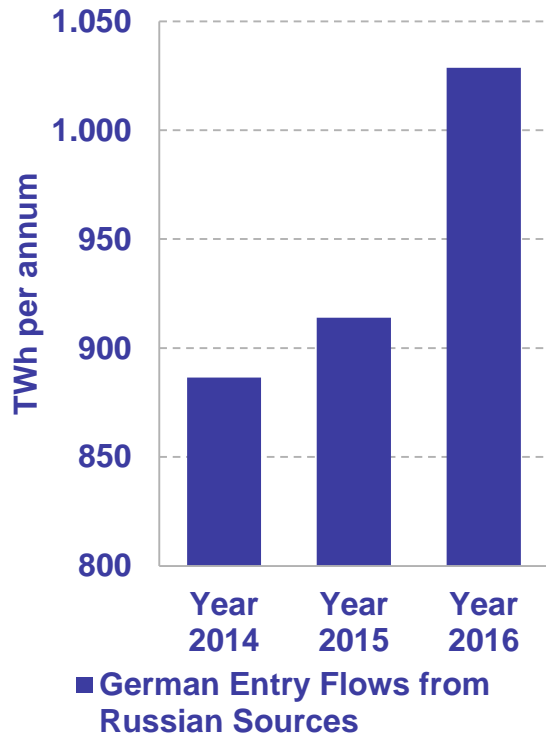


Source: ENTSO-G, Websites of Pipeline Operators, TEAM CONSULT Analysis

3

Some of the increased H-Gas-flows to Germany from Russia are most likely transited to NL while LNG has not significantly benefited from the situation

Gas Flows to Germany and to the Netherlands from 2014 to 2016



Source: ENTSO-G, TEAM CONSULT Analysis

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Are German gas storages regaining importance? (1/2)

4

- In the winter 2016/17 some unique effects were observable which led to low storage levels:
 - Partial outage of Rough storage
 - Shut-downs of French nuclear power generation
 - Cold winter in many parts of Europe
- Also some fundamental changes took place in recent years:
 - L-Gas production from the Groningen field was significantly reduced which led also to lower flexibility from this source.
 - The Netherlands compensates this reduction by importing less structured H-Gas and converting it to higher structured L-Gas.
 - The Netherlands still provides flexibility to Germany, but not the same as in recent years.
 - Additional LNG capacity is available, but LNG has so far not contributed to extra gas volumes or flexibility.
 - Volatility of power generation is increasing with higher share of fluctuating renewable capacities.

Are German gas storages regaining importance? (2/2)

4

- The combination of the specific circumstances of the winter 2016/17 in combination with fundamental changes led to higher utilization of German storages.
- The fundamental changes will continue to reinforce higher utilization rates of storages as some factors like the declining Groningen production are even going to worsen in the future.
- As the planned switch from L-gas to H-gas takes place in North-Western Germany over the next years rerouting and structuring over the Netherlands will most likely become obsolete. Structuring of H-gas can also take place in Germany.
- Some of the unique effects that contributed to the higher storage utilization should be seen as “wildcards” which can also occur sporadically in the future. If they occur they are likely to amplify the fundamental changes as seen in this winter.
- The conclusion could be drawn that the importance of German storages to provide flexibility has increased and the prospect is slowly improving. However, there are multiple further developments which can have a positive or adverse effect on storages and which have to be analyzed in detail.

Positive or adverse developments for German storages

4

- Positive developments
 - **Nord Stream II**, if build structuring of additional H-Gas needed
 - **Higher utilization of gas-fired power plants** due to volatility of renewables, shut-down/phase-out of old nuclear power plants, higher CO₂-price
 - **Hardly any new storages** under construction and closure/mothballing of old and or uneconomical storages
 - Uncertain situation of **Rough gas storage**
- Adverse development
 - **Reduction of gas demand** due to efficiency, climate change and substitution by heat pumps/power-to-heat
 - German **storage price increases are limited** by prices for substitutes such as additional LNG imports and/or idle capacities in Eastern Europe

Further research of the combined magnitude and impact of these developments is imperative.



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