Gas System Operator

GFOP within-day behaviour study

Instalment 3: South east focus piece

nationalgrid

Key messages

- Our physical network's ability to transfer gas in and out of the south east plays a crucial role in enabling customers to bring gas on and off the network in a manner that suits their commercial and operational needs.

- **Managing imbalances in gas brought on and off in the south east:** as forecasted by the Future Energy Scenarios, LNG and Interconnector flows are anticipated to increase. Therefore, gas entering the south east could grow. The importance in our capability to transfer gas out of the south east to manage linepack levels in the region may therefore increase.

- **Managing within-day behaviour:** a sudden change in the amount of gas brought on or off at a location can create significant operational challenges in meeting customer needs in the south east, especially if this occurs when national linepack levels are already declining or increasing.

- **Next steps:** Through the RIIO-T2 Network Capability work stream, we plan to replicate this south east analysis across the whole network. If potential gaps in both our ability to accommodate future regional imbalances or within-day flows are identified, we will be considering the development of new commercial tools/market solutions as well as asset solutions.

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Using the findings from our 1st and 2nd study instalments[1], we have looked to assess the operability impacts of how gas is brought on and off the network within-day in the south east.

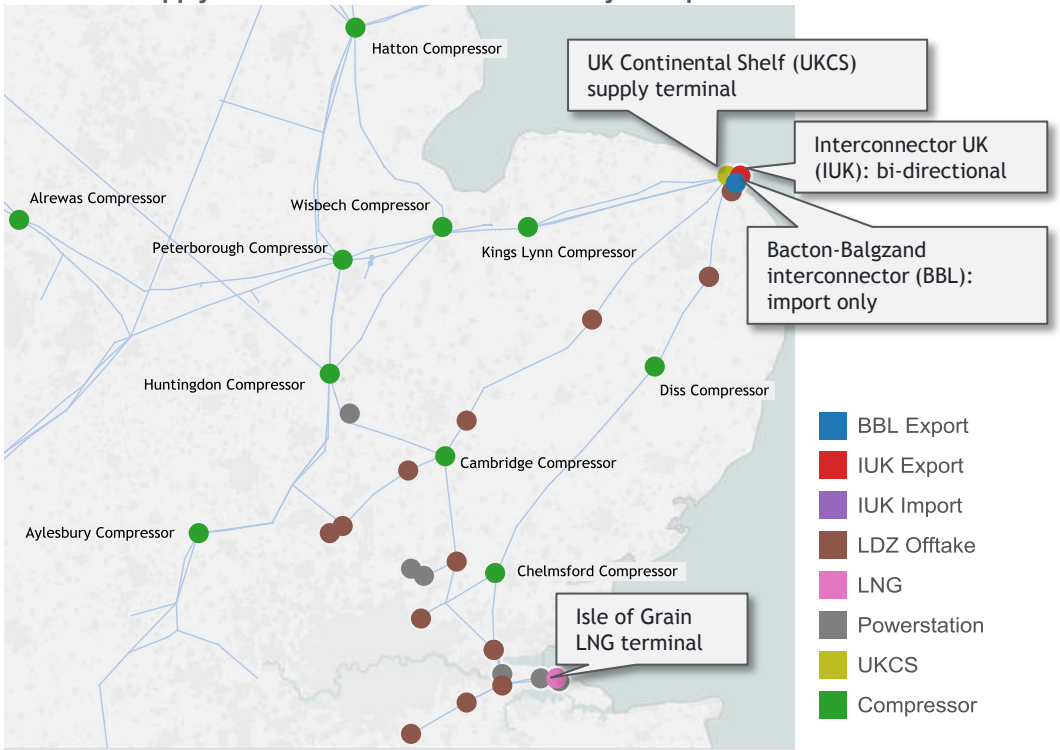
The south east has a wide mix of sources that bring gas on and off the network, namely:

- bi-directional interconnectors
- LNG terminal
- UK Continental Shelf terminal
- gas-fired power stations
- distribution network offtakes

In a previous publication[1], we highlighted that the region is sensitive to within-day flows.

We have therefore looked at this region in more depth to better understand the challenge of accommodating within-day customer needs.

South east supply and demand locations and "nearby" compressors



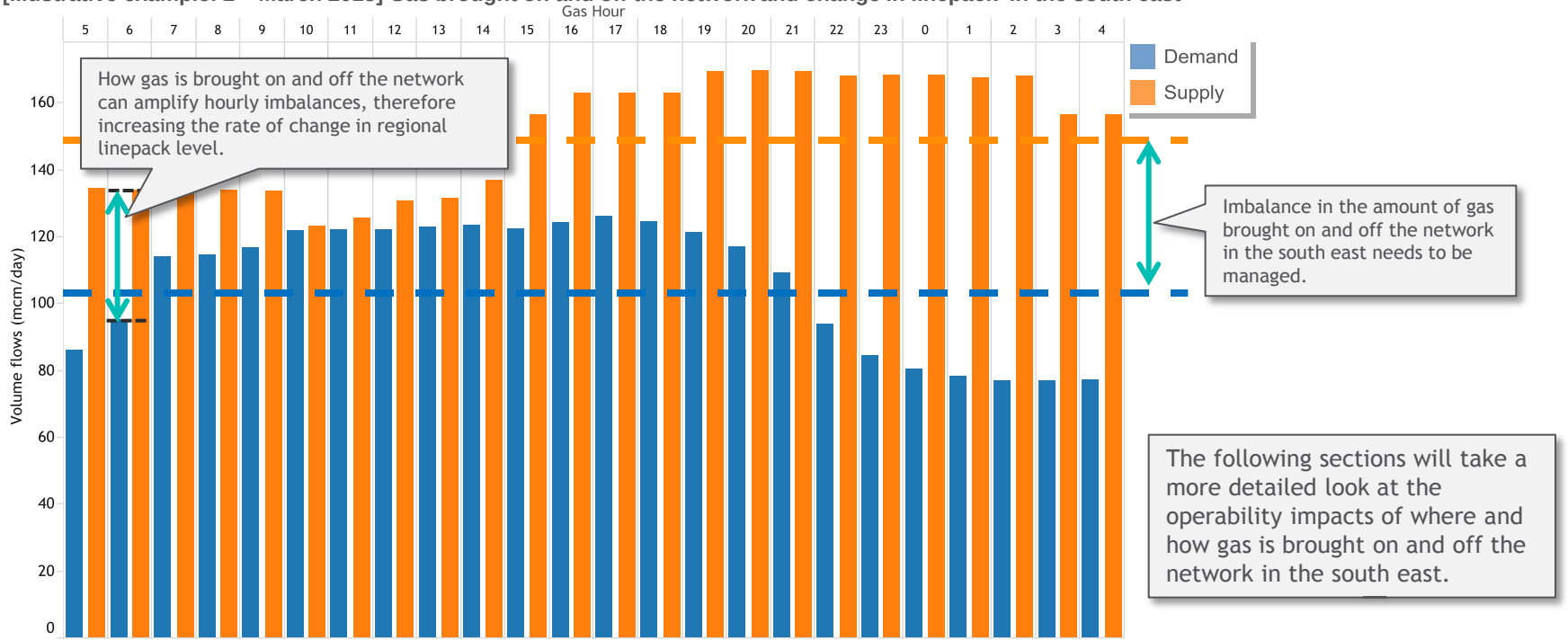
Operationally we manage linepack by zones. We aim to keep linepack levels within a range defined by our customer's offtake pressures and the network's maximum safety pressures.

The actions we take to manage linepack are dictated by:

(1) the regional imbalance in the amount of gas brought on and off the network and

(2) how this gas is delivered and taken off within-day.

[Illustrative example: 2nd March 2018] Gas brought on and off the network and change in linepack in the south east



The following sections will take a more detailed look at the operability impacts of where and how gas is brought on and off the network in the south east.

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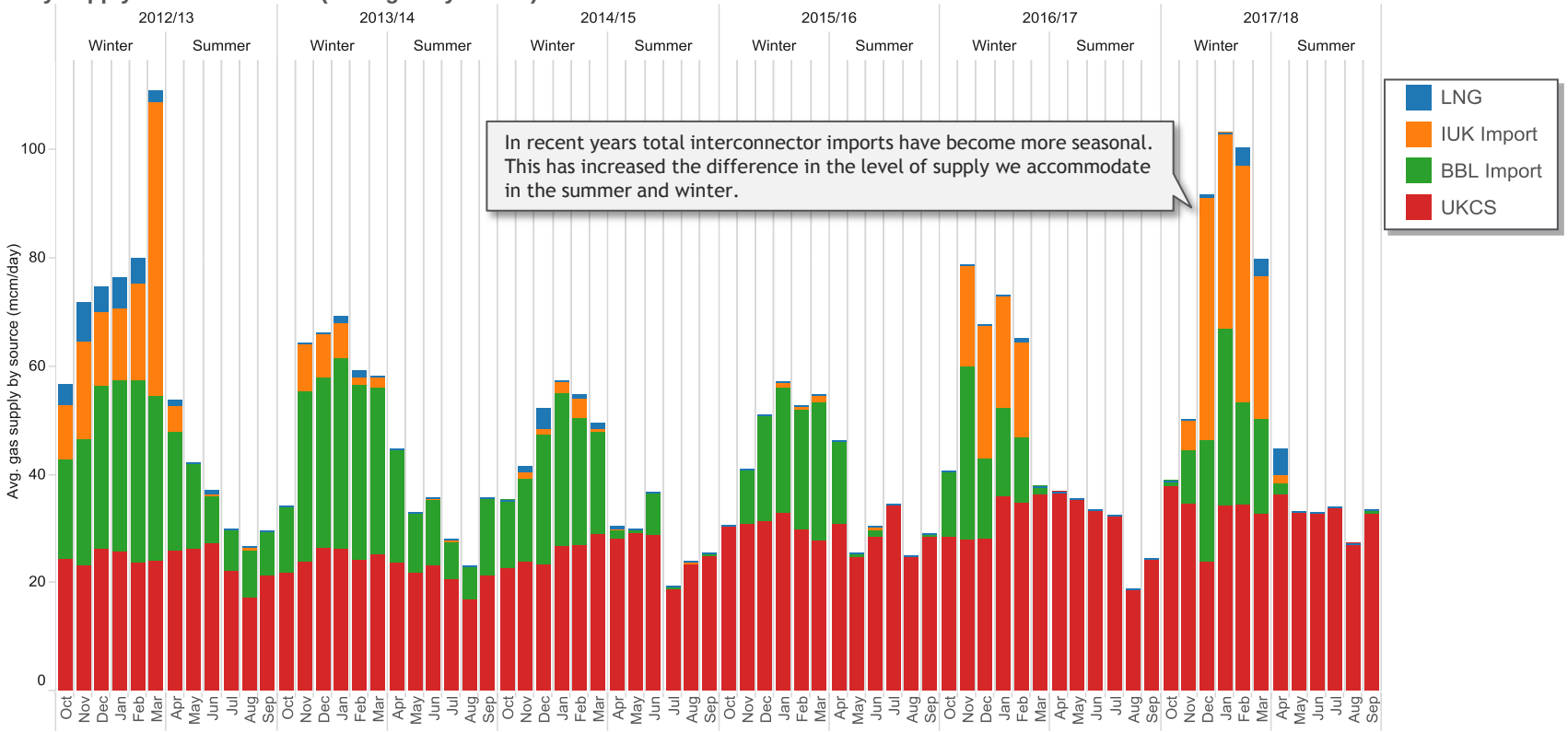
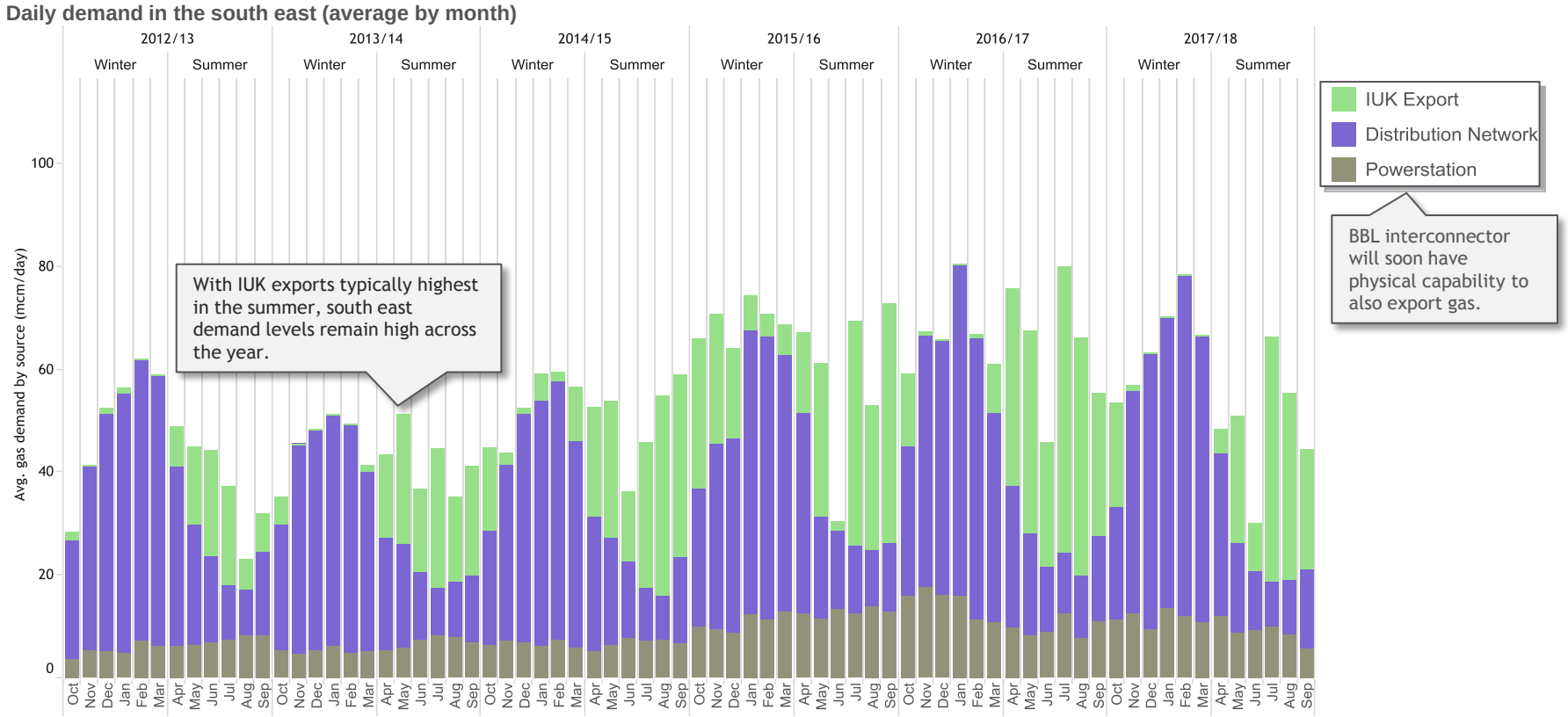
The array of commercially-driven supplies in the south east leads to a high variability in the amount of gas brought onto the network.

Daily supply in the south east (averaged by month)



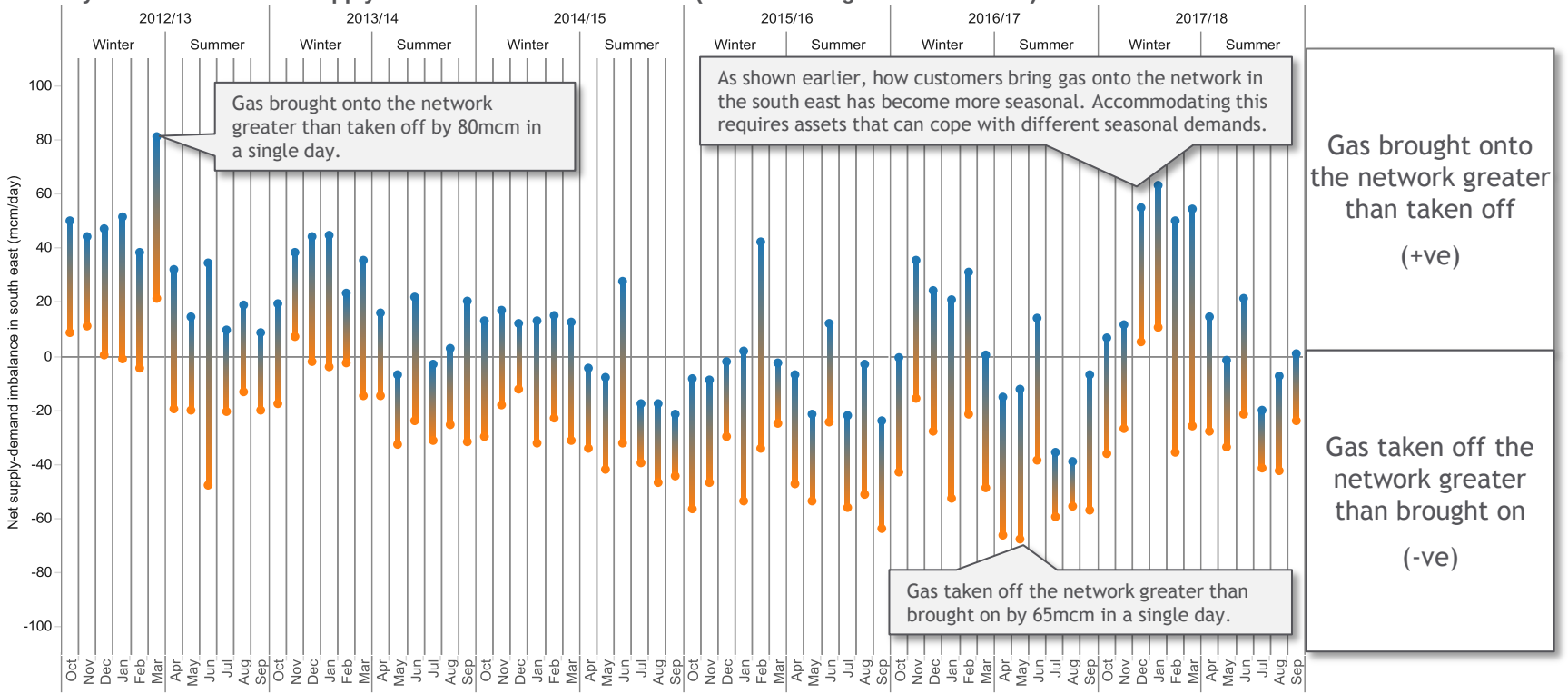
National Grid Average supply : average of total daily supply by source during the month

IUK being bi-directional adds another commercially-driven source to the demand mix, along with gas-fired power stations and distribution network offtakes.



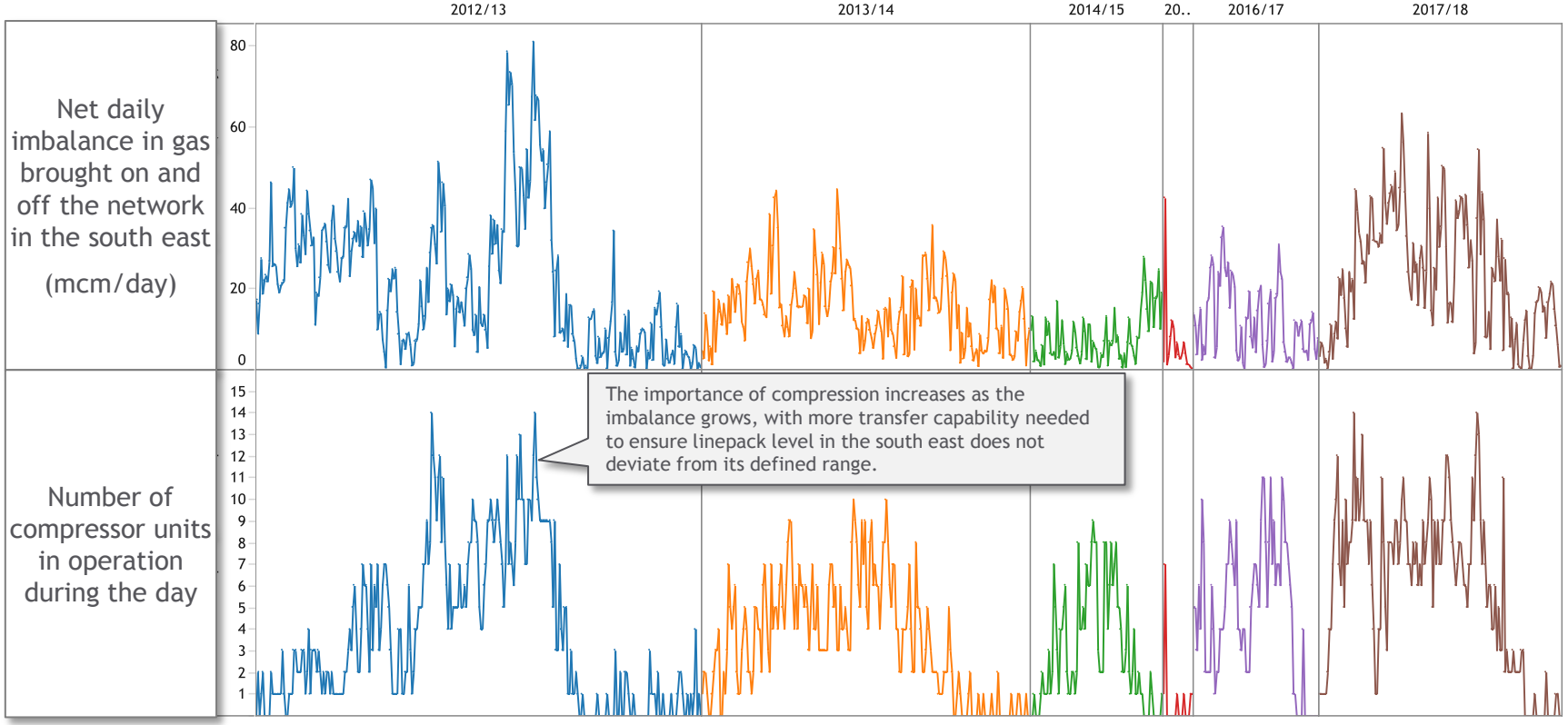
The commercially-driven nature of these sources can result in the south east being significantly "supply-heavy" or "demand-heavy" during a gas day.

Net daily imbalance between supply and demand in the south east (shown as range over the month)



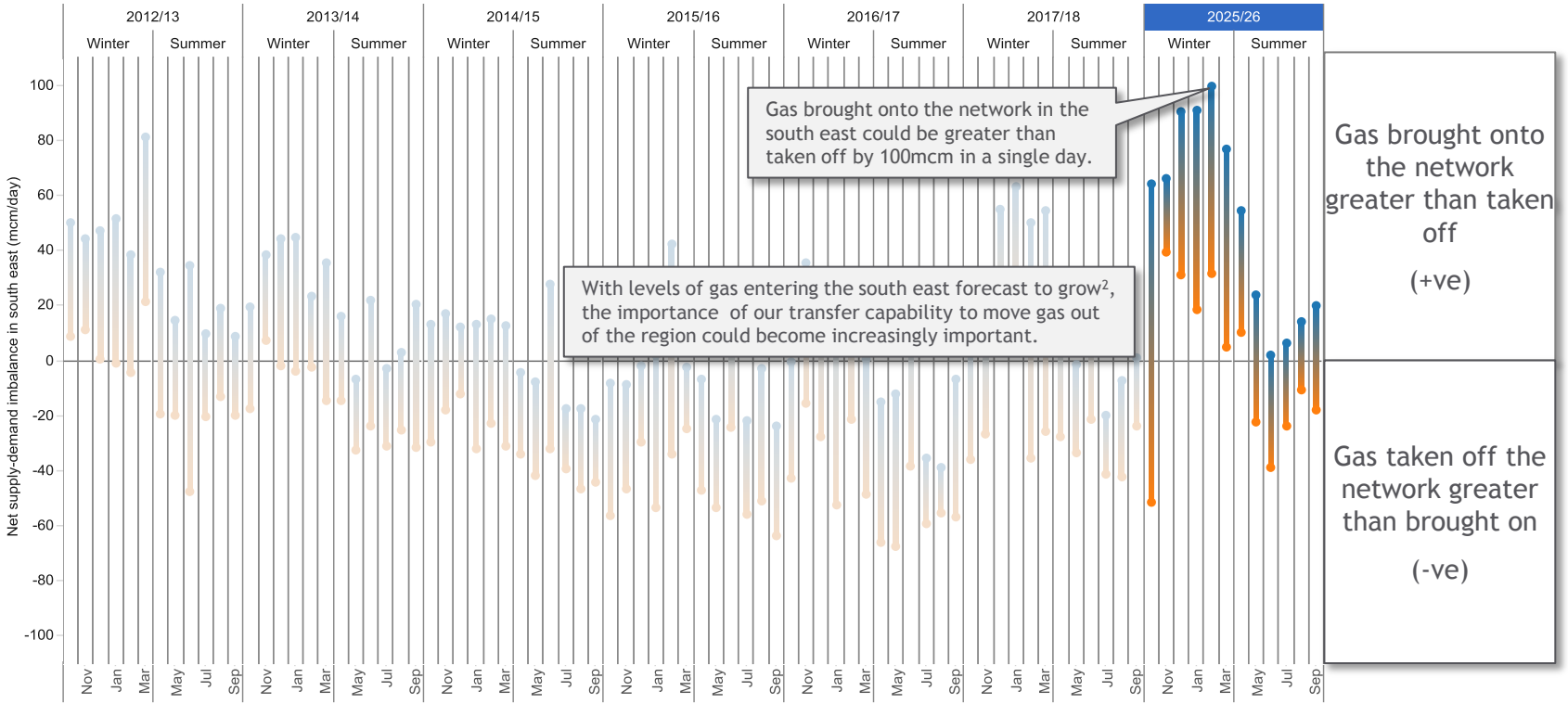
When south east supply is greater than demand our fleet of compressors play a crucial role in moving gas out of the region, allowing supplies to continue to enter with minimal restriction.

Net daily imbalance and compressors in operation in the south east (only days where more gas is brought on than taken off)



2025 FORECAST: With the frequency and magnitude of interconnector and LNG operation anticipated to increase[2], and more variability in gas-fired power station demand, imbalances in gas brought on and off the network in the south east could increase.

Net daily imbalance in gas brought on and off the network in the south east (shown as range over the month)



To continue to enable gas to be brought on and off the network in the south east with minimal restrictions, further refining our understanding of the network's capability to transfer gas between regions may become increasingly important.

Our ability to transfer gas between regions is influenced by a number of factors, for example:

- availability of compressors to bulk transport gas
- where gas is brought on and off the network across Great Britain (influences our compressor strategy)
- level of within-day volatility (can amplify locational constraints)

To give an example of the interplay between these factors, future compressor reliability/availability could be impacted because:

- increased seasonal variability leads to some of our assets being utilised in a manner that was not originally intended.
- variability makes it more challenging to schedule maintenance and construction activities, as it is harder to predict six months to a year in advance the compressors that will be needed and when.

Next step: Defining network capability

Our initial findings have highlighted that the need for transfer capability between regions could increase. This raises several questions that we will look to answer through our RIIO-T2 Network Capability work stream. To name a few:

I. What is the maximum capability required in transferring gas in and out of the south east?

II. How is transfer capability impacted by: where gas is brought on and off the network, asset availability etc?

This may help us to identify if we have the right network capability to meet future customer needs.

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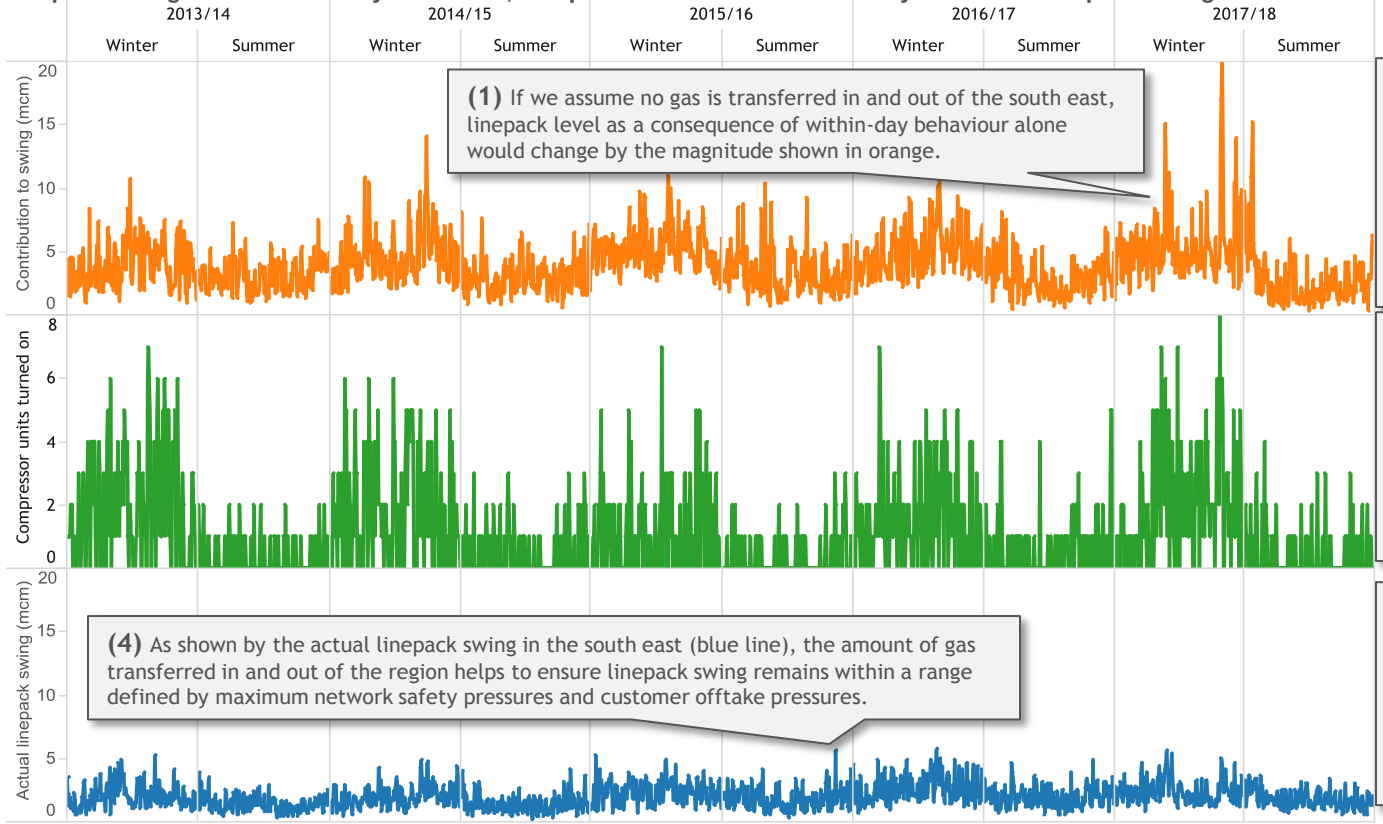
Transfer capability between regions plays a huge role in accommodating within-day optionality in how gas is brought on and off the system, whilst maintaining safe network operation.

Linepack swing due to within-day behaviour, compressors turned on within-day and actual linepack swing in the south east



(2) Linepack in any area can be used to absorb an imbalance for only a finite period of time.

A point is then reached where the balance needs to be addressed by transferring gas in or out of the region to allow system pressures to be maintained.

(3) As the level of within-day flexibility needs increases, the number of compressors turned on within-day increases.

This is to quickly increase transfer capability between regions to manage linepack level, and ultimately system pressures.

(5) Turning on compressors within-day to increase transfer capability also enables customers to be more flexible in how they flow gas.

This ultimately helps to facilitate efficient gas market operation.

2025 FORECAST: Using network analysis software and forecasts of how gas may be brought on and off the network within-day[3], we analysed the operational impacts of varying degrees of within-day flexibility

Increasing within-day optionality in how gas is brought on and off the system in the south east

Scenario 1:

- Demand sources are taking gas off the network flexibly to meet commercial needs.
- Supplies enter the network at flat 1/24th rate.

Compression is turned on to bring gas into the region. This reduces linepack declining, ensuring we customer offtake pressures are met.

Scenario 2:

- Both supply and demand sources are profiling to meet their commercial and operational needs.

Further compression is needed to move gas into the south east as the hourly imbalance between supply and demand is amplified, ultimately depleting linepack levels quicker.

Scenario 3:

- Both supply and demand sources are profiling, with a sudden surge in gas-fired power station demand later in the gas day.

Customer offtake pressures in the extremities of the south east could not be maintained by transfer capability alone as the surge causes the rate of south east linepack depletion to increase significantly.

Therefore, an option would be required to address this within-day mismatch in flow.

[3]See instalment 2

We assume we have full availability of our compressors. In reality this is may not be the case (network maintenance, asset trips etc.)

Level of supply and demand is the same across all scenarios

As the level of imbalance and within-day optionality in how gas is brought on and off the system in the south east increases, it becomes operationally challenging to continue to manage linepack levels and thus maintain system pressures.

Through the **RIIO-T2 Network Capability work stream**, we plan to replicate this south east analysis across the whole network. This will allow us to identify potential gaps between how customers want to use the gas network and our future network plans.

Any potential gaps in both our ability to manage future regional imbalances or within-day flows could be addressed by four options:

Commercial tools (energy management)	Energy actions such as locational trading etc.
Commercial tools (buy back)	Capacity actions to reduce specific entry point capacity.
Build/retain assets	Asset investments (such as compressors) to increase transfer capabilities between zones.
Market solutions	New market arrangements to potentially incentivise appropriate and efficient actions to optimise consumer benefits.

If gaps are identified, we will be considering the development of new commercial tools/market solutions as well as asset solutions.

We will be hosting industry webinars to summarise the findings from our GFOP study.

We will also set out the next steps we will be taking as part of the RIIO-T2 Network Capability work stream.

Click one of the dates below to register your interest in joining the webinar.

Option A: Thursday 25th April (1pm – 2pm)

Option B:Tuesday 30th April (1pm – 2pm)

Once we receive an email of your preference, we will send through your specific webinar details!

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