Operating the gas transmission system

We will start at 10.32 to allow people to finish previous meetings and join this session.

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Welcome and Opening

Thank you for joining us today

Please feedback via SLIDO

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Who will be speaking today?

Glenn Bryn-Jacobsen
National Control Manager

Craig Davies
Physical Operations Manager

Jennifer Pemberton
Stakeholder Manager

Logistics

- Should last for approximately about 60 min
- Questions via slido #NGG4
- All callers will be placed on mute
- We will circulate the slides and a recording of this webinar

Agenda

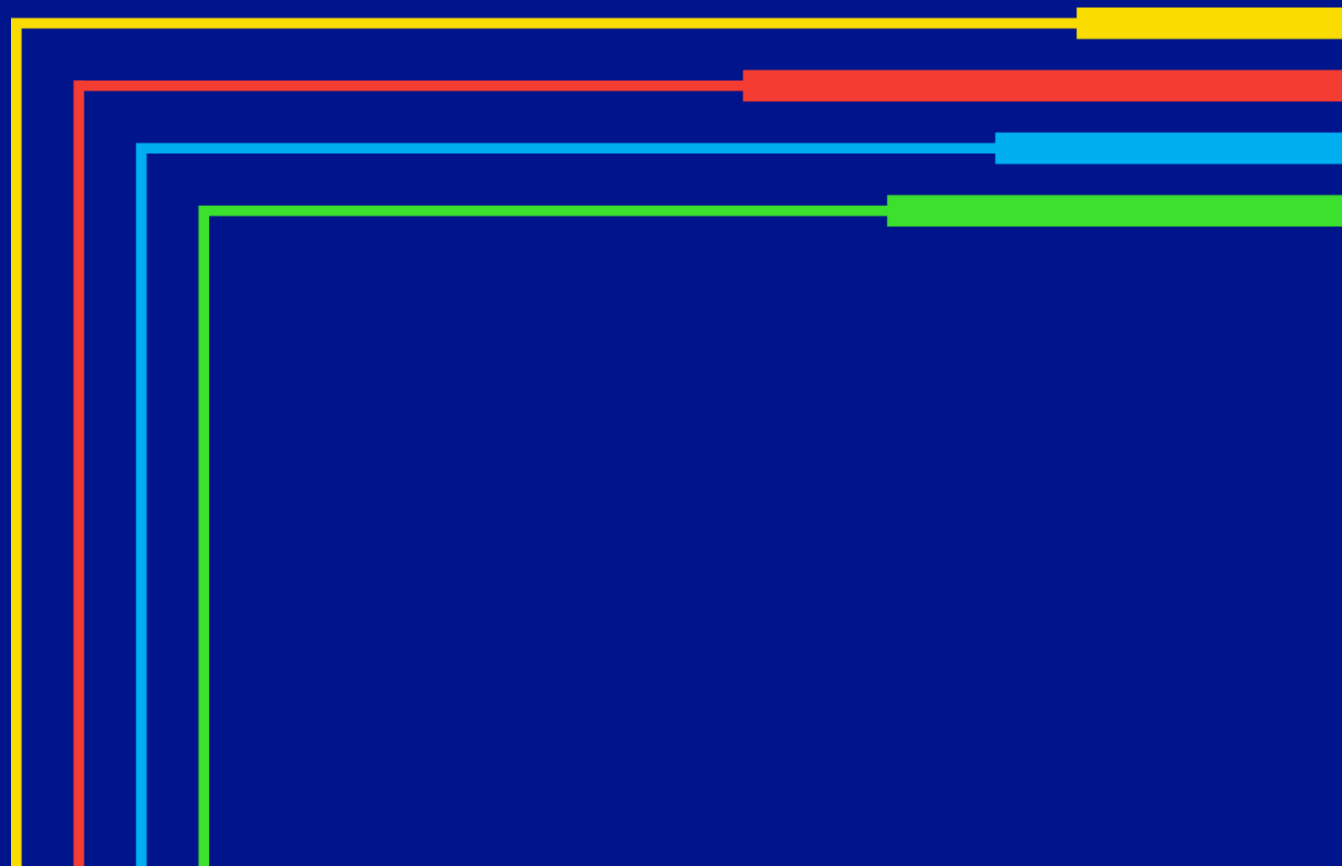
Part I :

Operating the Gas National Transmission System 101

Part II :

Impact of COVD-19 on UK Gas Demand

Part I : Operating the Gas National Transmission System 101



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The National Transmission System (NTS) - An 'Active' Network

Key Assets

- 7,660 km pipeline
- Operating pressure 38 - 94bar
- 23 compressor stations (+1 St Fergus – Non NTS)
- Gas National Control Centre (GNCC) + Emergency Control Room + Data Centres
- 530+ Above Ground installations

Entry Points

- 6 Beach Reception Terminals & 2 LNG Importation Terminals
- 3 Interconnectors
- 9 storage sites

Exit Points

- Distribution Offtakes (121)
- Power Station (48)
- Large Industrial (21)
- Storage (10)
- Interconnectors (3)

What is real time role of the operator?

Safe, Efficient and Economic operation of the National Transmission System

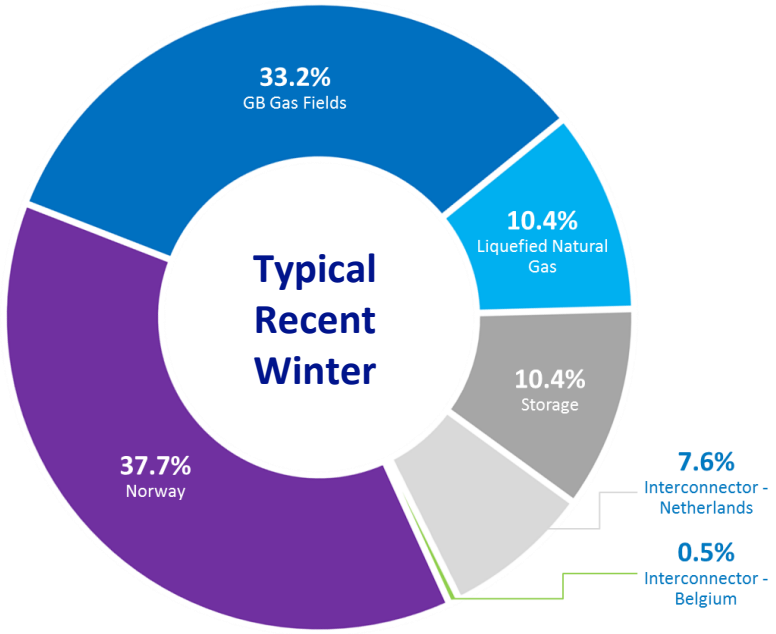
Pressure management (extremities, entry and exit points)	Managing System Balance	Selling Capacity & Managing System Constraints	Compressor optimisation	Gas quality	System access (maintenance and capital works)	Operating margins	Inform Customers of Issues	Emergency Arrangements	Forecast Supply & Demand	Faults & Defects

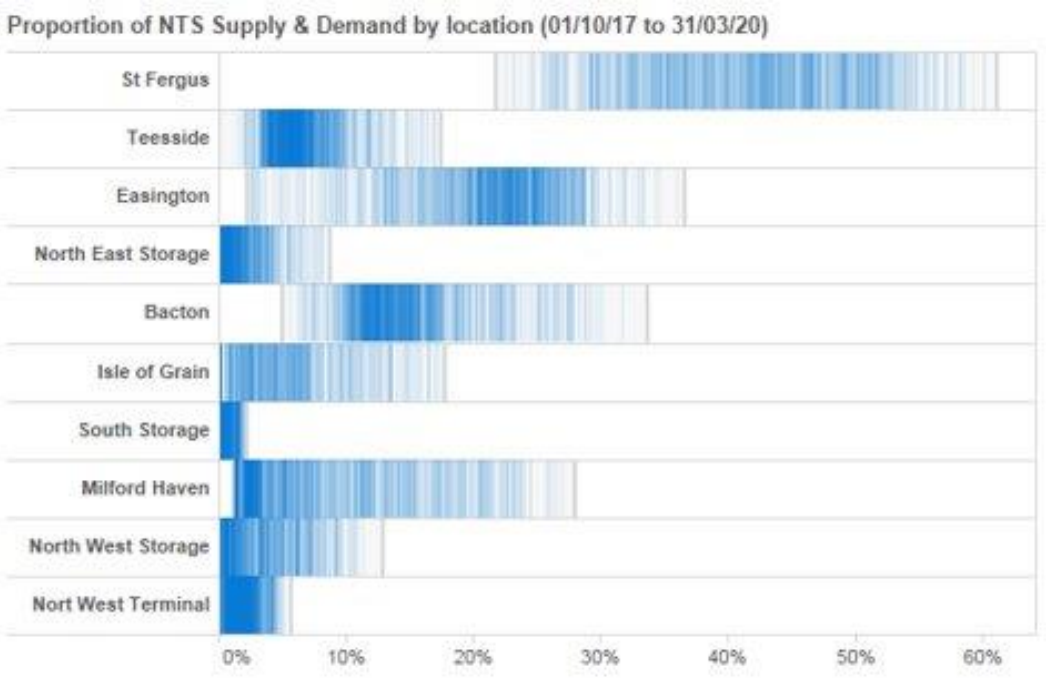
In achieving the above, the Gas System Operators primary tools in the short term are **optimising network assets**, **information provision** and **operational customer agreements** rather than market tools

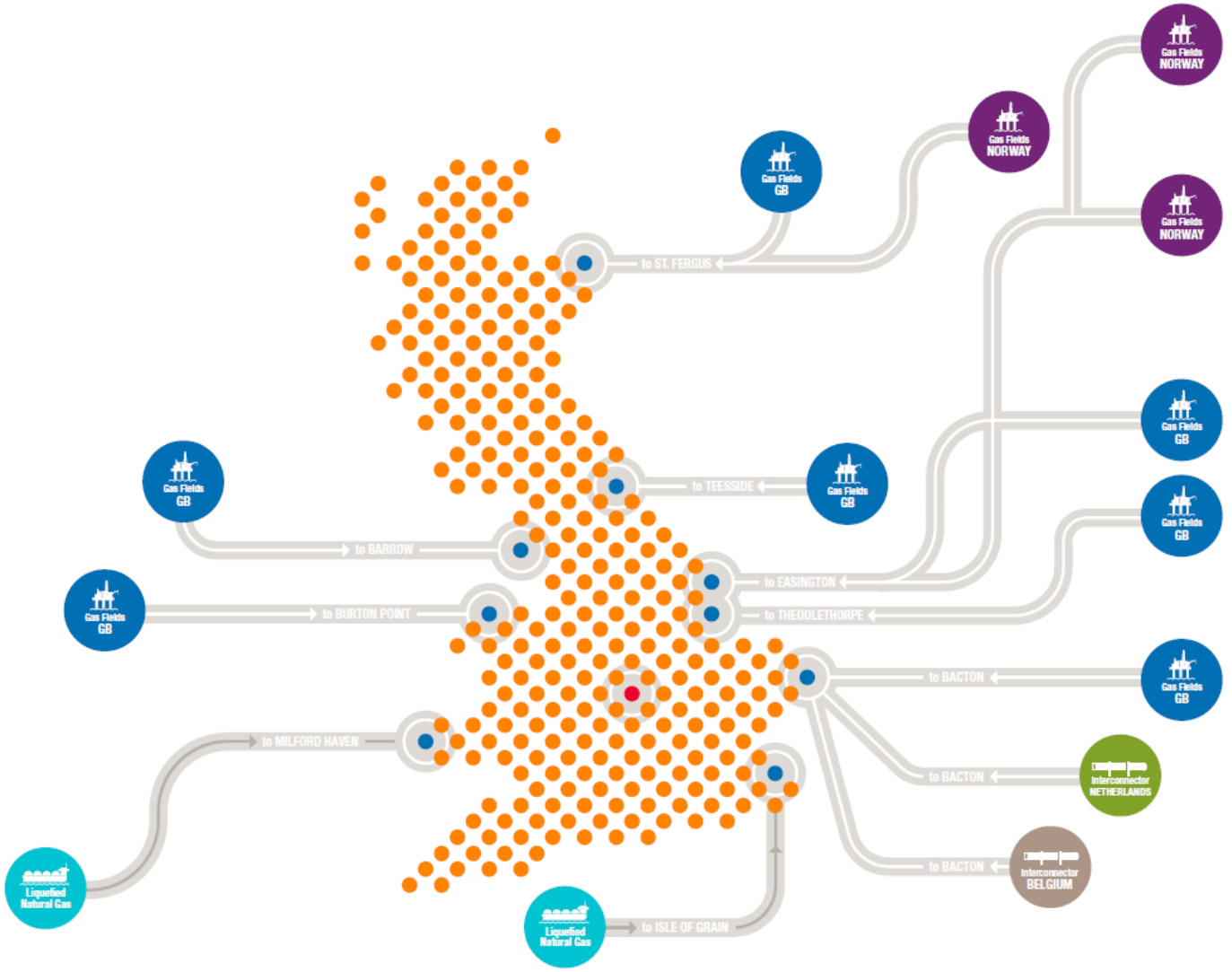
Operating the NTS

- Natural gas comprises of **molecules** that **physically move** through the system thus is inherently different in nature to electricity
- Natural gas **moves slowly** (typically walking speed) therefore there can be a significant **lag** between a control **action** and a resultant **change** in pressure
- For this reason, the NTS requires **close active management** by the GNCC
- This is achieved through the control of physical assets, including:
  - **Compressors** which create a pressure differential in the system thus creating or **increasing** the **flow of gas** through the system
  - **Valves** which allow us to **route** gas to where it is required, **stop** gas for maintenance or capital work and isolate sections of the network in the event of an emergency
- On average we take **120 primary control actions** per day in the GNCC

Diverse GB Supply Sources

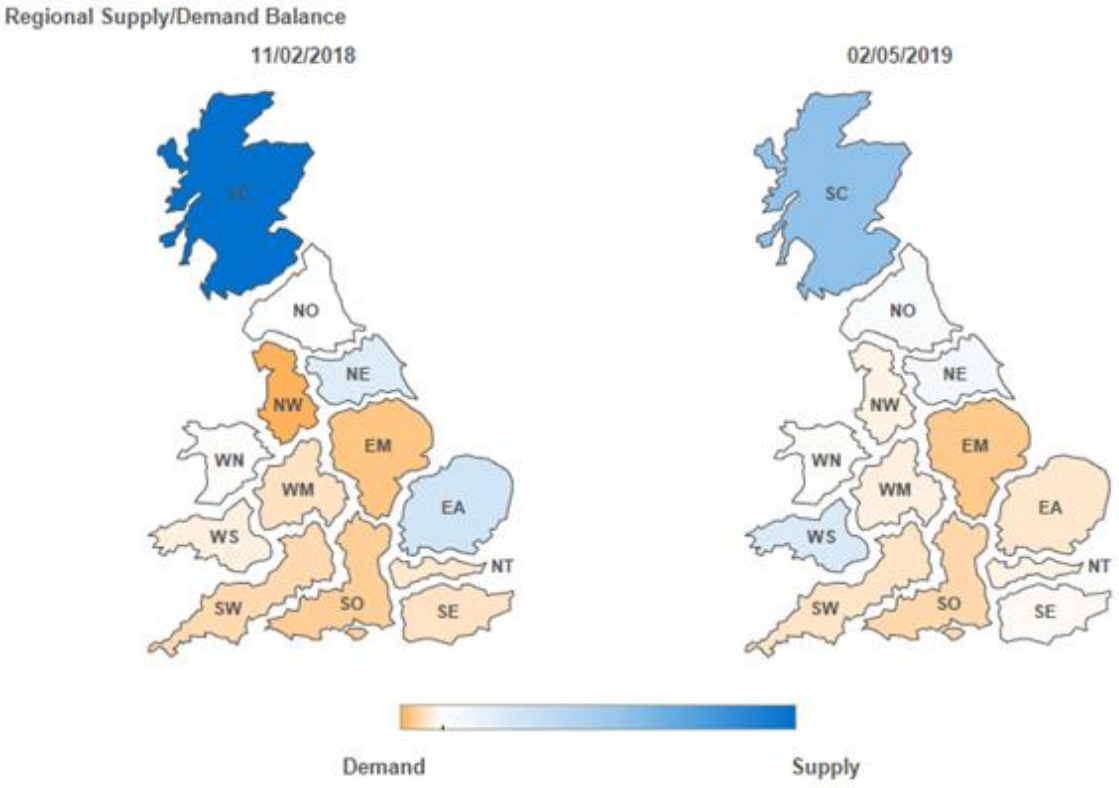




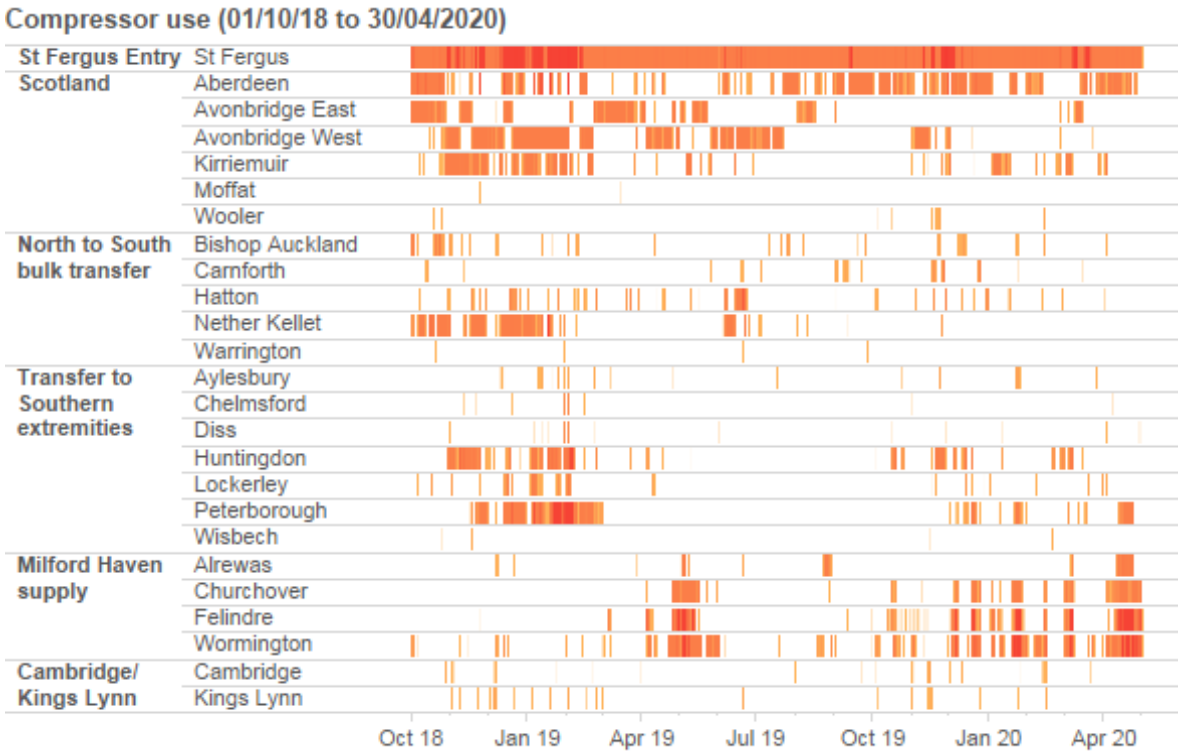


Moving gas around the NTS

We are **reliant** on using **compression** to move gas from the **entry points** to where it's **needed**.

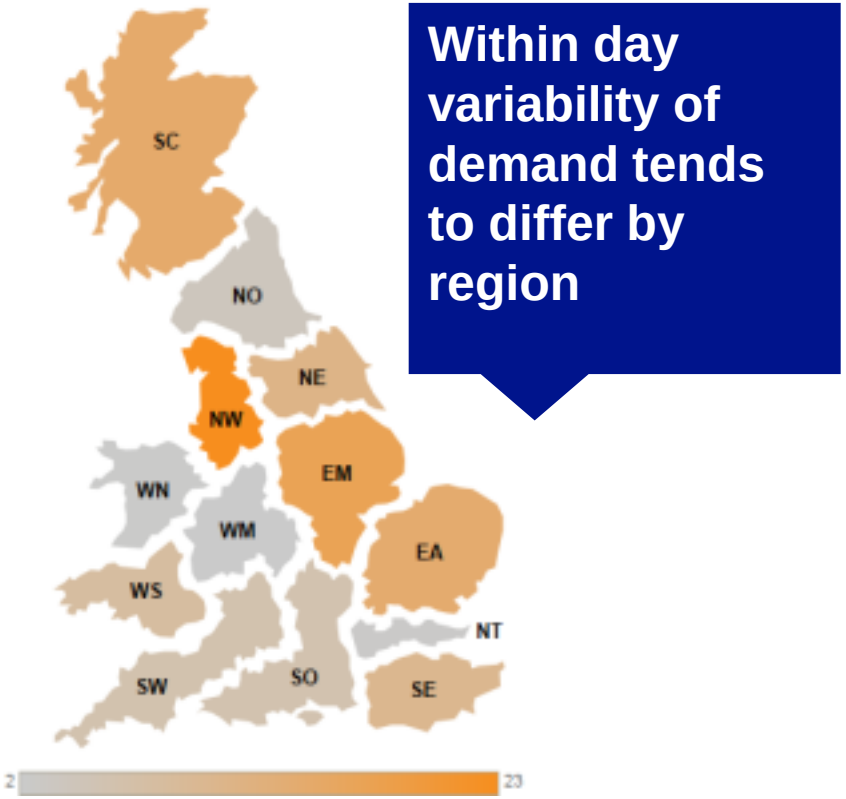


It is becoming increasingly **challenging** to plan and manage our **outage requirements without** causing customer **disruption**.



.. and meeting within day supply & demand using assets

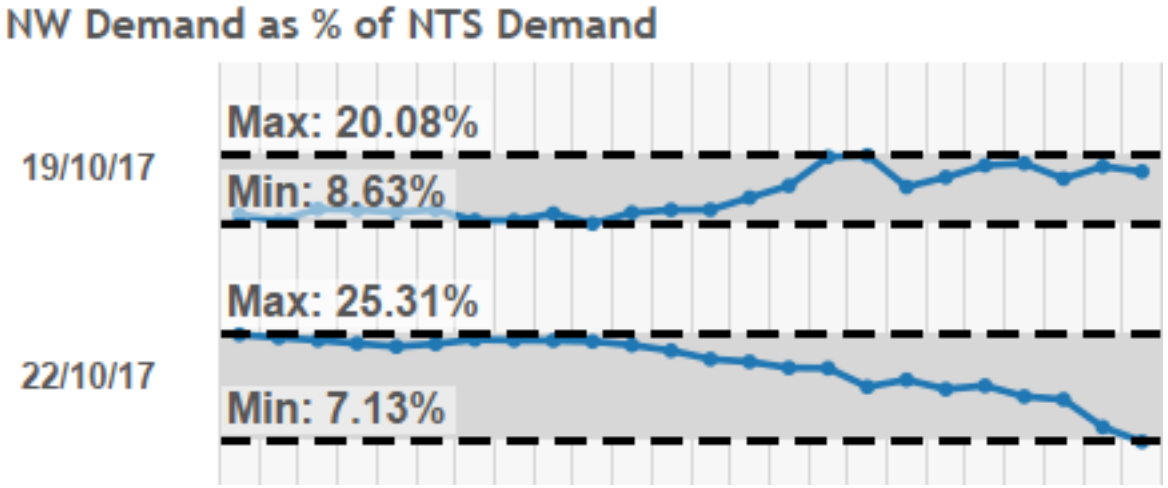
Within the day demand and supply will **vary regionally**.



Within day variability of demand tends to differ by region

Whilst aggregate demand levels have been reducing over time, we are dealing with **more volatile demand profiles** within days.

For example, the North West can vary from less than 10% to more than 20%of NTS Demand and doesn't necessarily follow a predictable pattern from day to day.



Managing Significant End of Day Supply Diversity

Similar demand patterns requiring completely **different operational configurations** over the last two years

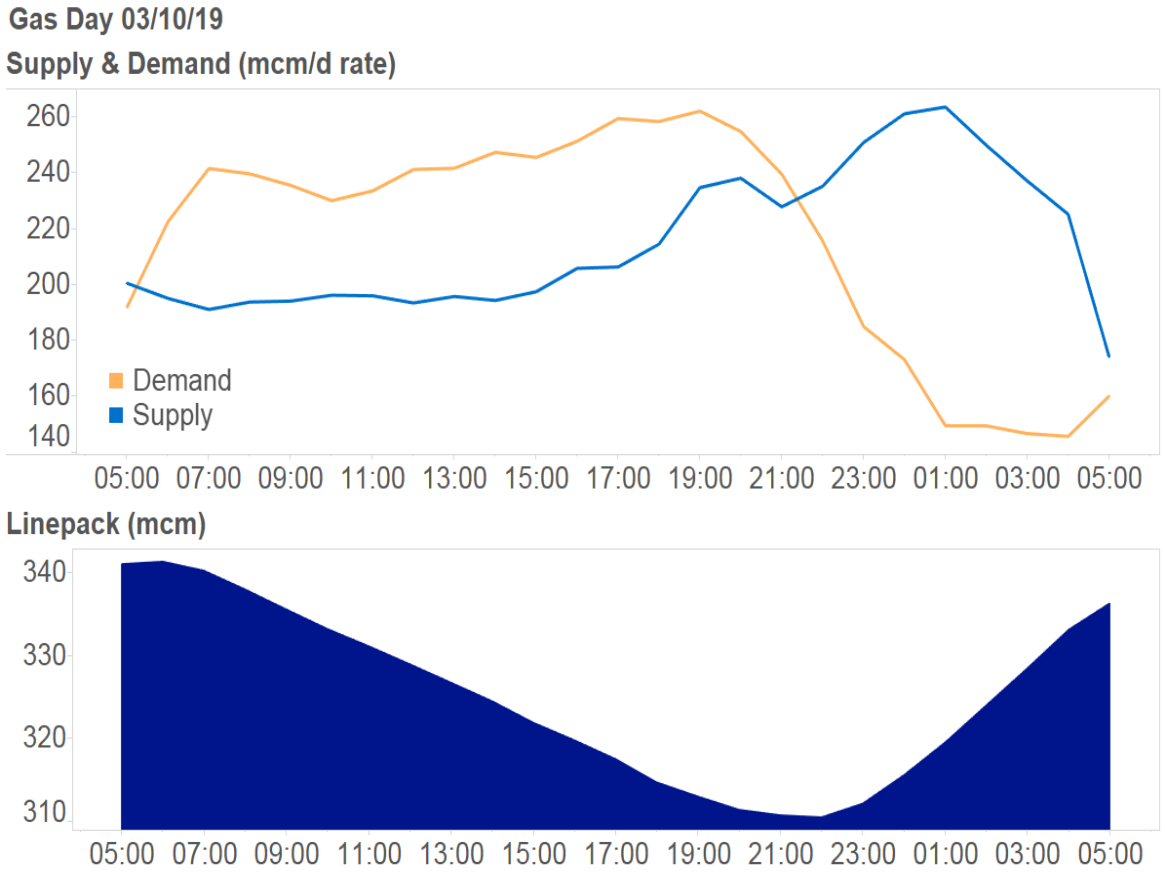
18 compressors needed

3 compressors needed

Only 1 in common across both

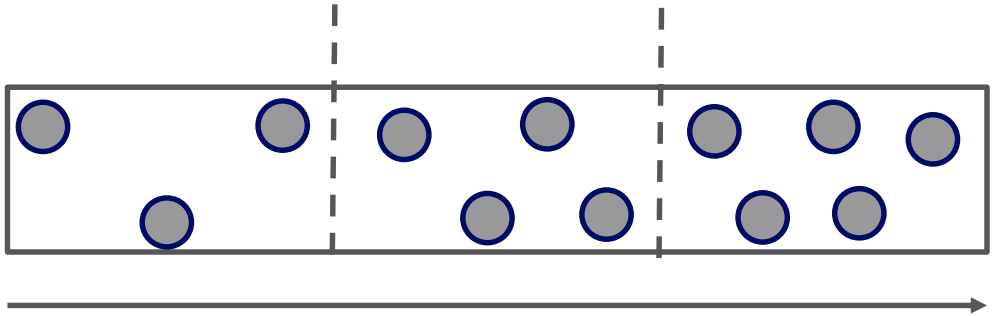
Safe Operation of the NTS

- **Supply** and **demand** are not in steady state and **vary throughout** the **day**
- This **variation** affects the **volume** of gas in the system (linepack) and therefore the **pressure** within the system itself **changes**
- If **pressure** gets **too high** this could result in the safe operating limits of the physical pipelines being exceeded and the **risk** of **rupture**
- If **pressure** gets **too low**, it could fall below the minimum pressures required by the GDNs for them to safely run their networks, resulting in the **risk** of **domestic customers** being **disconnected**
- The **time** and **complexity** associated with isolation & **restoration** of **domestic** consumers would be **significant**
- **Gas does not fail safe**

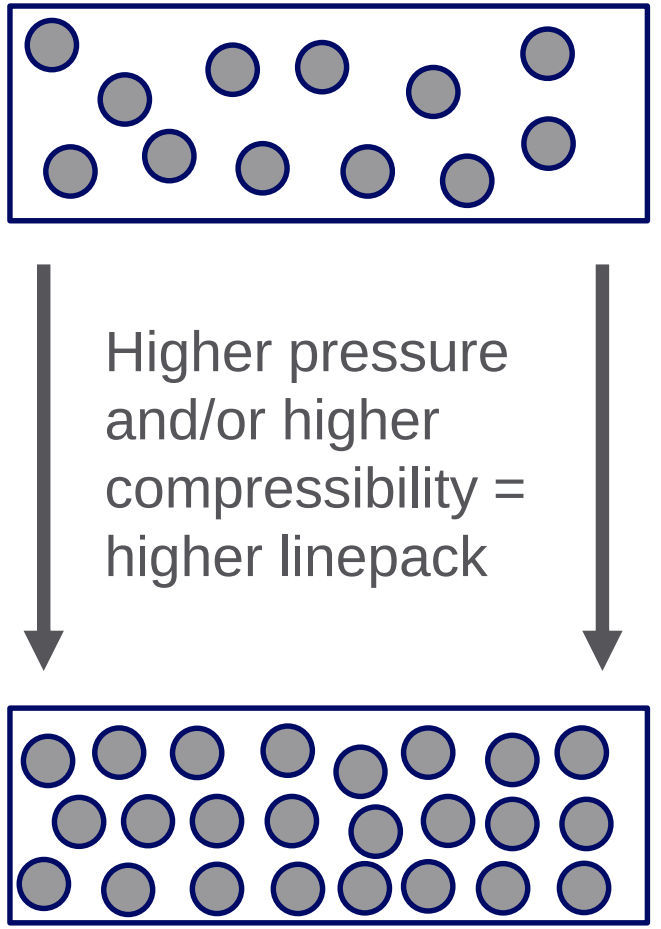


What is Linepack?

- Linepack describes the **total** of **volume** of **gas** contained within the system
- The methodology for calculating actual linepack is set out in our Transporters Licence and is publicly available
- Linepack considers only volume and is measured in millions of cubic meters, which is the volume the gas would cover at standard atmospheric pressure



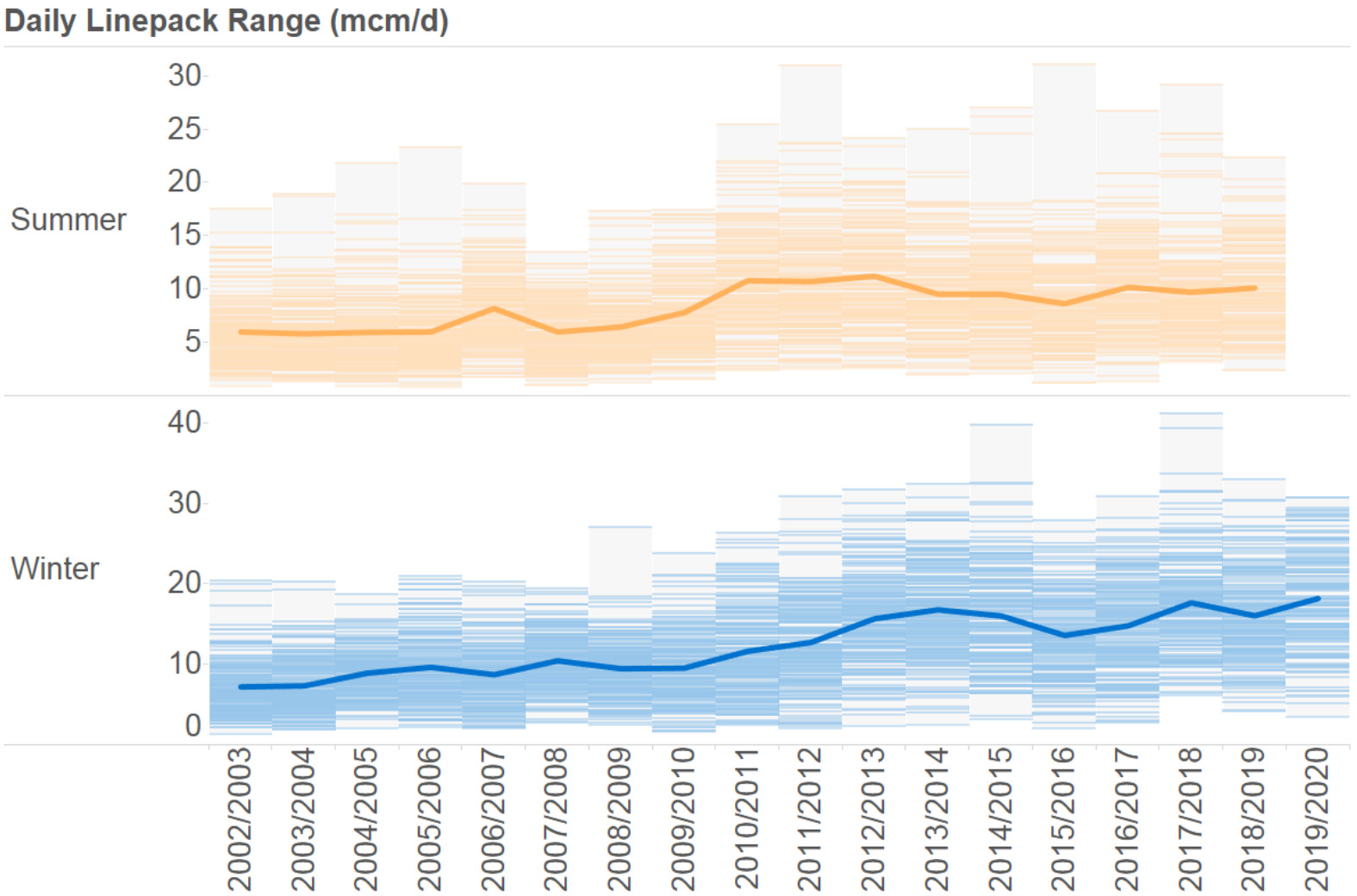
Same pressure but increasing compressibility



More molecules in the same space

Reliance on assets to provide market flexibility ...

- There are an increasing number of days where **market operation** is using up more of the **available linepack flexibility**
- Consequently the system is becoming **less resilient** to **asset failures**



… with only a Residual Balancing Services Role

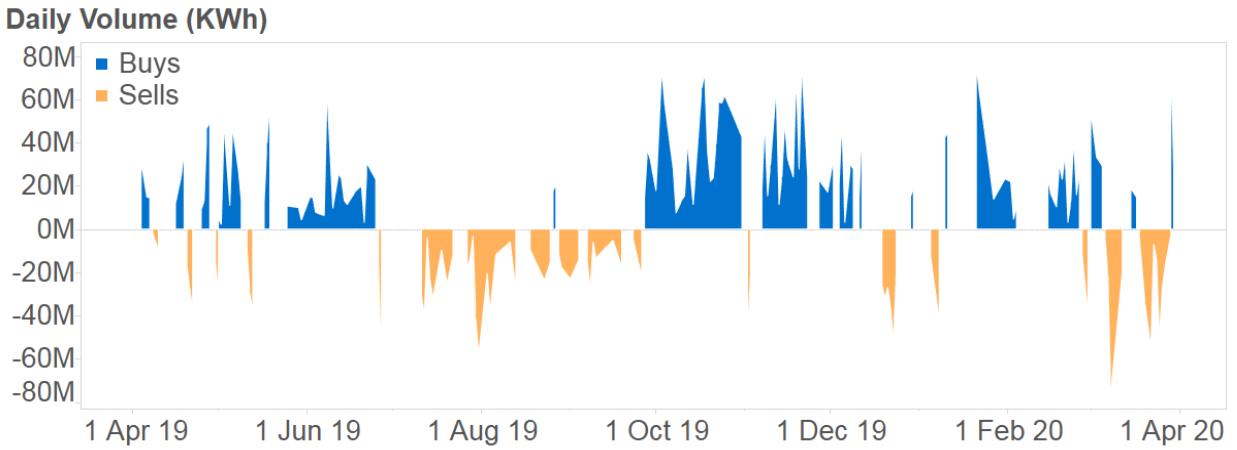
GSO Total £29M

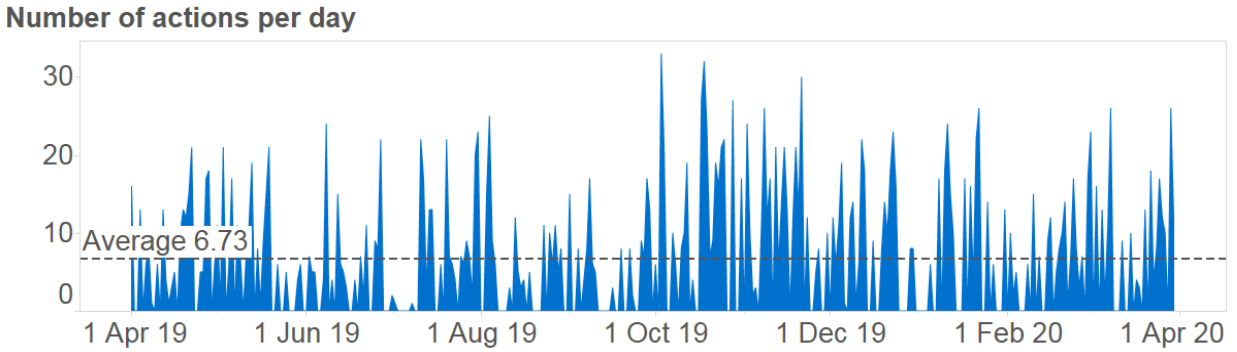
- Energy (OM & Balance) £28M
- Constraint £1m
- Stability Services N/A

Amount of Energy Transported :

(Demand on Transmission Network)

GSO Balancing Actions (1 Action = 1 OCM Title Trade)

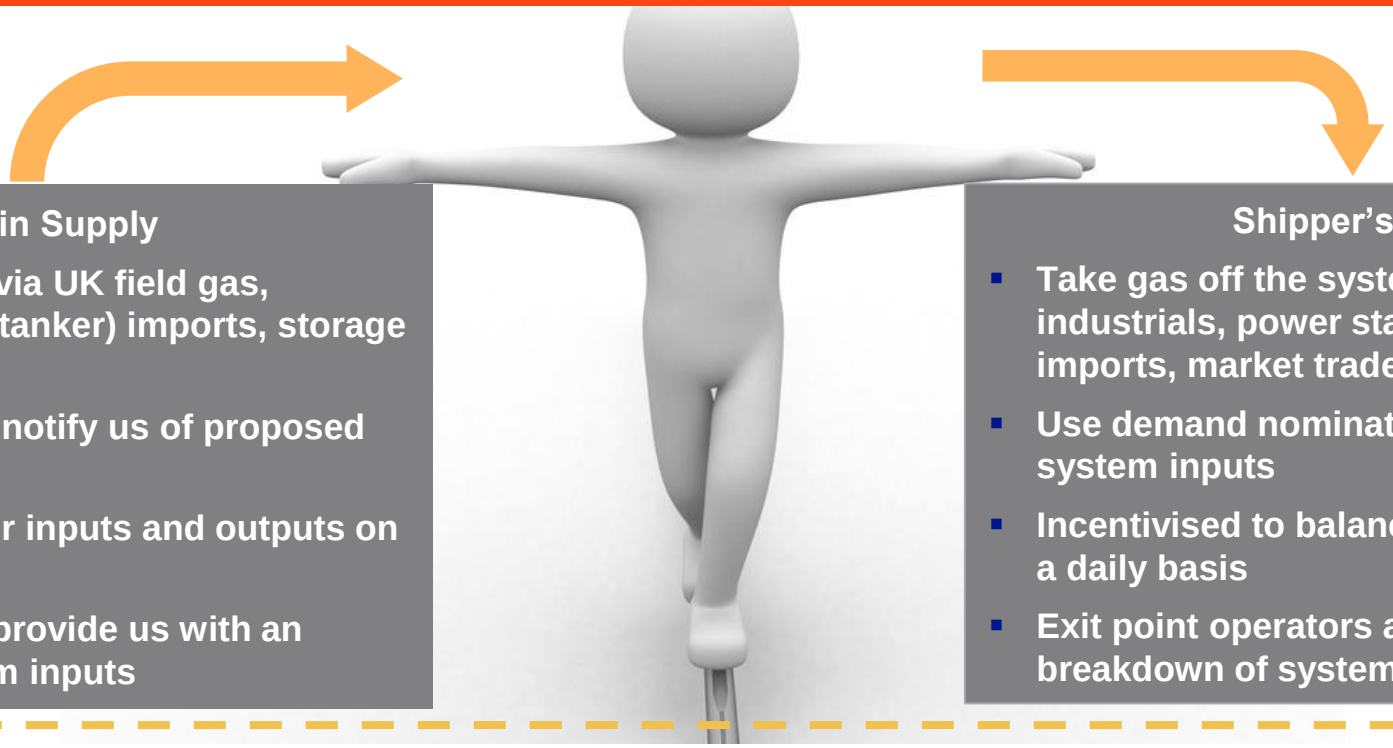




(All figures19/20)

Ensuring the Balance

- **Both Shippers and National Grid have established roles**



Shipper's Role in Supply

- Bring gas onto the system via UK field gas, pipeline imports, LNG (sea tanker) imports, storage exports, market trade buys
- Use supply nominations to notify us of proposed system inputs
- Incentivised to balance their inputs and outputs on a daily basis
- Entry point operators also provide us with an hourly breakdown of system inputs

Shipper's Role in Demand

- Take gas off the system via distribution zones, industrials, power stations, pipe exports, storage imports, market trade sells
- Use demand nominations to notify us of proposed system inputs
- Incentivised to balance their inputs and outputs on a daily basis
- Exit point operators also provide us with an hourly breakdown of system outputs

National Grid System Operator Role

- Ultimate responsibility to ensure safe operation of the grid on a daily basis (5am to 5am)
- Monitor supply/demand & transport gas for shippers whilst managing the system line pack
- Provide real time information to assist shippers with their balancing
- Enter the ICE exchange (The On-the-day commodity market - OCM) to buy and sell title gas if shippers do not balance effectively
- Over the counter title gas is traded under the Short Term Flat NBP (National Balancing Point) 2015 Terms & Conditions

Ensuring the balance - Incentives are key

DURING THE DAY

- Real time balancing information supports shipper's commercial decision making
- National Grid enters the market to balance if shippers do not balance effectively
- A penal system of imbalance pricing provides a flexible incentive for shippers to balance
- The default System Buy Price is 1.11p/therm higher and the system sell price is 1.11p/therm lower than the system average prices
- During the gas day, National Grid may trade to move these prices further away from the system average price, increasing the penalty on out of balance shippers

AFTER THE DAY

- Shippers daily balance is calculated (gas brought on to the system minus gas taken off the system)
- The difference between these indicates a shippers imbalance
- Shippers who are "long" sell gas to NG at the System Sell Price
- Shippers who are "short" buy gas from NG at the System Buy Price
- NG is neutral to any charges or credits which is "smeared back" based on system usage

Inputs & Buy Trades – Outputs & Sell Trades

= a Shippers imbalance

SYSTEM OPERATOR INCENTIVES

The Balancing Incentive

- Driving economic and efficient balancing actions

The Line pack Incentive

- Ensuring closing the day as close to opening balance as possible

Providing information in real-time

http://mip-prod-web.azurewebsites.net/StatusView

We have recently released a new version of Prevailing View (System & Market Summary)

Further enhancements to the page will be included in future releases e.g. data ranges on charts, IT system messages

More standardised design tools used means that future changes can be made more efficiently

Where it all happens : The Gas National Control Room

A DAY IN THE LIFE OF THE VIDEO

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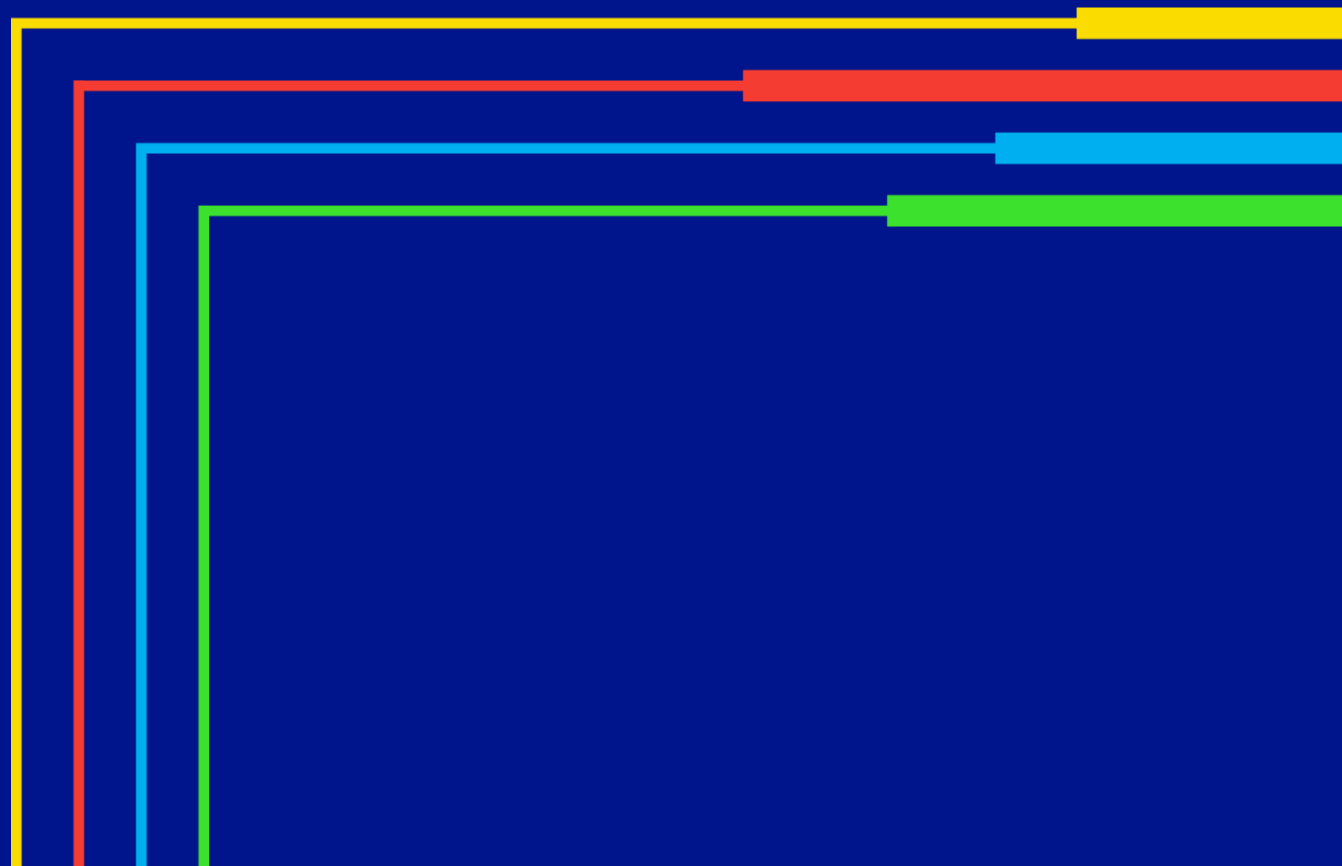
Part II : Impact of COVD-19 on UK Gas Demand



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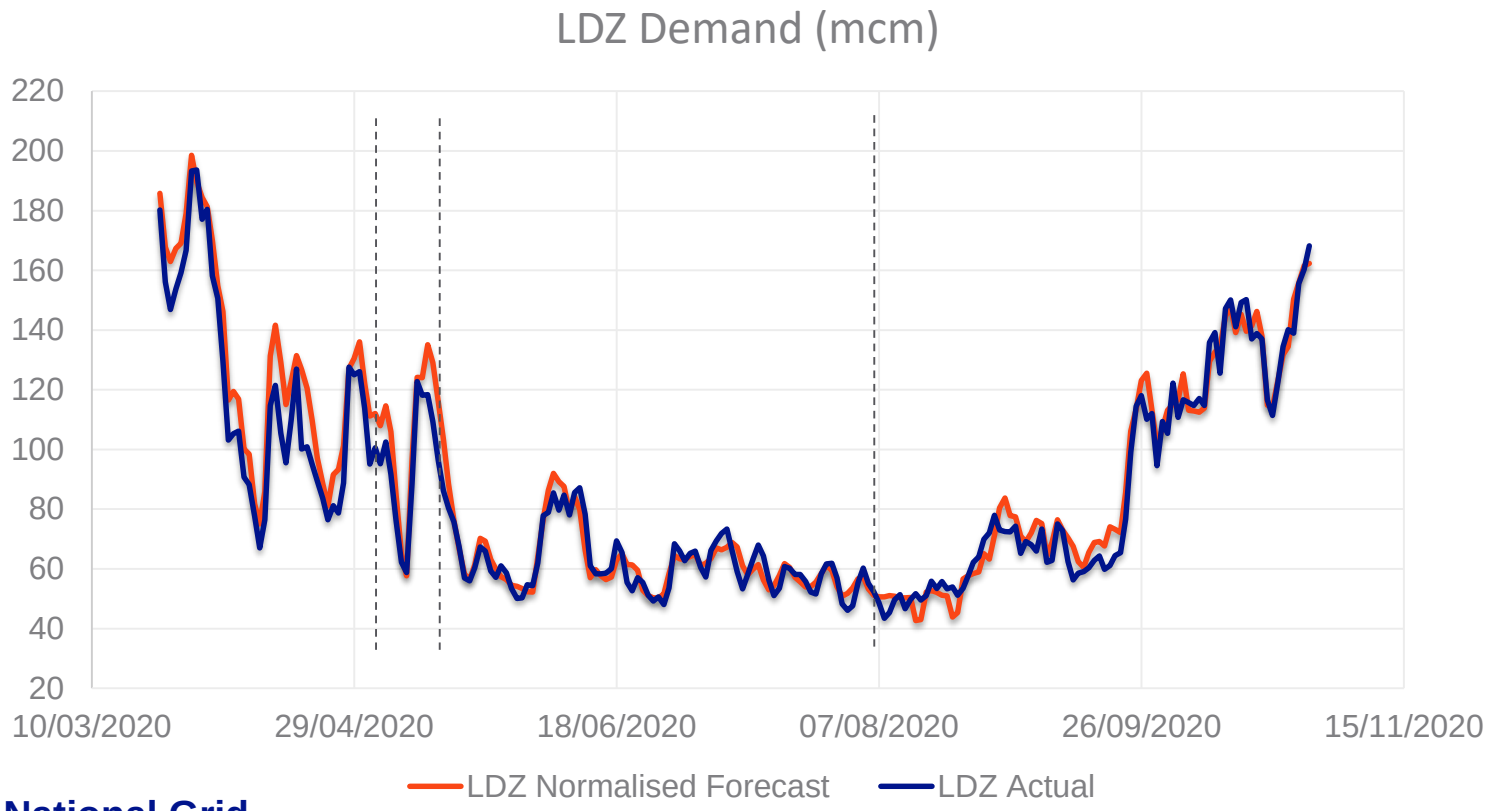
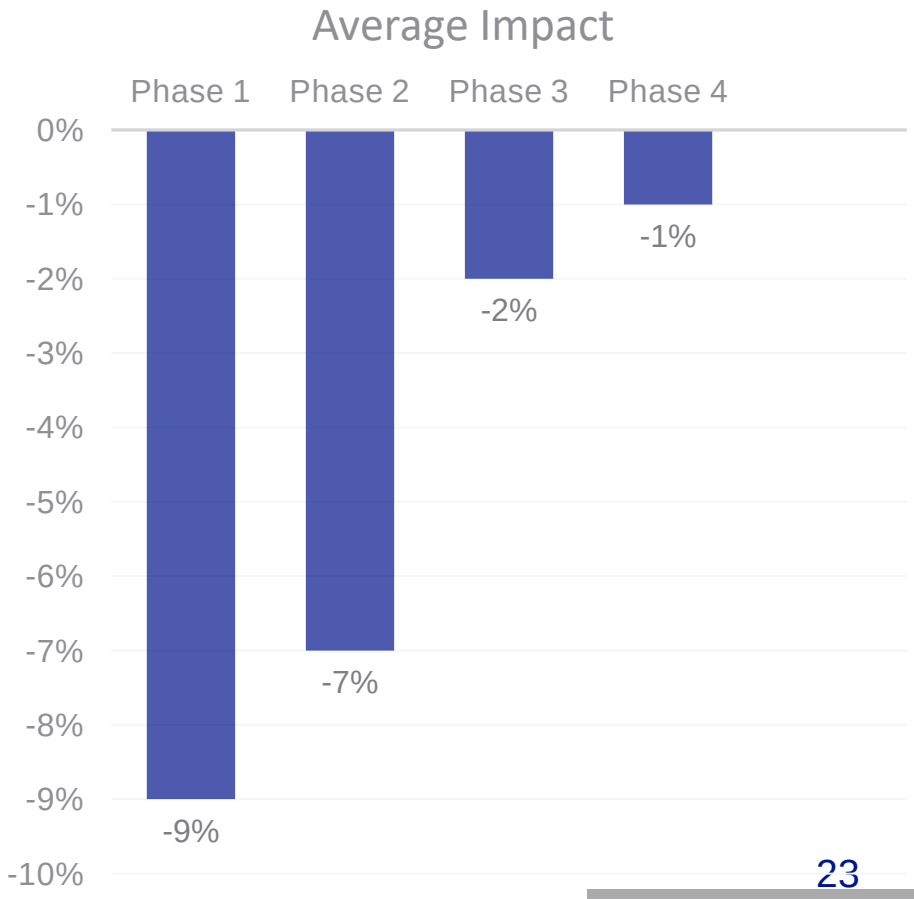
Local Distribution Zone (LDZ) Demand

On a National Level, the overall **reduction** in LDZ **Demand** (compared to expected demand based on CWV was **9%** to begin with

This was due predominantly to **embedded Industrial** and **Power station** reductions, and the impact has periodically reduced over time as Industry has ramped up



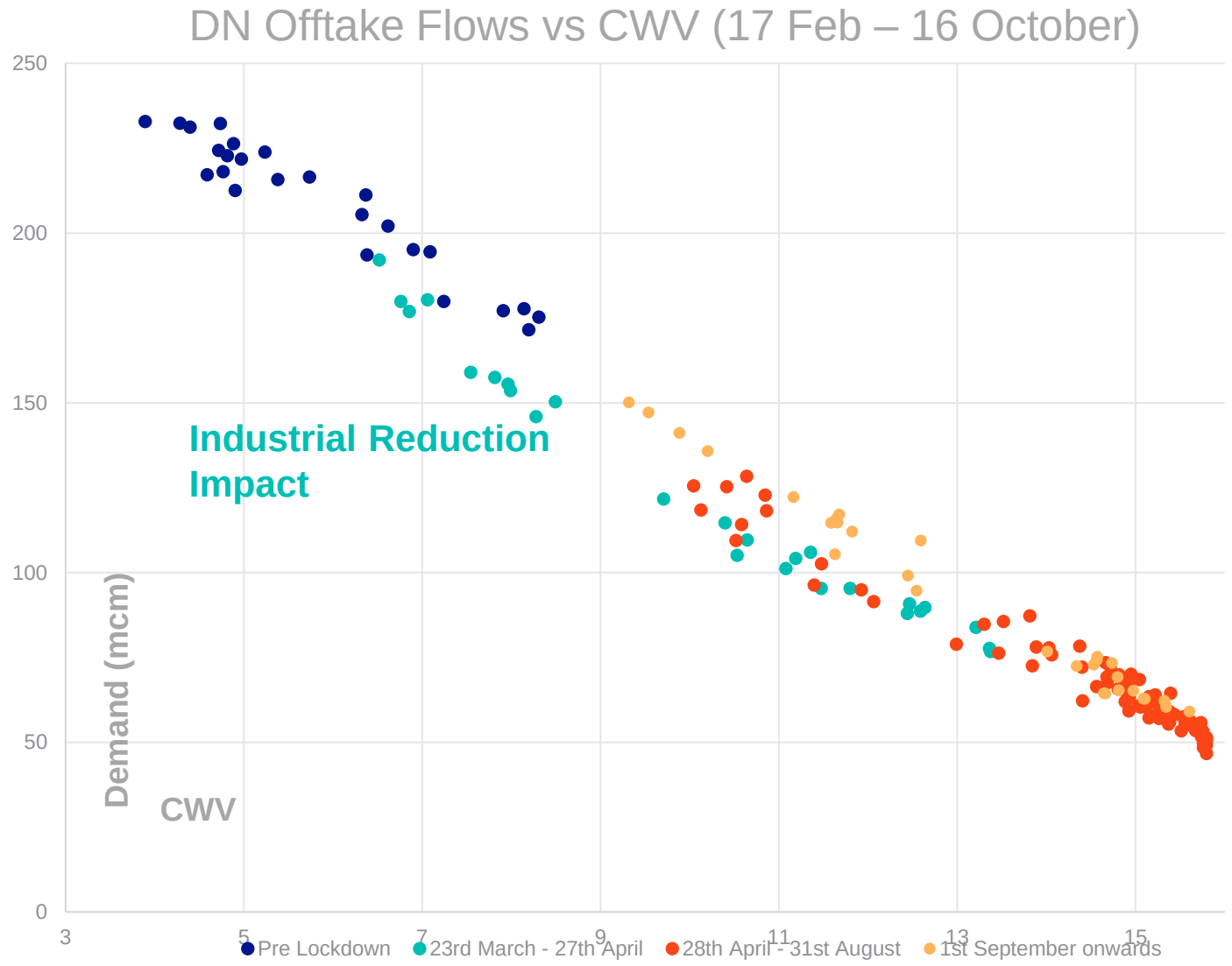


Covid-19 Demand Impact

Impact to date has largely been on **Industrial** and **Power station demand**

Currently there is **no clear impact** on **domestic** demand

- Relatively **mild weather** still so would not expect to see an impact yet
- Demand actuals, within day profiles and UIG will help to understand domestic use as temperatures drop



Quick poll

Has this overview been helpful?

Yes | **Somewhat** | **No**

Please explain your answer

What else would you like to see?

Q&A

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Thank you for joining us today

Building skills today for a Net Zero	Mon 09th Nov @ 13.30 – 14.30	Register here
Reducing methane emissions: opportunities and barriers	Thu 12th Nov @ 11.00 – 12.00	Register here
Gas Markets Action Plan (GMaP)	Mon 16th Nov @ 10.00 – 11.00	Register here
Mapping our hydrogen transition	Wed 18th Nov @ 14.00 – 15.00	Register here
Net Zero construction2025/26 roadmap	Thu 19th Nov @ 10.00 – 11.00	Register here
Heating our homes in a Net Zero future	Fri 20th Nov @ 9.00 – 10.00	Register here
Planning the network	Mon 23rd Nov @ 14.00 – 15.00	Register here
HyNTS FutureGrid	Tue 1st Dec @ 14.00 – 15.00	Register here

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Thank you