Gas as a key enabler of flexible electricity generation

THE ROLE OF GAS IN THE ENERGY TRANSITION
Rapidly growing intermittent renewables have created a compelling need for increased flexibility within GB power market

Intermittent renewables have been rapidly displacing conventional thermal generation in GB ...

...which has resulted in a greater mismatch between supply and demand at particular periods of time

Source: DUKES, NG – Slow Progression.

* Storage includes pumped hydro storage and batteries.
Value of flexibility offered by different technologies depends on their technical characteristics, but a role for gas remains in the short run.

Supply, demand and storage solution can each contribute to the system’s need for flexibility...

...but some technologies have their natural ‘niche’ areas where they can monetise their value.

Legend
“Old world” sources of flexibility
“New world” sources of flexibility

- **Wholesale market**
  - Interconnectors and fossil fuels best placed
  - DSR / storage have not found route to arbitrage yet

- **Balancing Mechanism**
  - Fast flexibility required, ‘nimble’ plants have an advantage (e.g. recips, pumped hydro)

- **Capacity Market**
  - Recips have been the winners (initially diesel, later only gas), but less so in 2018 after the triads cut
  - Short-duration batteries now less prominent

- **STOR**
  - Long-term STOR contracts are an advantage
  - Recips have been successful, but market highly competitive

- **Fast Reserve**
  - Historically a niche area for pumped hydro...
  - ...but recips have been making some headway

- **Firm Frequency Response**
  - Very fast flexibility required, suited to storage
  - Recips have sought to enter this market too

- **Embedded benefits**
  - Historically a key source of revenue for distributed plants, but now reduced through triad cuts
Gas recips. have exploded onto the scene but profitable growth is a complex game of ‘bash the weasel’...
....as recent regulatory interventions and market outcomes have reduced investor certainty

**Initial business case: distributed gas**

<table>
<thead>
<tr>
<th>Capacity market</th>
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</thead>
<tbody>
<tr>
<td>• Prices ~£20/kW in the initial auctions, but most recently at £8.4/kW</td>
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<tr>
<td>• Previously seen as reliable baseline revenue, but recently too low</td>
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<th>Embedded benefits</th>
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<td>• Initially seen as reliable revenue...</td>
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<tr>
<td>• ...but recent cuts to triads aimed at restoring ‘level playing field’ in CM to the detriment of recip</td>
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**Recovering lost EB revenue**

<table>
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<th>Wholesale market</th>
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<tr>
<td>• Increasingly sharper peaks: harder-to-hit but more valuable opportunities</td>
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<tr>
<td>• Fundamentals may worsen as RES increasingly ‘self-balancing’</td>
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<th>Balancing mechanism</th>
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<tr>
<td>• Historically set up for large plants, so not everyone benefits equally</td>
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<tr>
<td>• BM Lite could increase competition for all parties</td>
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**Continued investment uncertainty**

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<td>• Ongoing policy risks through CM reforms</td>
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<tr>
<td>• Uncertain future prices, which may only pick up in the mid-2020’s when coal shuts down</td>
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<tr>
<td>• Benefits as such appear to be gone</td>
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<tr>
<td>• Value of being ‘distributed’ currently uncertain and not fully monetised</td>
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<th>Ancillary services</th>
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<tr>
<td>• SO reforms likely to have limited impact...</td>
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<tr>
<td>• ...but competition already stiff and DSO reform might not help</td>
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<th>Wholesale market / BM</th>
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<td>• Increasingly saturated markets where flexibility providers compete for a small number of highly valuable hours</td>
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<tr>
<td>• Forecasting capabilities and willingness to take risks key drivers of success</td>
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</table>
The Capacity Mechanism has been an important source of revenue for providers of flexible generation, but will this continue?

- **2014**: £19.4 / kW
  - 2.1 GW OCGT + recip

- **2015**: £18 / kW
  - 2.4 GW OCGT + recip

- **2016**: £22.5 / kW
  - 3.8 GW OCGT + recip

- **2018**: £8.40 / kW
  - 2.7 GW OCGT + recip
Gas power generation could grow significantly if ‘green gas’ becomes mainstream, but electrification is a potential game-changer.

**Decarbonised gas**
- Maximum use of gas in the power sector with **43GW of gas with CCS** supporting renewables
- Hydrogen-based transport and heat could drive growth in gas demand (avoiding roll-out of heat pumps)

**Two degrees**
- Mixed approach with some heat and transport electrification...
- ...combined with increasing volumes of ‘green gas’

**High electrification**
- Power generation virtually decarbonised...
- ...but **21GW of gas with CCS** remains to balance renewables
- Electric vehicles and heat pumps dominate heat and transport sector

**Key uncertainties**
- Hydrogen as ‘green gas’
- Carbon Capture and Storage
- Heat pumps
- Electric / CNG transport

*Source: National Grid Future of Gas 2017*
Long-term drivers of gas-based flexible power generation are complex, creating significant uncertainty for prospective investors.

**Technology**
- Continued intermittent renewables deployment
- Green gas (hydrogen)
- Gas with CCS

**Commercial**
- Speed of reduction in storage cost
- Impact of co-location of storage and renewables
- Speed of increase in DSR reliability
- Large-scale electrification of heat / transport
- Commodity prices (driven by import, storage, UKCS and LNG factors)
- Arbitrage & stacking route to market (storage)

**Policy**
- Environmental restrictions on fossil fuels
- Philosophical preference for CCGTs
- New nuclear
- Market reforms (triads, CM,...)

**Impact**
- Speed of increase in DSR reliability
- Decentralisation of the power system
- Commodity prices (driven by import, storage, UKCS and LNG factors)
- Speed of reduction in storage cost
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Any questions?

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