

UK Future Energy Scenarios 2013



Richard Smith
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National Grid

Political uncertainty



Economic uncertainty



Social uncertainty



Technology uncertainty

Fracking – game-changer in world energy markets

Hydraulic fracturing – also known as “fracking” – is a two-phase process to extract natural gas from prehistoric shalebeds thousands of metres below ground. The first phase includes drilling the wells, the second uses high-pressure blasts of water and sand-laden gel to fracture shale rock and release gas

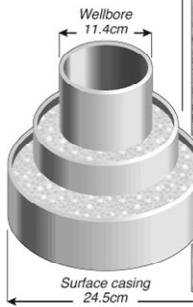
DRILLING PHASE

Drilling rig: Time to drill each well from *spud* – point of breaking ground – to *total depth (TD)* is about three to six weeks depending on depth and length of horizontal well. (Record for 4,000-metre well is 7.5 days)

Reserve pit: Used to store drilling mud and cuttings

Aquifer: Water-bearing rock is at average depth of 100 metres

Fresh water protection: Three sets of steel casings are cemented into place to prevent accidental pollution of drinking water aquifers

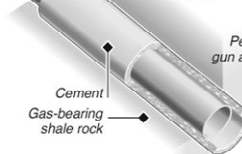


Shale layer: Rock formations are 1,000-2,500m underground

Kick-off point: Drill turns horizontal, roughly 150m above shale. Horizontal section extends up to 3,000m

Wellbore: Steel pipe surrounded by cement

Jet perforation: Holes punched through wellbore, cement and adjacent rock by shaped explosive charges – similar to those used in anti-armour ammunition

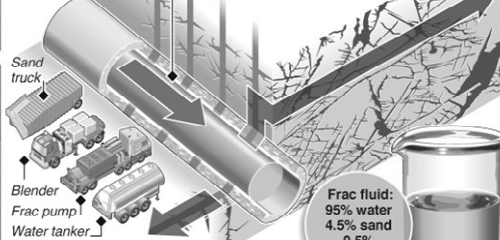


FRACKING PHASE

1 Hydraulic fracturing fluids: Water, sand and additives are pumped at extremely high pressure – over 100 bar, about 1,500 pounds per square inch (1,050kg/sq m) – down wellbore



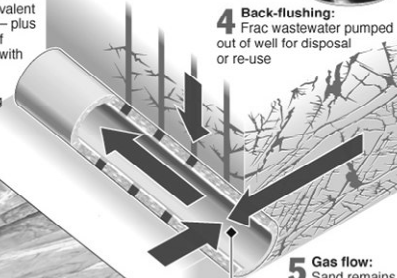
2 Continual pumping: Increases pressure of frac fluids in well, breaking rocks apart. Fracking continues until rocks are cracked to desired length, about 200-300m



Frac fluid: 95% water, 4.5% sand, 0.5% additives

3 Injection: Typically requires 20,000 cubic metres of water – equivalent to 500 tankers – plus 1,800 tonnes of sand, blended with 100 tonnes of additives to promote gelling

4 Back-flushing: Frac wastewater pumped out of well for disposal or re-use



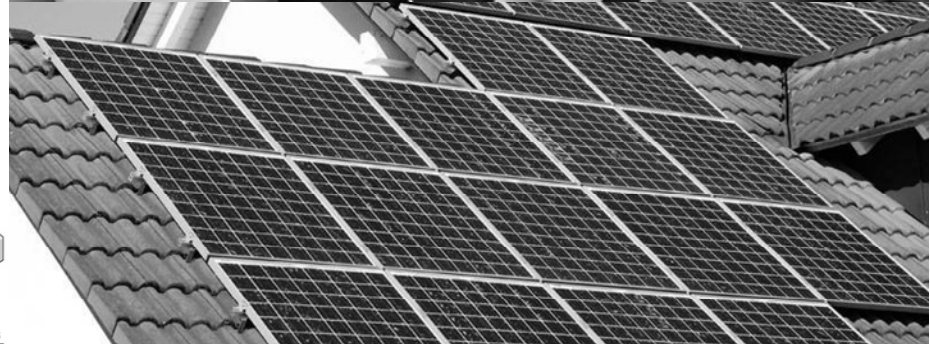
5 Gas flow: Sand remains, holding fractures open to allow gas to flow into well. Fracking process takes up to 10 days



6 Production: Well head and pipeline remain. Single well can produce thousands of cubic metres of gas per day for 20-40 years

Sources: Ground Water Protection Council, Exxon Mobil, Austin Exploration Limited

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There are many possible future scenarios...

Marcus Stewart
Energy Demand

Lauren Moody
Power Demand

Stephen Marland
Gas Demand

Mark Ripley
NG EMR

Peter Parsons
Energy Supply

Lilian Macleod
Power Supply

Simon Durk
Gas Supply

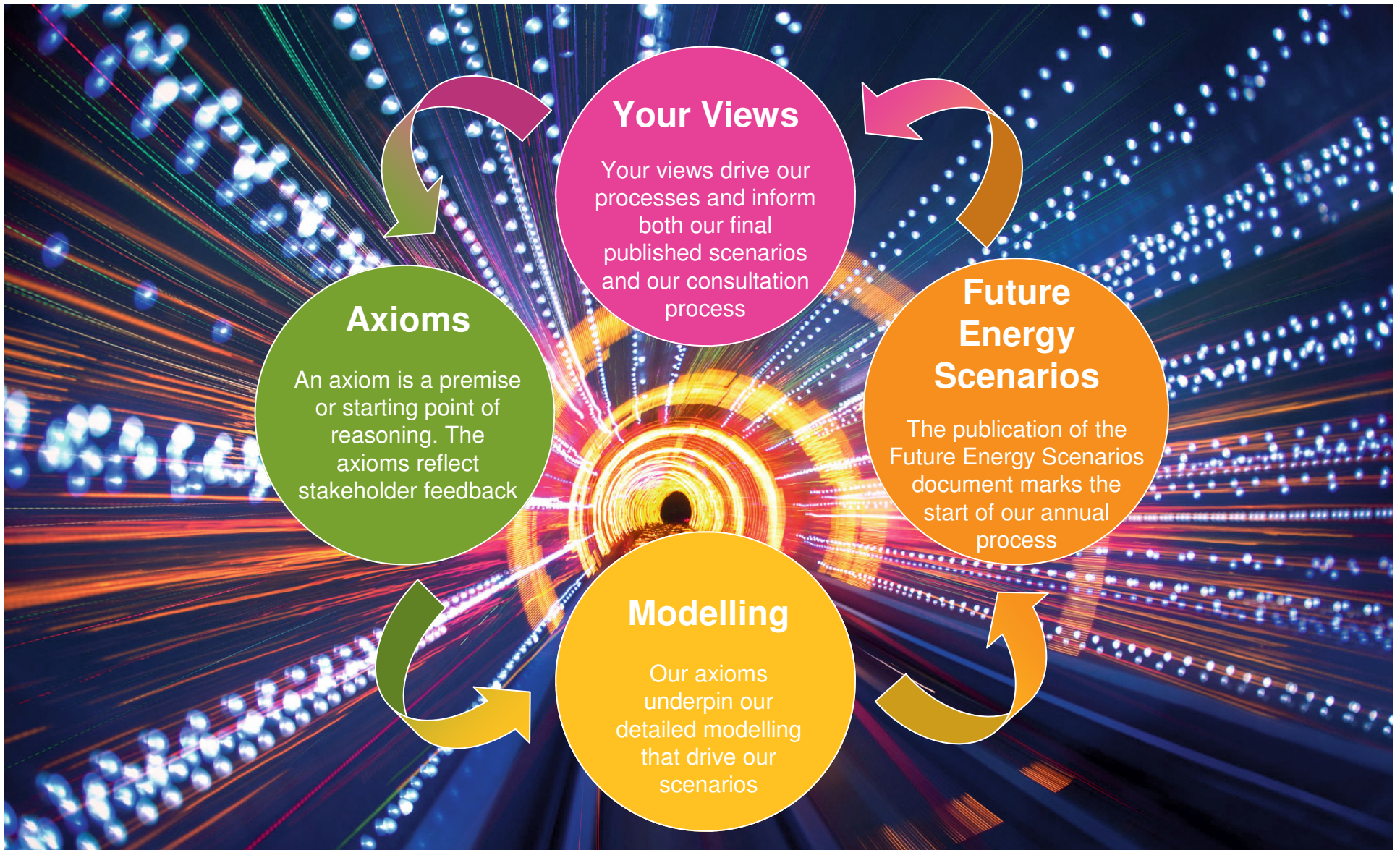
Department of Energy & Climate Change
Emily Bourne
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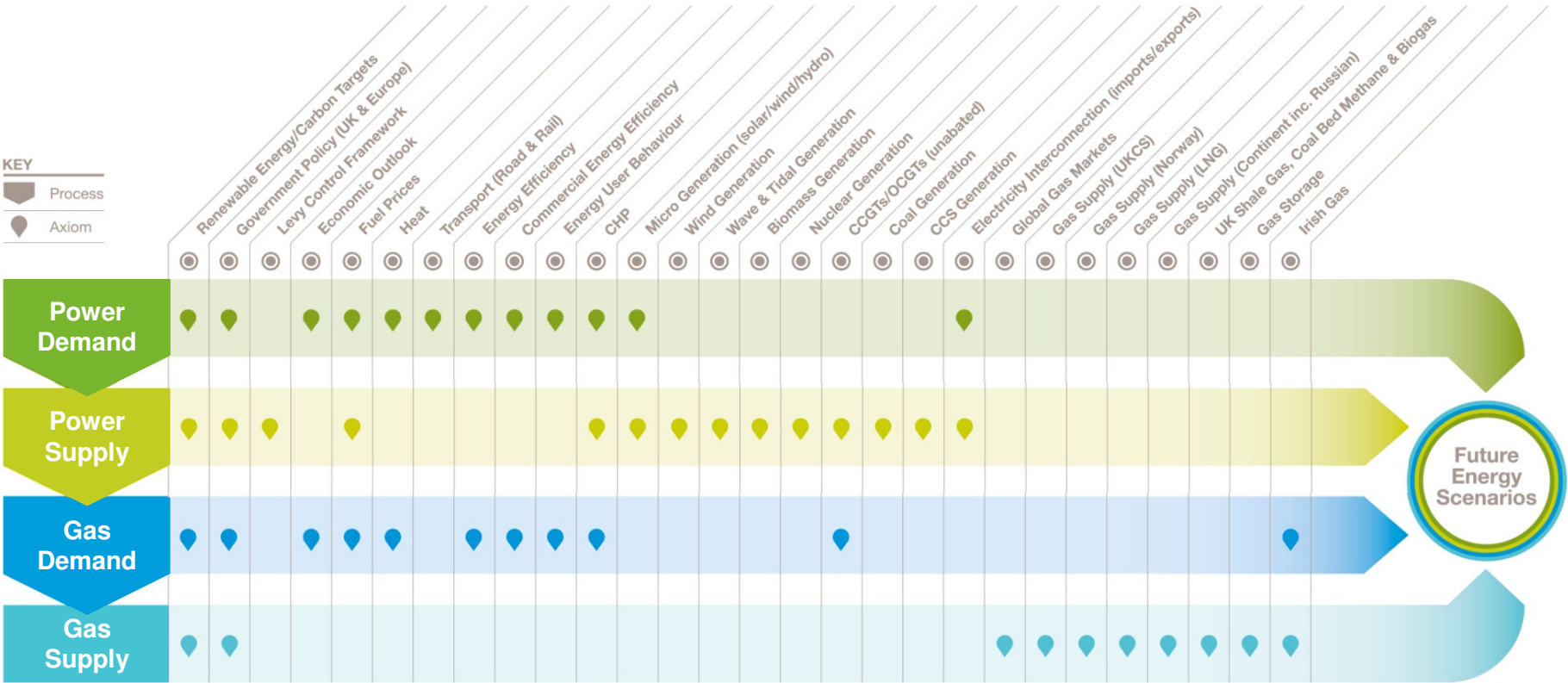
Gary Dolphin
Market Outlook

Phil Sheppard
Network Strategy

So how do we create our scenarios?



So how do we create our scenarios?



What's changed?

Accelerated Growth retired

Axioms updated & amended

Demand analysis improved

New case studies



Our 2013 Future Energy Scenarios...

Gone Green

has been designed to meet the UK's environmental targets; 15% of all energy from renewable sources by 2020, greenhouse gas emissions meeting the carbon budgets out to 2027, and an 80% reduction in greenhouse gas emissions by 2050

Gone Green Sensitivities

Case Study 1: High offshore wind

Case Study 2: High onshore wind

Slow Progression

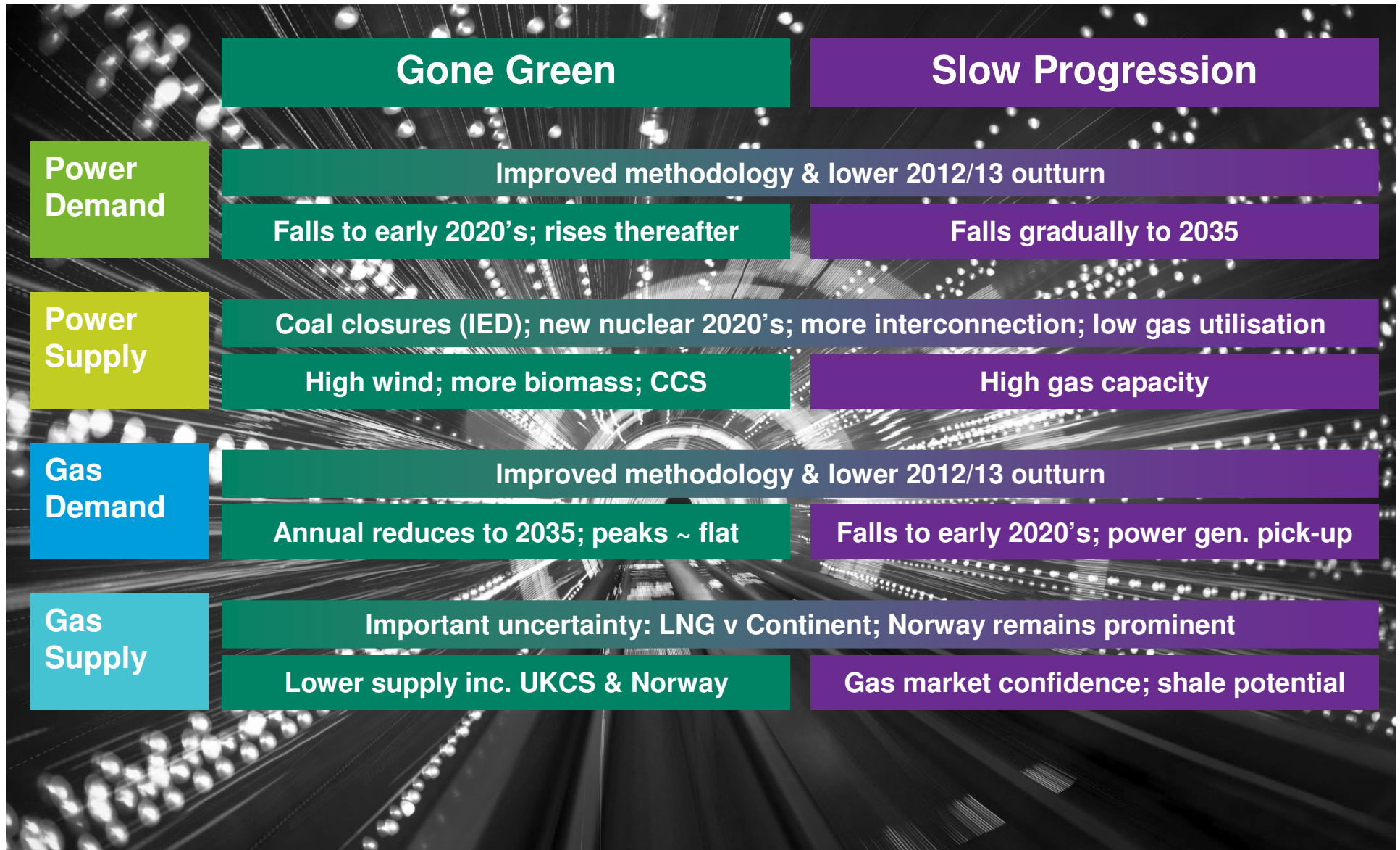
where developments in renewable and low carbon energy are comparatively slow, and the renewable energy target for 2020 is not met. The carbon reduction target for 2020 is achieved but not the indicative target for 2030

Slow Progression Sensitivities

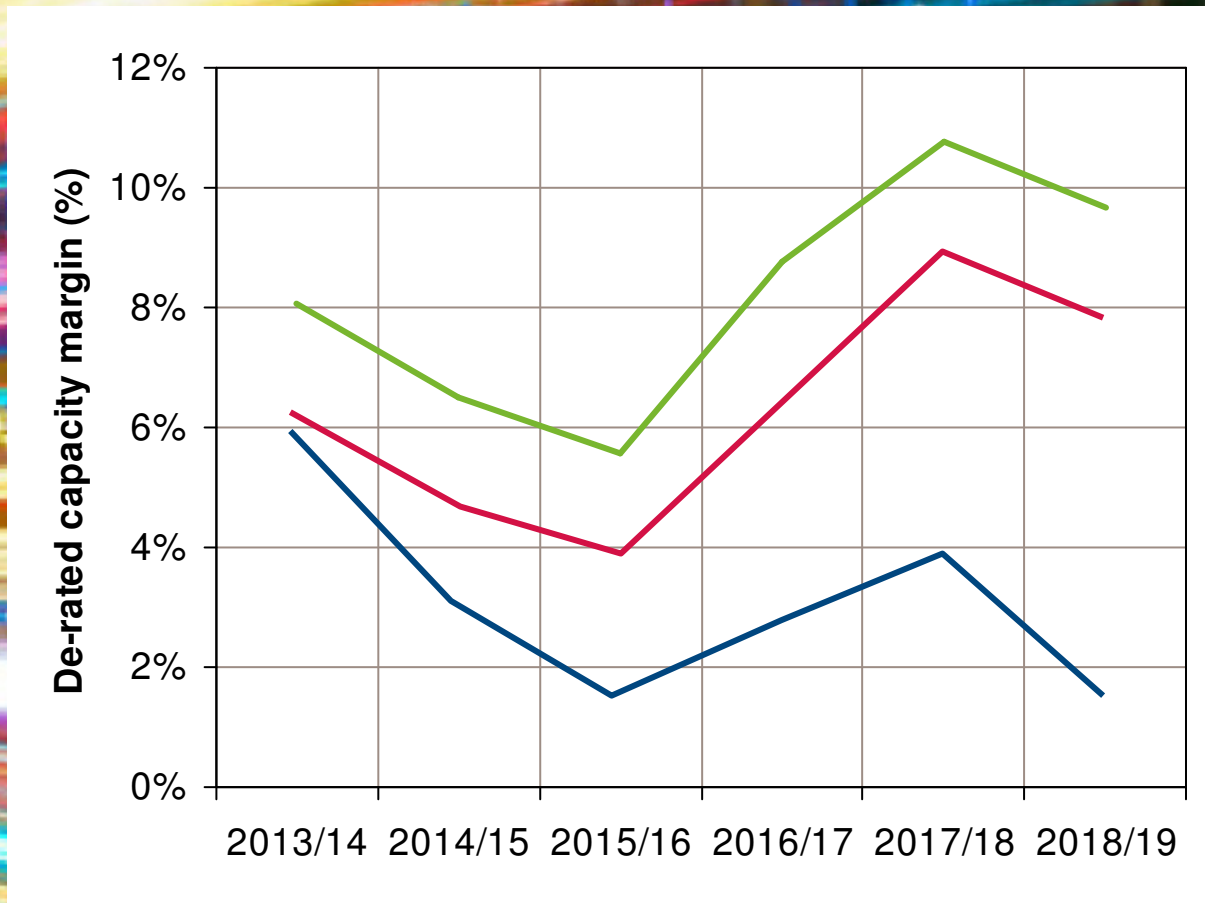
Case Study 1: High CCGT, low Coal

Case Study 2: High coal, low CCGT/biomass

Our 2013 Future Energy Scenarios...

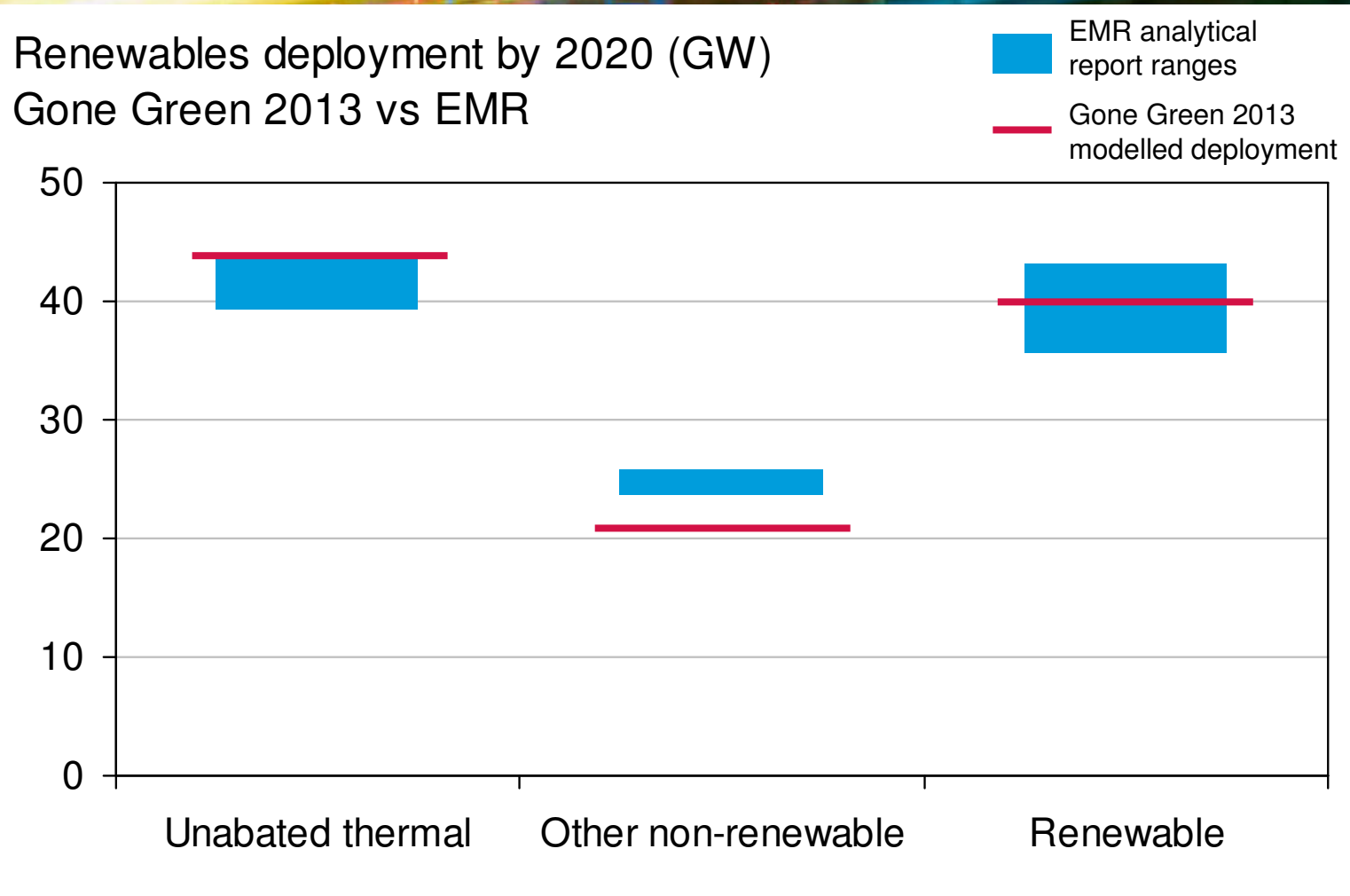


Challenges in the shorter term...



- Gone Green 2013
- Ofgem reference scenario 2013
- Ofgem high demand sensitivity

Confidence in the medium term...



Summary

Robust engagement – holistic, self consistent & transparent scenarios

Uncertainties & challenges remain

Tools to deliver are being deployed

