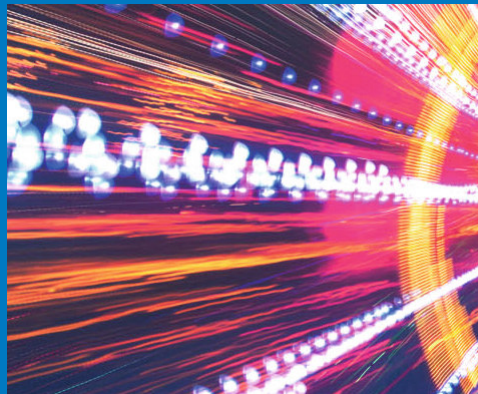


# UK Future Energy Scenarios 2013



Richard Smith  
Head of Energy Strategy & Policy  
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

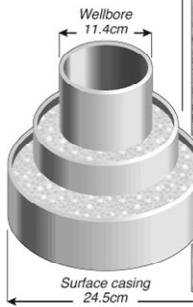
### DRILLING PHASE

**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

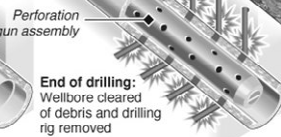
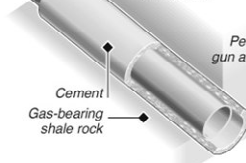


**Shale layer:** Rock formations are 1,000-2,500m underground

**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

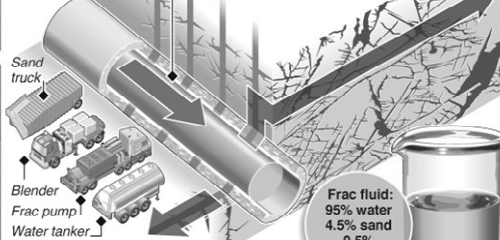


### FRACKING PHASE

**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



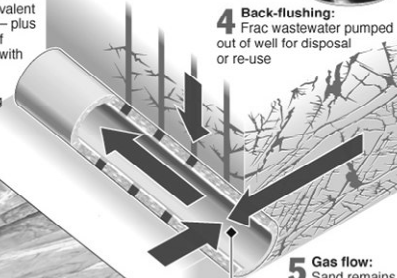
**2 Continual pumping:** Increases pressure of frac fluids in well, breaking rocks apart. Fracking continues until rocks are cracked to desired length, about 200-300m



**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



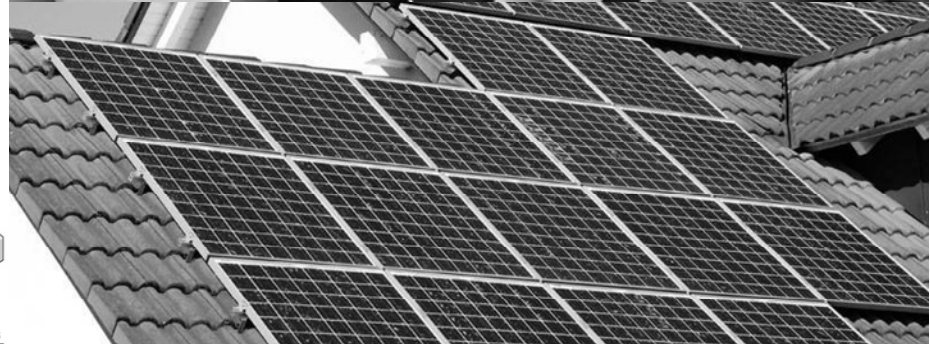
**5 Gas flow:** Sand remains, holding fractures open to allow gas to flow into well. Fracking process takes up to 10 days



**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

© GRAPHIC NEWS



# 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**

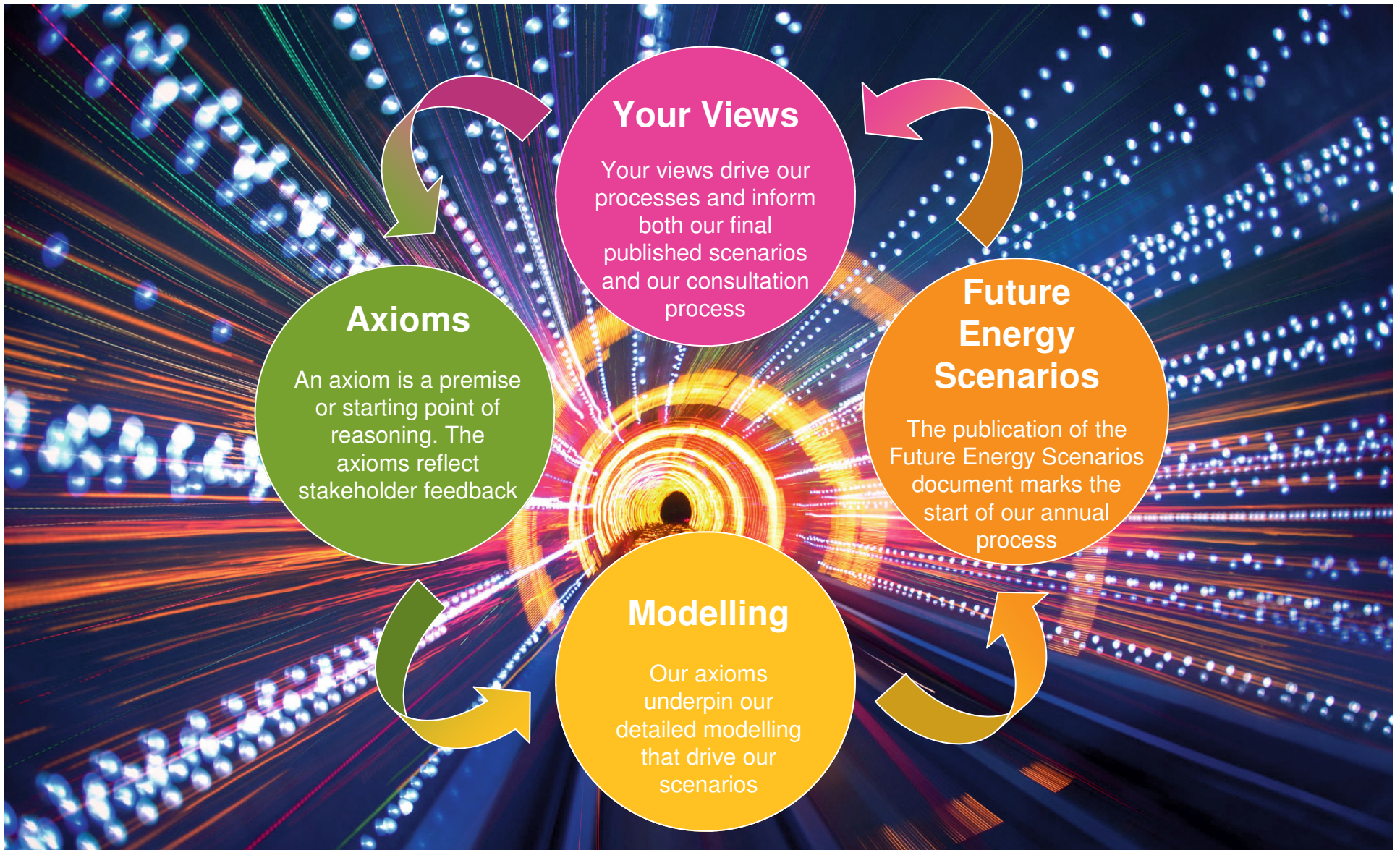
**Emily Bourne**  
DECC EMR

**Craig Dyke**  
Strategy Dev.

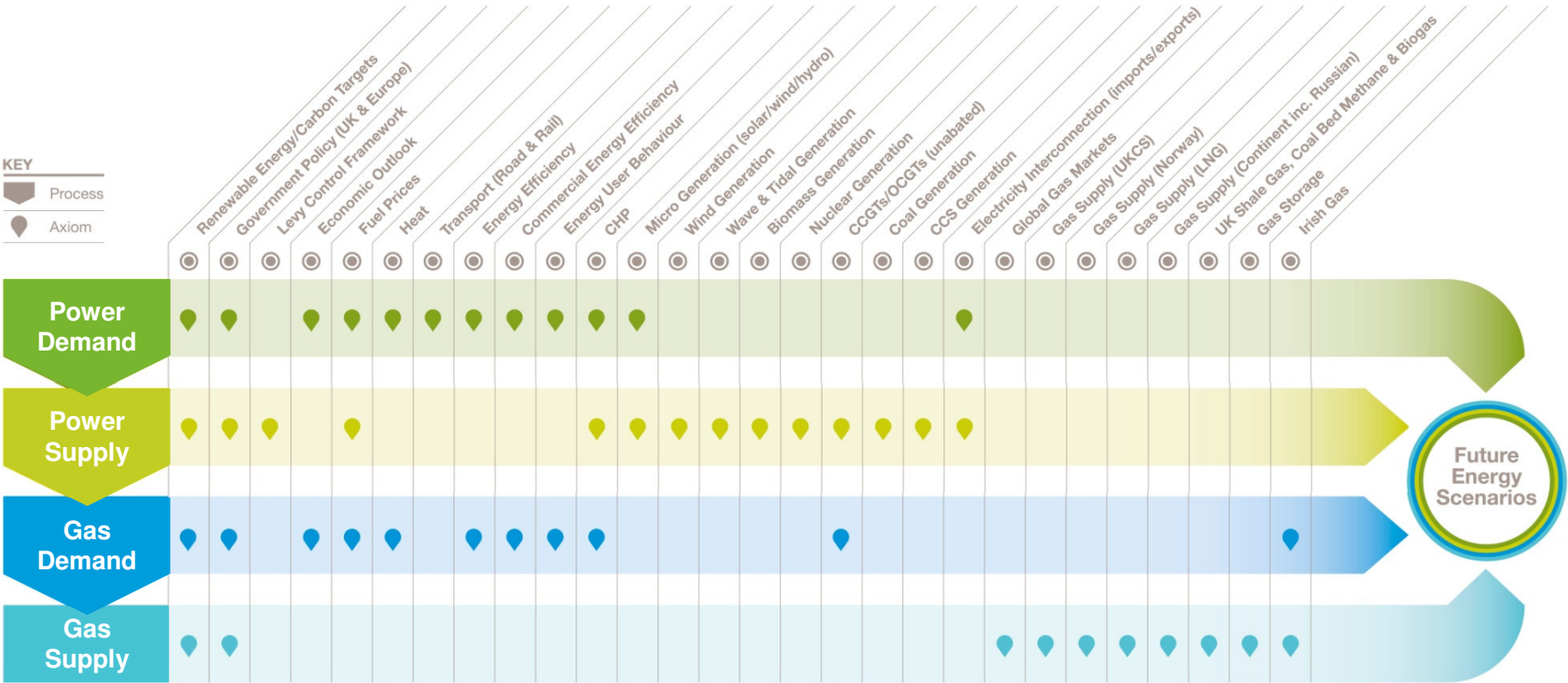
**Gary Dolphin**  
Market Outlook

**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

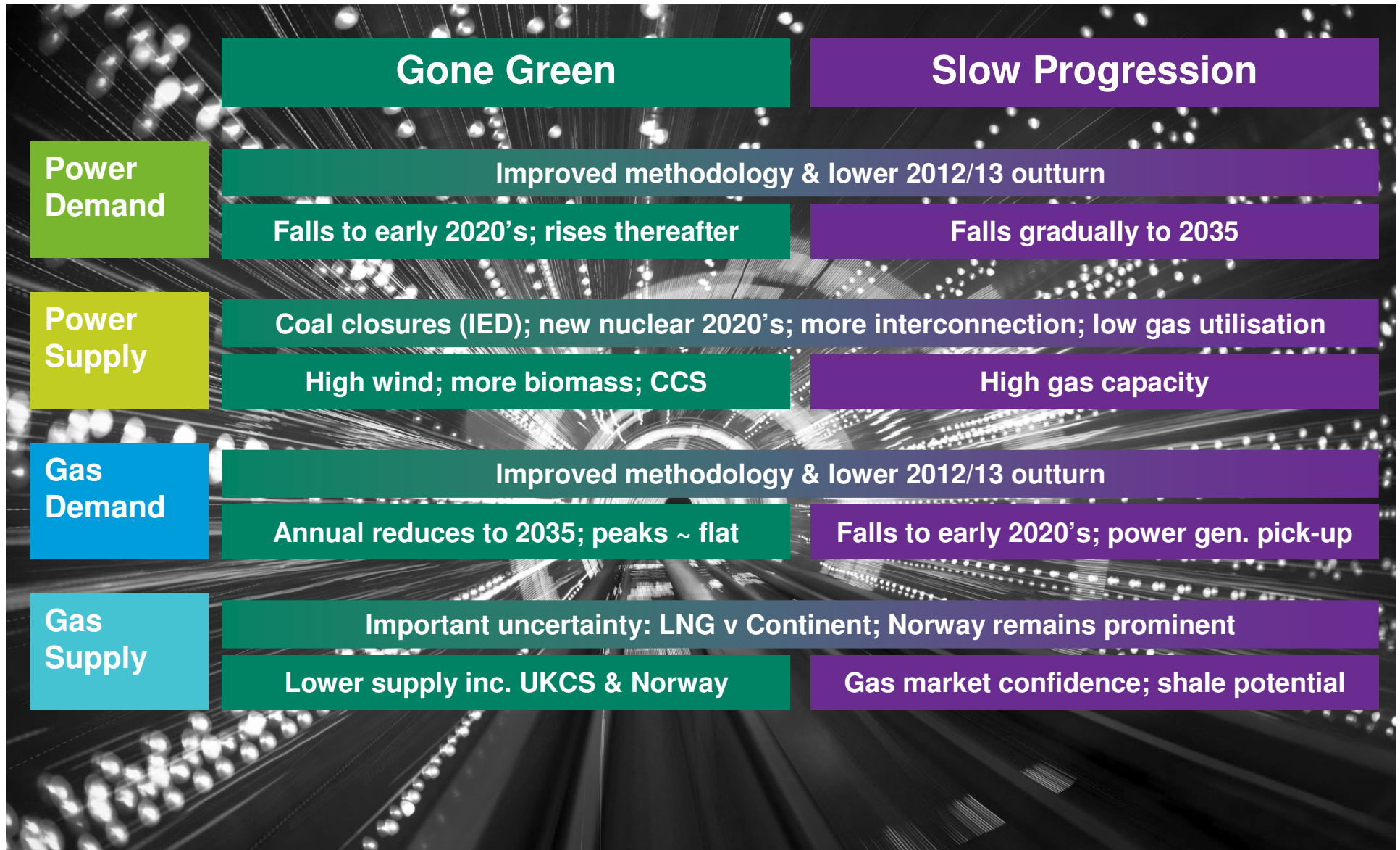
where developments in renewable and low carbon energy are comparatively slow, and the renewable energy target for 2020 is not met. The carbon reduction target for 2020 is achieved but not the indicative target for 2030

#### Slow Progression Sensitivities

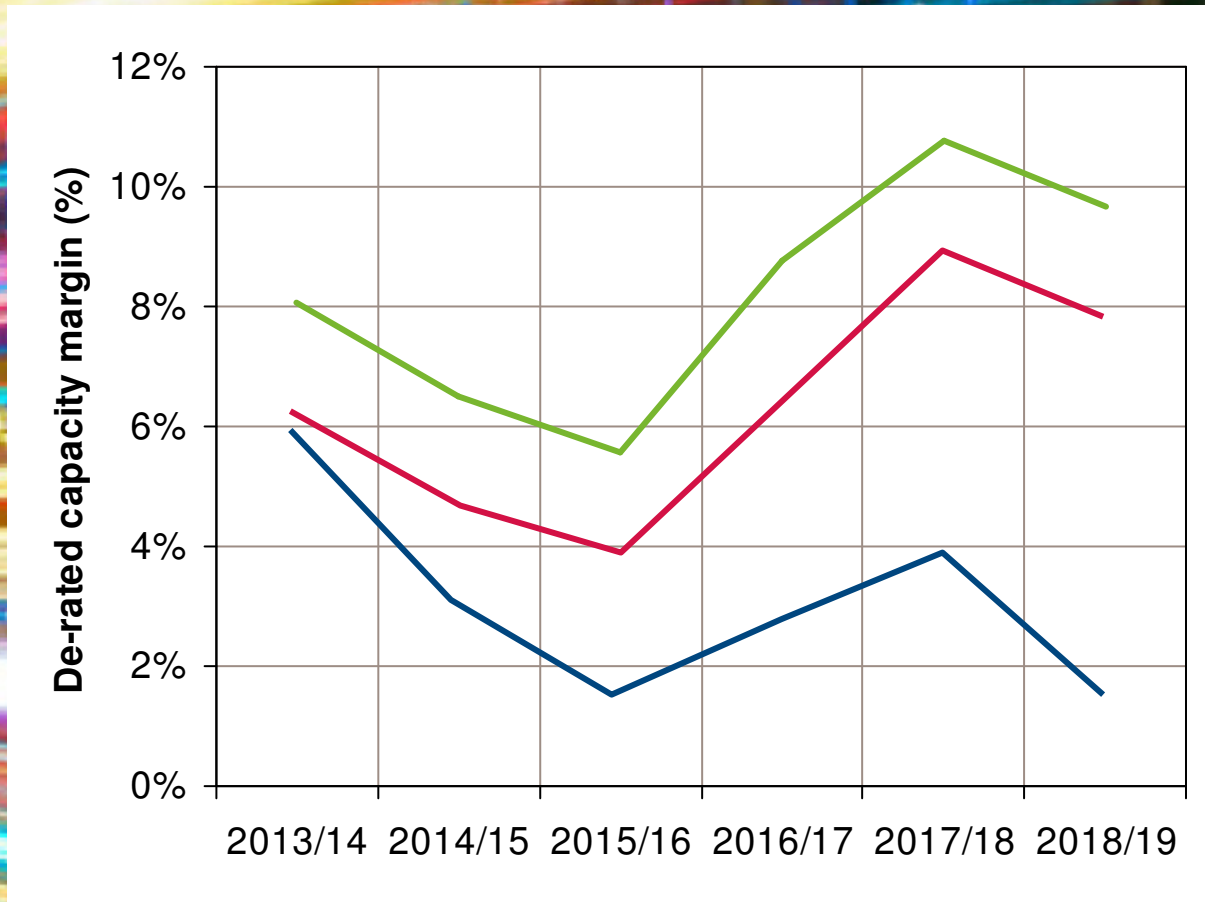
Case Study 1: High CCGT, low Coal

Case Study 2: High coal, low CCGT/biomass

# Our 2013 Future Energy Scenarios...

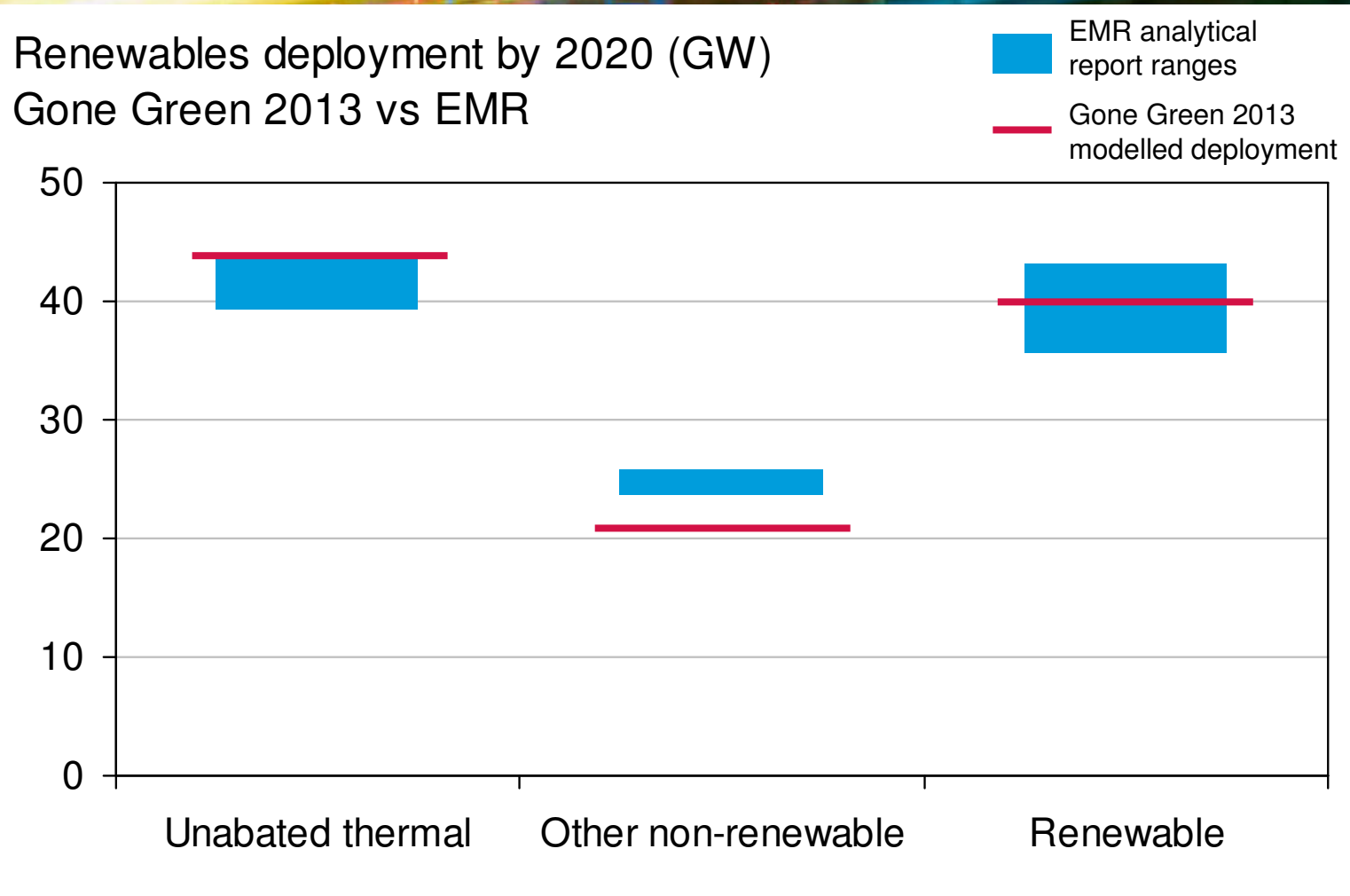


## Challenges in the shorter term...



- 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