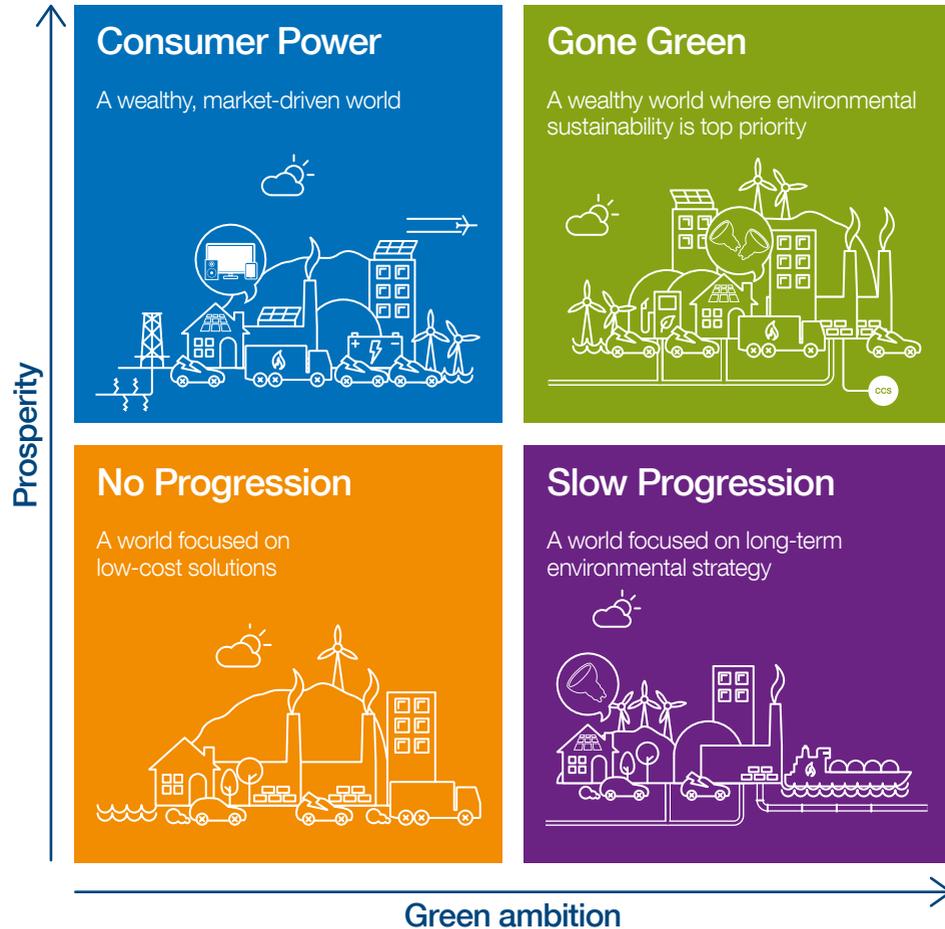


Future Energy  
Scenarios in  
five minutes

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# The 2016 scenarios



# Introduction

## What is the *Future Energy Scenarios (FES)* document?

The *FES* document outlines a range of credible pathways for the future of energy out to 2050. The scenarios outline the possible sources of, and demands for, gas and electricity in the future, and the implications of this for the energy industry.

## Why do we make scenarios?

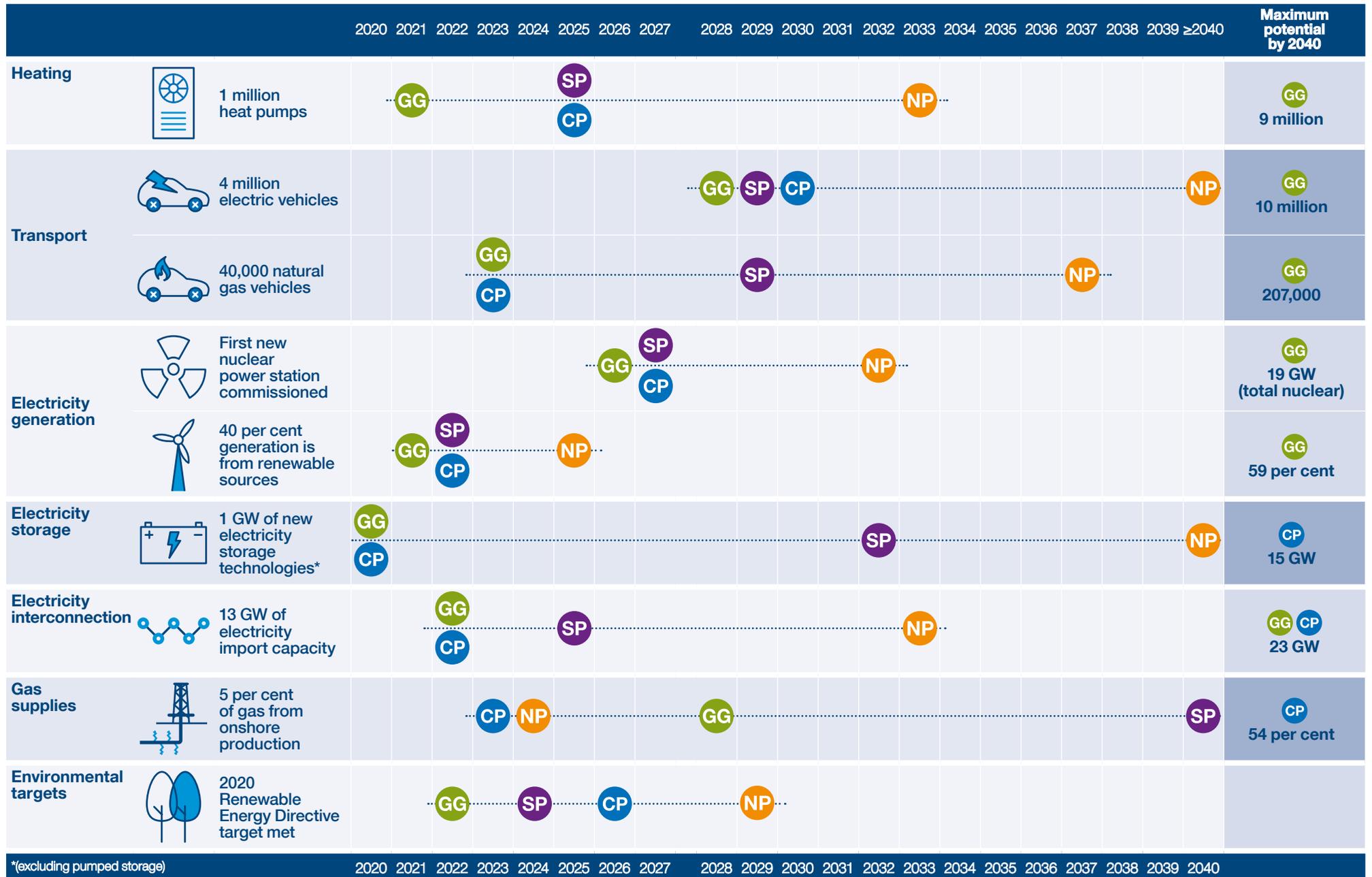
Our scenarios are used across the energy industry, driving debate and decision making. Our stakeholders tell us they use the *FES* as a reference document and a benchmarking tool for their own scenario development. The scenarios are also used within National Grid for network planning.

## How do we make our scenarios?

Every year we engage with hundreds of stakeholders through workshops, bilateral meetings and webinars. The information we gather supports and inputs into our detailed modelling.

# Scenario comparison

GG Gone Green   
 SP Slow Progression   
 NP No Progression   
 CP Consumer Power



\*(excluding pumped storage)

# Key messages

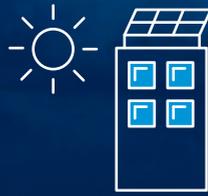
1.

The decarbonisation agenda is driving significant changes to the energy supply market. Traditional sources of supply are being replaced with an ever-divergent mix.



2.

Over the past year the volume of renewable electricity sources has increased substantially. While the electricity generation sector is on the required trajectory, significant progress is still needed in the heating and transport sectors if the UK is to meet the 2020 renewable target on time.



3.

Action needs to be taken this decade to drive progress towards the 2050 carbon reduction target.



4.

The importance of gas in GB's energy mix has been further emphasised this year. It will continue to play a key role in energy decarbonisation, by providing flexible electricity generation and top-up heating over the long term.



# Key messages

1. The decarbonisation agenda is driving significant changes to the energy supply market. Traditional sources of supply are being replaced with an ever-divergent mix.



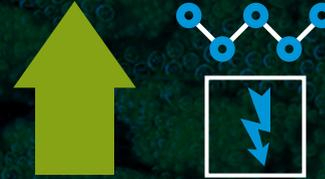
**5 GW**  
decline

Fossil fuel generation continues to decline; an extra 5 GW will close in 2016, while renewable capacities increased.



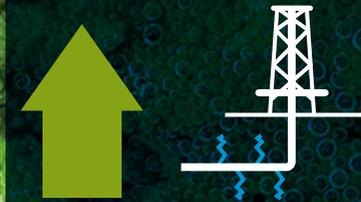
**18 GW**  
storage

Our scenarios show a maximum of 18 GW of electricity storage by 2040.



**23 GW**  
electricity  
import capacity

In comparison to *FES 2015*, electricity interconnection has increased across all scenarios. **Gone Green** has increased from 18 GW of import capacity to 23 GW in 2040.



**54 per cent**  
of gas from  
alternative sources

New sources of gas are increasing, including shale, biomethane and bio-substitute natural gas. In **Consumer Power** more than half of gas demand is met by alternative sources in 2040.

# Key messages

2. Over the past year the volume of renewable electricity sources has increased substantially. While the electricity generation sector is on the required trajectory, significant progress is still needed in the heating and transport sectors if the UK is to meet the 2020 renewable target\* on time.



**34 per cent sub-target**

**Gone Green** sees the most progress towards the 2020 target. The (unofficial) sub-target for 34 per cent of electricity coming from renewable sources is met on time. By 2020, 12 per cent of all energy comes from renewables.



**2022**

The 2020 target date is missed in all scenarios. The 15 per cent target level is reached in dates ranging from 2022 in **Gone Green** to 2029 in **No Progression**.



**170 per cent increase required**

To reach the target, a 170 per cent increase in renewable heat is required. This is an increase of around 60 TWh.



**25 TWh increase required**

A 25 TWh increase in renewable transport is also required, above the current level of 15 TWh.

\*15 per cent of UK energy coming from renewable sources by 2020.

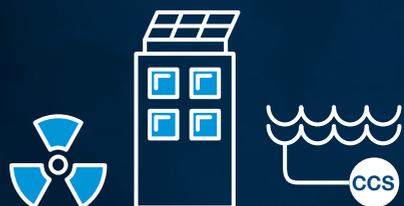
## Key messages

3. Action needs to be taken this decade to drive progress towards the 2050 carbon reduction target\*.



### Electricity generation

A widely accepted path to meeting the target is to decarbonise electricity generation first, then the heat and transport sectors.



### Key technologies

Three key technologies which will enable electricity decarbonisation are: **nuclear, renewables and carbon capture and storage (CCS)**.

The cost-optimal pathway utilises all three of these technologies; approximately 22 GW of nuclear, 100 GW of renewables and 20 GW of CCS in 2050.



### Clear pathway

A clear pathway to decarbonise heat and transport is vital. To do this in the most cost-effective way, approximately 25 per cent of heat and of transport need to be decarbonised by 2030. This will allow us to continue on a pathway to achieve the longer-term target.



### Renewable gas

Renewable sources of gas (such as anaerobic digestion and bio-substitute natural gas) are required to decarbonise the heating and transport sectors in a cost-effective manner.

\*An 80 per cent reduction in carbon emissions from 1990 levels.

## Key messages

4. The importance of gas in GB's energy mix has been further emphasised this year. It will continue to play a key role in energy decarbonisation, by providing flexible electricity generation and top-up heating over the long term.



**70 per cent of homes**

Gas will support the electrification of heating by providing top-up heating at peak times. In 2030 in **Gone Green**, 70 per cent of homes will still use gas for all, or part, of their heating requirements.



**11 GW of CCS-enabled gas plant**

Gas will be used for flexible electricity generation, enabling the growth of renewable sources of generation. There could be up to 11 GW of CCS-enabled gas-fired power station capacity by 2040.



**Flexibility**

These changes to the demand for gas will create new operability challenges, requiring greater system flexibility.

## Key statistics in 2030

	2015	Gone Green	Slow Progression	No Progression	Consumer Power
<b>Electricity</b>					
Annual demand (TWh)	334	346	318	322	331
Peak demand (GW)	61	67	59	61	63
Total installed capacity (GW)	97	165	131	114	157
Low carbon capacity (GW)	39	103	78	53	87
Interconnector capacity (GW)	4	23	15	11	23
Total storage capacity (GW)	3	8	4	3	11
<b>Gas</b>					
Annual demand (TWh)	880	603	633	808	746
1-in-20 peak demand (GWh/day)	5,194	4,714	4,906	5,640	5,261
Residential demand (TWh)	326	189	251	299	275
Gas imports (%)	58	72	80	62	25
Shale production (bcm/yr)	0	0	0	15	30
<b>Decarbonisation</b>					
Renewable energy (%)	~8 <sup>1</sup>	31	27	21	23
Reduction in carbon emissions (%)	~37 <sup>1</sup>	58	53	48	49

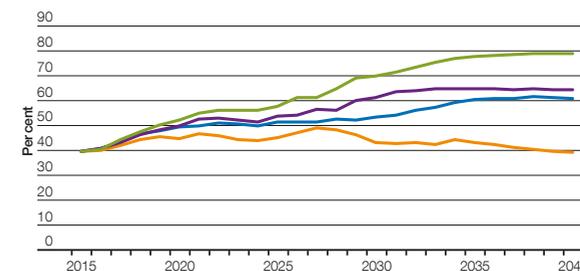
All numbers rounded to the nearest whole number.

<sup>1</sup> Actual 2015 data not available at the time of writing. This estimate is based on DECC's 2014 figures.

## Evolution of key areas

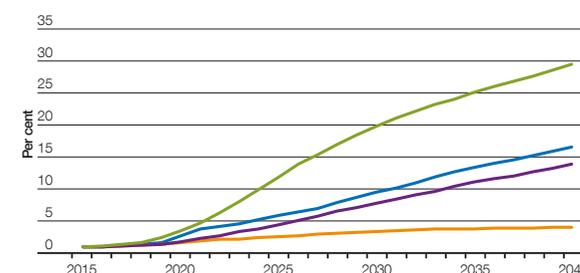
### Electricity generation

Percentage from low carbon sources



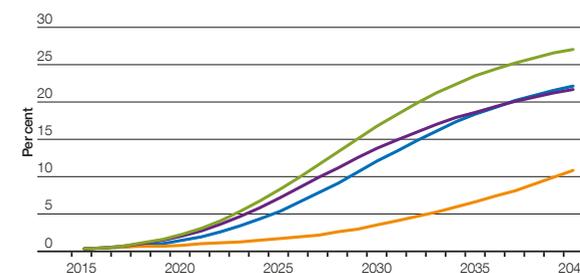
### Heat demand

Percentage of homes using low carbon heating



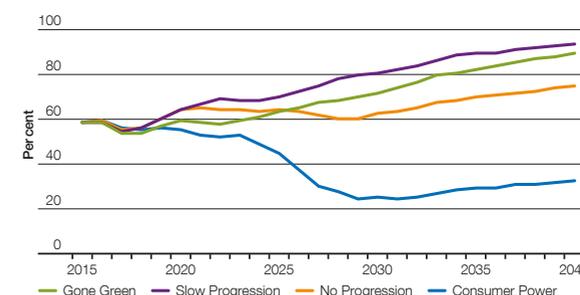
### Transport demand

Percentage of cars which are electric



### Gas supply

Import dependency



## Other documents from the System Operator

FES is one document within our future of energy publications. We aim to inform the whole energy debate through addressing specific issues in each document. These are the planned publication dates for 2016/17.



### Future Energy Scenarios

July 2016  
A range of plausible and credible pathways for the future of energy from today out to 2050.



### Future Operability Planning

November/December 2016  
How the changing energy landscape will impact the operability of the gas system.



### Winter Outlook Report

October 2016  
Our view of the gas and electricity systems for the winter ahead.



### Network Options Assessment

January 2017  
The options available to meet reinforcement requirements on the electricity system.



### Electricity Ten Year Statement

November 2016  
The likely future transmission requirements on the electricity system.



### Summer Outlook Report

April 2017  
Our view of the gas and electricity systems for the summer ahead.



### Gas Ten Year Statement

November 2016  
How we will plan and operate the gas network, with a ten-year view.



### Winter Review

May 2017  
A comparison between the past winter's actual gas energy demand and supply and our forecast.



### System Operability Framework

November 2016  
How the changing energy landscape will impact the operability of the electricity system.



### Winter Consultation

June 2017  
An opportunity to share your views on energy demand and supply for the winter ahead.

## Continuing the conversation

Get involved in the debate on the future of energy and join our LinkedIn group 'Future of Energy by National Grid.'

Email us with your views on FES or any of our future of energy documents at: [transmission.ukfes@nationalgrid.com](mailto:transmission.ukfes@nationalgrid.com) and one of our experts will get in touch.

Access our current and past FES documents, data and multimedia at: <http://fes.nationalgrid.com>

Keep up to date on key issues relating to National Grid via our Connecting website: [www.nationalgridconnecting.com/](http://www.nationalgridconnecting.com/)

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Future of Energy

