

Powering the Future - sector pages

Electricity

The electricity generation sector consumes about 37% of UK fossil fuel and emits around 33% of CO₂

Over 95% of electricity is generated from just three types of fuel: coal, gas and nuclear. Operations are determined solely by demand from the other UK sectors and opportunity to reduce CO₂ emissions is limited to the generating mix rather than any measures to reduce demand.

The sector covers large generating stations, the transmission network linking stations with major substations at high voltage, and the distribution network taking power from the substations to the consumer.

Report findings - electricity:

UK electricity generating capacity is forecast to fall to half of its current value by 2023. The rate of new plant construction necessary to maintain adequate capacity for reliable electricity supply from about 2020 is at least equal to the highest historical rate achieved by the industry. This new-build programme will not only have to meet capacity requirements but must do so while achieving CO₂ emissions commitments.

Development of the transmission and distribution network system will make a critical contribution to the implementation of the changes identified in this report. A holistic approach to the production, transmission, distribution and control of electricity production and demand will be essential if the transition away from intensive fossil fuel use is to be made successfully.

Renewable power generation will make a large contribution to future electricity production and is likely to include a significant component embedded within each sector, reducing production required in the electricity sector.

There is a risk that decisions and actions taken now to meet the EU 2020 renewables target will have undesired and adverse impacts on the UK's ability to meet 2050 carbon targets. For example, the early and widespread adoption of wind power would severely undermine the viability of other low-carbon technologies, making it more difficult to meet carbon targets and longer-term commitments.

Anticipated new build mix required will include:

- 12-18 GW gas CCGT
- 16-21 GW nuclear
- 7-15 GW coal CCS
- 4-8 GW tidal
- 10-30 GW wind
- 0-18 GW open cycle GT

It is anticipated that embedded generation (site specific) by 2050 will include:

- 10-20 GW combined heat and power
- 5-20 GW wind
- 10-40 GW solar PV

Further work - electricity:

Review the current strategy for renewable development to identify what changes to the electricity system are required to handle larger scales of intermittent renewable generation. Assess the role of generators, supply companies, distribution companies and the transmission system operator in mitigating the risks to supply reliability.

Review the impact on the electricity system generation mix of a large amount of renewable generation by 2020. Assess the economic viability of different types of fossil generation at reduced load factors and the likely consequences on overall carbon emissions by the sector to 2050.

Assess the implications of the battery-charging demands of a large-scale rollout of electric vehicles on distribution system capacity and on transmission and generating system operation.

Prepare a strategy for infrastructure development to support a progressive extension of roadside charging facilities with 'smart grid' control facilities for mobile electricity consumers.

Assess the impact on charging mechanisms, tariffs and competitive electricity supply of large numbers of electric vehicles becoming new mobile consumers.

Prepare a strategy for 'smart grid' definition, development, standardisation and implementation to support economic and reliable network operation and electricity supply through the radical changes foreseen in the next 30 years.