nationalgrid

High Electrification

A Future of Gas Programme Sensitivity

This is the last of three publications which set out divergent views of the future energy landscape. Given the uncertainty which exists around the future of gas, they have been produced in order to support our testing of a broader range of possible uncertainties and what might need to happen to reach the 2050 carbon reduction goals. They are not intended to provide a National Grid view of what the future energy landscape will look like, but are intended to facilitate debate and test the boundaries when considering what the future of gas could look like.

Background

The high electrification sensitivity looks at what would happen if society decided we should pursue a more electric future, including more renewable electricity to help us reduce our dependency on other fuel types.

More electricity is used in heating, transport is decarbonised using electric vehicles (EVs) and hydrogen fuel cell vehicles, and the installation of renewable generation is significantly increased. High Electrification shares the green ambition of the Two Degrees sensitivity, but adopts an even more ambitious electrification policy, which will require not only consumer preference but also considerable government support and intervention in the market.

The chosen technology for space heating is the heat pump, so it is widely used across all market sectors. However it remains very difficult to remove gas entirely. Assuming all homes install heat pumps by 2050, some gas is used in hybrid heat pumps, where the majority of the heat demand is met by an electric heat pump but the peak heat demand is supplemented by output from a gas boiler on the coldest days. Many industrial processes, such as steel or glass making where high temperature heat is needed, are also unable to move away from gas.

From a gas demand perspective, this scenario represents our ‘low-case’ when compared with the Two Degrees (mid-case) and Decarbonised Gas (high-case) sensitivities.

The Journey to 2050

In the early 2020's, electricity demand is growing rapidly due to EVs and the widespread roll out of heat pumps which has happened thanks to strong financial incentives, a positive consumer environment and a clear government policy choice. Renewables, primarily wind, are the main supply side contributors. Significant investment in the electricity transmission network is required to cope with the extra demand.

Throughout the 2030's public support remains and consumers see the cost and high level of disruption as a price worth paying for decarbonisation. Electricity demand growth levels out, due to the increased efficiencies of household appliances and a slowing in the rate of Hydrogen electrolysis growth. Gas demand however, is now falling steadily on an annual basis (now less than 70% of 2016 level); although where hybrid heat pumps are deployed there remains an important role for gas on the coldest days. By the end of the decade decarbonisation is also happening in the power and industrial sectors through a series of Carbon Capture & Storage (CCS) projects which are now operating.

From 2040 electricity demand begins to grow rapidly again, with high levels of interconnection, Demand Side Response (DSR) and more than 15GW of battery storage devices supporting the system. Gas demand continues to fall, however as the UKCS is now no longer operating, there may be some NTS investments required to move gas from the LNG and interconnection points around the rest of the network.

By 2050 electricity demand continues to grow rapidly (now 44% above 2016 levels), primarily supplied by wind, electricity storage, and interconnection. Gas demand continues to fall (now only 25% of 2016 levels on an annual basis). However with 21GW of CCS gas generation on the system and millions of hybrid heat pumps, there can still be a heavy reliance on gas on cold, still winter days.

On the road, all cars are electrically powered, with heavy goods vehicle and other commercial vehicles powered by hydrogen, which is produced through electrolysis.

Summary

High Electrification adopts an ambitious approach to the electrification of heat and transport through heat pumps, EVs and Hydrogen produced through electrolysis. Despite an ongoing requirement from industry, by 2050, annual gas demand is much lower. However, significant NTS capacity is still required to move gas from international import points to areas of consumption due to the use of hybrid heat pumps on the coldest days and for CCS enabled CCGT's to balance renewable intermittency on the electricity system.

If you would like to discuss anything contained in this document, or discuss the Future of Gas programme in general please get in touch with Justin Goonesinghe directly or contact us via our website.