

## **Projections of Water Use in Electricity and Hydrogen Production to 2050, under 2020 Future Energy and CCC Scenarios – Regional Analysis’ Important Context**

### The Joint Environmental Programme (JEP)

This report has been commissioned by the Joint Environmental Programme (JEP) which supports a programme of research into the environmental impacts of electricity generation funded by seven of the leading producers in the UK. The objective of the JEP work programme is to understand and increase knowledge of the environmental science and impacts associated with the production of electricity and hydrogen from coal, gas, gasoil and biomass fired power plant.

### Report Description

Under DEFRA’s Abstraction Plan (DEFRA, 2017) a collaborative multi-sector approach is required to provide appropriate environmental protection, a resilient Public Water Supply and resilient water-dependent industry including power and energy provision. For the energy sector, Competition Law, precludes collaboration between individual companies and therefore rules out the preparation of sector plans which would inform future water use.

In recognition of these two aspects the JEP commissioned a study to explore potential water use by power producers under a range of future energy production scenarios to 2050. The objective of the work is to allow parties active in UK water resource planning initiatives an appreciation, expressed quantitatively, of the potential power sector future demand for water and water resource, in particular freshwater. The focus of our quantitative reporting is water abstracted (gross) and consumed (not returned to surface waters, e.g. through evaporation), where consumption is regarded for the purposes of this report to be on an installation basis.

The study is aimed at illustrating the potential development and uncertainty of power sector future water use in the period to 2050. It is an addendum to the recently released report by Gasparino and Edwards (2021) which modelled water use by the power sector under a number of energy scenarios released by National Grid ESO and the Climate Change Committee during 2020. Whereas Gasparino and Edwards (2020 & 2021) focused on water use at GB scale and in the East of England, this study has applied the same modelling process to consumptive freshwater use in electricity generation and for hydrogen production within water resource regions. It is intended that this report be read in conjunction with Gasparino and Edwards (2021) which provides details of the model, the derivation of the energy scenarios and the water use rates. However, for ease of use some text, from Gasparino and Edwards (2021), providing an overview of the modelling process and context for the work has been included.

The work of Gasparino and Edwards (2021) was concerned with the potential development and uncertainty of power sector future water use, in the period to 2050. The following energy scenarios and supporting material, recently released in the public domain, are used in Gasparino and Edwards (2021) report and this addendum:

- 2020 Future Energy Scenarios. released by National Grid ESO in July 2020;
- UK’s path to Net Zero scenarios, released by the Climate Change Committee in December 2020 (in the framework of the Sixth Carbon Budget); and
- ‘Modelling 2050: Electricity System Analysis’ published by the Department for Business, Energy & Industrial Strategy (BEIS), also in December 2020.

The study used generation levels consistent with scenarios presented by National Grid, in their Future Energy Scenarios report (FES20), the Committee on Climate Change (illustrative net zero scenario) and the modelling 2050: Electricity System Analysis. The modelling is also consistent with the work undertaken by Imperial College (alternative pathways for the decarbonisation of heating). The energy scenarios included the adoption of

Carbon Capture Usage & Storage (CCUS) and Hydrogen production, both of which have an additional water requirement beyond current cooling water use.

The study illustrates the potential development and uncertainty of power sector future water use in the period to 2050. Any reported result should be regarded as indicative, rather than as a specific forecast.

June 2021