

## **‘Projections of Water Use in Electricity and Hydrogen Production to 2050, under the 2020 Future Energy and CCC Scenarios including BEIS 2020 lowest system cost analysis – with a Focus on the East of England’ 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 c, 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 supersedes a previous report (Gasparino and Edwards, 2020), in view of the release of updated sets of net zero consistent energy scenarios by National Grid ESO and the Climate Change Committee. Text used in the previous report to illustrate the adopted methodological approach and to frame the policy background, has been mostly retained in this revised version, so that this updated report can be read as a stand-alone document.

More specifically, the analysis is aimed at updating the results previously presented in Gasparino and Edwards (2020) on the potential development and uncertainty of power sector future water use, in the period to 2050. The need for updating the report in such a short space of time is mainly driven by the rapid progress in the analysis of pathways available for the UK Government to achieve its 'net zero' legal target by 2050. The following main additional studies and updates have been recently released in the public domain and are considered in the report:

- 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.

Whilst Gasparino & Edwards (2020) focused on water demand without regard to the quality of water needed, the present report introduces explicit consideration of high quality water demand, i.e. water of a quality suitable for steam generation and/or as a chemical process feedstock which would often need to be considerably more pure than potable supply. We therefore consider here that demand to be exerted either through direct abstraction from surface waters or via potable water through the Public Water Supply (contributing to non-household demand).

This study was aimed in particular at informing the Water Resources East (WRE) regional plan, which is of particular interest to the power sector given the history of the power sector in this region and the water resource challenges WRE faces. Results are provided at the geographic scale of Great Britain, for the East of England and at sub-regional scales within WRE. A companion JEP study (link to JEP20WT09 [here](#)) provides a similar analyse of energy sector water need for other Water Resource Regions.

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.

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