

1. Non-technical Summary

This document presents the supporting information for a Bespoke Environmental Permit application under the Environmental Permitting (England and Wales) Regulations 2016 (as amended) ('the EP Regulations'), submitted on behalf of Keadby Next Generation Limited ('KNG', part of the FTSE-listed SSE plc) to operate the proposed Keadby Next Generation Power Station ('KNGPS' or the 'Proposed Installation'), to be located on land adjacent to the existing Keadby Power Station site near Scunthorpe in North Lincolnshire. The existing Keadby Power Station site comprises two operational power stations, referred to as Keadby 1 and Keadby 2, which are operated by Keadby Generation Limited ('KGL', also part of the FTSE-listed SSE plc) under Environmental Permit EPR/YP3133LL.

The Proposed Installation is an alternative to the already permitted Keadby 3 Carbon Capture and Storage (CCS) Power Station, the operation of which has been included in the existing Keadby Power Station Environmental Permit (EPR/YP3133LL/V013) and would be located on the same plot of land.

The Proposed Installation consists of a combined cycle gas turbine (CCGT) electricity generating station designed to run on 100% hydrogen and capable of operating on 100% natural gas from the start of operations. When hydrogen becomes available and operation with hydrogen firing is commercially viable, the Proposed Installation will be upgraded to operate on a blend of natural gas and hydrogen or 100% hydrogen, dependent on availability. Unlike combustion of conventional fuels, combustion of hydrogen produces no direct emissions of carbon dioxide (CO₂) and therefore, it is a credible avenue for low-carbon combustion processes.

As the existing Keadby Power Station is operated by KGL and the Proposed Installation would be operated by a different SSE entity (i.e. KNG), a separate new Permit application is being made. Permitting both the Keadby 3 and the Proposed Installation in this way will enable SSE to make Financial Investment Decisions in a timely manner and to pivot to whichever decarbonisation pathway (hydrogen or CCS) becomes technically and commercially viable at the Site first. As such, only one option (KNGPS or Keadby 3 CCS Power Station) will ever progress to the construction and operational stages, and the redundant Environmental Permit would be surrendered, or partially transferred, as applicable.

The Proposed Installation's location in relation to the existing Keadby Power Station Environmental Permit and the Proposed Installation Site Boundary are provided in Figures 1 and 2 (Appendix A).

This Environmental Permit application is made in connection with the application for a Development Consent Order (DCO) that has been submitted to the Planning Inspectorate for the Proposed Installation. The Environmental Statement (ES) for the DCO application is provided in Appendix B.

The Site for the Proposed Installation is to the west of the existing Keadby Power Station Installation Boundary, on land that has until recently been used for arable

production. Should the Proposed Installation be constructed, this area of the Keadby Power Station Installation would require a partial transfer to KNG.

An assessment of the current site conditions has been undertaken for the Installation Boundary, and the application Site Condition Report is provided in Appendix C.

As the Proposed Installation is a 'first of a kind' for this type of power station infrastructure project and would represent one of the UK's first hydrogen-fired power stations, certain design aspects and features cannot be confirmed until the detailed design stage has been completed. The design of the Proposed Installation therefore, incorporates a necessary degree of flexibility, to allow for design amendments in line with detailed design progression as well as changing economic conditions and the advancement of hydrogen fired CCGT technology in the period between submitting the Permit application and starting construction.

The Proposed Installation will have a capacity of up to 910 megawatts electrical output (MWe), for export onto the UK National Electricity Transmission System (NETS). As previously stated, Proposed Installation will be capable of operating using 100% natural gas from the start of operation, as hydrogen firing may not be feasible, however it will be designed to run on 100% hydrogen from the start. The time required to upgrade the Proposed Installation to hydrogen firing would be minimised as a result of embedding key design requirements in the Proposed Installation within the baseline design. It is therefore considered that the Proposed Installation will ensure the earliest possible decarbonisation of the electricity system.

It is recognised that after 28th February 2026, the Decarbonisation Readiness requirements will be implemented through the EP Regulations, however at this time the Carbon Capture Readiness (Electricity Generating Stations) Regulations 2013 (the 'CCR Regulations') are still in place. The intention of the Proposed Installation in regard to decarbonising is to remove direct CO₂ emissions by using hydrogen as a fuel thereby negating the need for carbon capture. However, to support the DCO application a CCR Report was produced to demonstrate that there is suitable space for CCS and that it is technically and economically viable. In addition, the report provides a review of the four tests proposed by the EA in their draft guidance for Hydrogen Decarbonisation Readiness for the Proposed Installation. This report is provided in Appendix D.

The Proposed Installation will generate electricity from the combustion of hydrogen or natural gas within a CCGT, using hot gas from the combustion process to drive the gas turbine (GT), and steam generated from the heat of the hot gas, in the heat recovery steam generator (HRSG), which is used to drive the steam turbine (ST). If required to ensure that the required Best Available Techniques Associated Emission Levels (BAT-AELs) are achieved for oxides of nitrogen (NO_x), the exhaust gas will then pass through a Selective Catalytic Reduction (SCR) system to reduce concentrations of NO_x in the resulting flue gas.

The design and operation of the Proposed Installation is intended to meet the indicative requirements of BAT as defined for Large Combustion Plant (LCP), as summarised in this document and described in full in Appendix E1.

Cooling for the Proposed Installation will be achieved through the use of hybrid (wet-dry) cooling towers, with freshwater make-up to the towers (and to the HRSG boiler and other minor uses) obtained from the Stainforth and Keadby Canal. The use of freshwater hybrid cooling for the Proposed Installation was determined as BAT for the Keadby 3 Proposed Installation, through an assessment process which considered a number of options and the site-specific technical considerations for generational output, parasitic load and water resource impacts, amongst others. The assessment has been updated for the Proposed Installation and concluded that there would be no change to the outcome of the Keadby 3 assessment, and therefore the proposed cooling technique of freshwater hybrid cooling is still considered to be BAT for the Proposed Installation. The updated assessment is provided in Appendix E2.

The Proposed Installation will be Combined Heat and Power (CHP) ready, with sufficient space allocated for future retrofit of a heat offtake within its footprint, should that be required, although it is not considered to be viable for CHP opportunities at the outset of commercial operation. A CHP Assessment is provided in Appendix F.

Emissions from the CCGT will be exhausted through an 85m above ground level (AGL) high stack, serving the HRSG exhaust. Emissions will meet the emission limits for LCP under the Industrial Emissions Directive (IED), the LCP BAT Reference document (LCP BRef) and BAT Conclusions for natural gas fired operation and the Environment Agency's (EA's) Guidance on Emerging Techniques (GET) Emission Limit Values (ELVs) for hydrogen firing.

The stack height and emission concentrations required to minimise impacts on air quality receptors from the main pollutants to an acceptable level have been determined through an Air Quality Impact Assessment, undertaken in accordance with the EA's Risk Assessment guidance. The assessment includes dispersion modelling of maximum emission parameters and existing air quality baseline conditions (including modelling of Keadby 2 emissions), to determine the worst-case predicted environmental concentrations for comparison with air quality standards. The impact assessment is presented in Appendix G.

Discharge of effluent from the Proposed Installation will include blow-down from steam and cooling water systems, to maintain operational performance. Other minor and intermittent water discharges will be combined with the process effluent, such as rainwater run-off collected in potentially contaminated areas (such as bunds) that has been tested to ensure it is safe for discharge and discharge from the demineralisation plant, and will be discharged into the existing Keadby 1 discharge infrastructure, via a dedicated compliance point for the Proposed Installation (Emission Point W1), and ultimately to the River Trent. Although no specific impact assessment has been carried out for the discharge to Emission Point W1, it is considered that the assessments carried out for Keadby 3 represent a worst-case assessment for the Proposed Installation, and therefore these assessments have been provided in Appendix H.

Uncontaminated surface water will be contained within two attenuation ponds prior to discharge to the Internal Drainage Board (IDB) at greenfield run-off rates via Emission Points W2 and W3.

A Noise Impact Assessment using the EA's Noise and Vibration Management guidance methodology has been carried out to assess the impacts of noise on identified Noise Sensitive Receptors (NSR). The assessment concluded that with appropriate mitigation measures, predicted noise emissions arising from the Proposed Installation would not exceed the background sound level ($L_{A90,T}$). As noted in BS4142, where the rating level does not exceed background sound levels, this is an indication of the specific sound source having a low impact. By reference to the EA permit guidance, the level of noise impact results in "no noise, or barely audible or detectable noise". The Noise Impact Assessment is provided in Appendix I.

Wastes from the Proposed Installation are expected to be minimal and will be appropriately disposed of via licensed 3rd party waste contractors.

The Proposed Installation will be operated in line with the wider SSE ISO14001:2015 accredited Environmental Management System (EMS), which includes operating procedures to manage the various aspects of the operation of the plant, including, but not limited to; emissions monitoring, accident management, waste minimisation and management, and infrastructure maintenance.