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6. Need, Alternatives and Design Evolution

6.1 Introduction

- 6.1.1 This chapter of the Preliminary Environmental Information (PEI) Report sets out the alternatives that have been considered during the evolution of the Proposed Development and design process as presented in Chapter 4: The Proposed Development (PEI Report, Volume I), up to this stage of statutory consultation.
- 6.1.2 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the 'EIA Regulations') state that the Environmental Statement (and a PEI Report) should contain *"A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen, option, including a comparison of the environmental effects"* (Regulation 14(2)(e)). This chapter recognises and fulfils this requirement in respect of the Proposed Development.
- 6.1.3 On the matter of alternatives, National Policy Statement (NPS) EN-1 (DECC, 2011a) paragraphs 4.4.1 and 4.4.2 state that *"This NPS does not contain any general requirement to consider alternatives or to establish whether the proposed project represents the best option. However, applicants are obliged to include in their ES, as a matter of fact, information about the main alternatives they have studied. This should include an indication of the main reasons for the applicant's choice, taking into account the environmental, social and economic effects and including, where relevant, technical and commercial feasibility."*
- 6.1.4 In this context, the consideration of alternatives and design evolution has been undertaken with the aim of avoiding and/ or reducing adverse environmental effects (following the mitigation hierarchy of avoid, reduce and, if possible, remedy), while maintaining operational efficiency and cost-effectiveness, and considering other relevant matters such as available land and planning policy.
- 6.1.5 The design of the Proposed Development is at a preliminary stage and will continue to evolve up to the point of the DCO application submission in response to consultation feedback and with reference to any ongoing surveys and technical studies. Detailed design work will proceed once the project moves into the Front End Engineering Design (FEED) stage which is due to commence in 2021, although any changes that result from the FEED work will remain within the design parameters set by the DCO.



6.2 The Need for the Proposed Development

- 6.2.1 The need for the Proposed Development is set out in Chapter 7: Legislative Context and Planning Policy of this PEI Report and is in accordance with the Overarching National Policy Statement for Energy (NPS EN-1) (Department of Energy and Climate Change, 2011) and the Government's net zero aspirations and the Clean Growth Strategy (Department for Business, Energy & Industrial Strategy, 2017).
- 6.2.2 The Clean Growth Strategy outlines the Government position on carbon capture, usage and storage. Three main action points were included within the strategy:
- *“re-affirming our commitment to deploying CCUS in the UK subject to cost reduction;*
 - *international collaboration on CCUS; and*
 - *CCUS innovation.”*
- 6.2.3 The Strategy illustrates the UK Government's commitment to CCUS including consideration of projects such as Net Zero Teesside. A programme of work has been set out *“to establish the additional steps that are required to meet the ambition of having the option to deploy CCUS at scale during the 2030s”*, with the Government stating that they *“will work with the ongoing initiatives in Teesside, Merseyside and Grangemouth to test the potential for development of CCUS industrial decarbonisation clusters.”*
- 6.2.4 CCUS will be important in balancing the mix of energy generation technologies and provide responsive plant for peaks in demand. This is important in complimenting offsetting the intermittency of renewable technologies and the inflexibility of nuclear generation.

6.3 Alternative Technologies

- 6.3.1 Given the need for the Proposed Development outlined in the previous section, a number of different technologies were evaluated to identify the preferred technology to deliver the CCUS scheme.
- 6.3.2 The need for a low carbon power generating station was identified as essential to the Proposed Development at an early stage, not only because of the recognised need to decarbonise the electricity generating sector in order to meet national carbon budgets but also to deliver dispatchable low carbon generation to complement the increased penetration of renewable sources onto the UK supply network. Low carbon power generation also provides an anchor to enable investment in infrastructure and the capture of carbon emissions from industrial sources.
- 6.3.3 Various low carbon solutions are being developed in the UK for generating stations including fuel switching to hydrogen, but the most mature carbon capture technology for large scale power at the time of developing the Proposed Development is post combustion carbon capture. Therefore, this technology was selected to minimise the technology risks associated with the Proposed Development.



- 6.3.4 The final decision has not yet been made on the choice of vendor for the generating station or carbon capture equipment and solvent provider and is unlikely to be made until the detailed design stage of the project. Therefore, the design of the Proposed Development at this stage incorporates a degree of flexibility in the dimensions and configurations of buildings and structures to allow for the future selection of the preferred technology and contractor. In order to ensure a robust assessment of the likely significant environmental effects of the Proposed Development, the EIA is being undertaken adopting the principles of the 'Rochdale Envelope' approach where appropriate. This involves assessing the maximum (or where relevant, minimum) parameters for the elements where flexibility needs to be retained (building dimensions or operational modes for example). As such, this PEI Report represents a reasonable worst-case assessment of the potential impacts of the Proposed Development at its current stage of design.

6.4 Alternative Sites

- 6.4.1 The key criteria that were assessed as part of the site selection process are:
- (1) East Coast due to proximity to a number of potential offshore CO₂ storage sites;
 - (2) Dimensionality – ensuring there is sufficient space for the Proposed Development and its constructability and expansion potential;
 - (3) Utilising brownfield land where possible;
 - (4) Proximity to industrial sources that could connect into the CO₂ gathering network, linking to the Tees Valley Combined Authority work to develop the Teesside industrial cluster;
 - (5) Proximity to the coast to enable high pressure CO₂ export and to separate high pressure systems from residential areas;
 - (6) Proximity to necessary connections including gas network, electricity transmission network, water supply; and
 - (7) Minimising environmental / social effects or risks.
- 6.4.2 The analysis of potential sites focussed on identifying a site that supports the development of a viable CCUS project that facilitates local regeneration industrial connectivity and the path to decarbonisation.
- 6.4.3 An initial site selection process was conducted at a UK scale which identified Teesside or Humberside as the most suitable locations for CCUS deployment given the proximity to the North Sea and to clusters of industrial facilities. Given the inclusion of a new build generating station as part of this CCUS Proposed Development, Teesside was selected as the preferred location as at the time there were concerns about the need for extended grid reinforcement works to Humberside to accommodate a gigawatt scale new power station on top of the existing power stations in the area.
- 6.4.4 Within Teesside a number of sites were shortlisted and this was refined to a preferred site identified as being suitable for the Proposed Development location – the STDC site (former SSI steelworks site).



- 6.4.5 This site was identified as being brownfield, relatively distant from residential areas, of sufficient area to enable construction, having proximity to the necessary connections, being close to the North Sea coastline for off-shore export of CO₂ and of being accessible for construction.
- 6.4.6 Further evaluation was undertaken to determine the most appropriate location within the STDC site for the Proposed Development, given that the wider STDC site encompasses an area of over 2,000 hectares.

6.5 Alternative Layouts within the Site

- 6.5.1 A number of locations within that site were considered for the Proposed Development taking into account the strategic masterplan for the site redevelopment, ground conditions, presence of existing structures, proximity to residential receptors, access, and proximity to the North Sea. A plot of land to the east of the former steelworks plant was identified as the most suitable for the following reasons:
- (1) Absence of major structures requiring demolition and removal on the main site footprint;
 - (2) Significant space available for the plant and also construction laydown.
 - (3) Proximity to the shoreline, thereby minimising the onshore high pressure CO₂ pipeline length;
 - (4) Distance from residential areas / population;
 - (5) Access to water supply (Tees Estuary or NWL supplies)
 - (6) Access to an existing effluent outfall or the existing Bran Sands wastewater treatment plant;
 - (7) Construction access including jetties that could be used for delivery of abnormal indivisible loads.
- 6.5.2 A number of options remain under consideration for the routing of the connections required for the Proposed Development, as shown on the site boundary figure (Figure 4-1, PEI Report Volume II). These options are being evaluated in terms of environmental effects, constructability and landownership and the routes will be refined prior to submission of the DCO application.

6.6 The Do Nothing Alternative

- 6.6.1 The do nothing alternative would mean that a first of a kind carbon capture utilisation and storage scheme would not be developed, meaning that dispatchable low carbon generating plant would not be available to support the increased deployment of renewables onto the UK transmission system. It would also mean that carbon emissions from industrial sources on Teesside would remain unabated.
- 6.6.2 CCUS is widely recognised as being essential to achieving the Government commitments to achieving net zero emissions by 2050. The Proposed Development is the furthest advanced CCUS project in the UK.



- 6.6.3 For these reasons the Do Nothing scenario is not considered appropriate, although it has been assessed as part of the baseline conditions in the environmental impact assessment.

6.7 Conclusions

- 6.7.1 As part of the site selection process, the STDC site is deemed the most appropriate site for the power generation and carbon capture site, given its location on brownfield land suitable for redevelopment, in close proximity to a number of existing industrial sources, and adjacent to the North Sea shoreline and some distance from residential properties.
- 6.7.2 The form and approach to the Proposed Development has been identified as above, taking into account environmental effects, alongside other factors such as technical and commercial feasibility. The design and associated connection routings will continue to evolve following consultation and the final Rochdale Envelope design will be reported in the ES submitted as part of the DCO Application.

6.8 References

Department for Business, Energy & Industrial Strategy (2019). *UK carbon capture, usage and storage* [Online]. Available at:

<https://www.gov.uk/guidance/uk-carbon-capture-and-storage-government-funding-and-support>

Department of Energy and Climate Change (2011). *The Overarching NPS for Energy (EN-1)*. London: The Stationery Office.

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (SI 2017/572). London: The Stationery Office.

