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6. Alternatives and Design Evolution

6.1 Introduction

- 6.1.1 This chapter of the Environmental Statement (ES) sets out the alternatives that have been considered during the evolution of the Proposed Development and design process as presented in Chapter 4: Proposed Development (ES Volume I, Document Ref. 6.2).
- 6.1.2 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the ‘EIA Regulations’) state that the Environmental Statement should contain “*a description of the reasonable alternatives studied by the applicant, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment*” (Regulation 14(2)(d)).
- 6.1.3 This chapter recognises and fulfils this requirement in respect of the Proposed Development.
- 6.1.4 Under the EIA Regulations there is no general requirement to assess the alternatives, only a requirement to provide information regarding the alternatives that have been considered.
- 6.1.5 On the matter of alternatives, National Policy Statement (NPS) EN-1 (DECC, 2011a) paragraphs 4.4.1 states that “...this NPS does not contain any general requirement to consider alternatives or to establish whether the proposed project represents the best option”.
- 6.1.6 Paragraph 4.4.2 of NPS EN-1 states: “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.”
- 6.1.7 In this context, the consideration of alternatives and design evolution has been undertaken with the aim of avoiding, preventing, reducing or, if possible, offsetting likely significant adverse environmental effects (following the mitigation hierarchy), while maintaining operational efficiency and cost-effectiveness, and considering other relevant matters such as available land and planning policy.
- 6.1.8 The concept design of the Proposed Development has evolved through engineering design work, in response to consultation feedback and with reference to surveys that have been completed. Given that this is a First Of A Kind project, further design work will proceed once the project moves into the Front End Engineering Design (FEED) stage, which is due to commence late in 2021, although any changes that result from the FEED work will remain within the Rochdale Envelope design parameters set by the draft Development Consent Order (DCO), and assessed in the ES.

6.2 The Do Nothing Alternative

- 6.2.1 The “Do Nothing” alternative would mean that a First Of A Kind power and industrial carbon capture usage and storage scheme would not be developed, meaning that carbon emissions from industrial sources on Teesside would remain unabated and dispatchable low-carbon generating plant would not be available to support the increased deployment of renewables onto the UK transmission system.
- 6.2.2 Carbon Capture Usage and Storage (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.
- 6.2.3 For these reasons the “Do Nothing” alternative scenario is not considered appropriate, although it has been assessed as part of the baseline conditions in the environmental impact assessment.

6.3 Alternative Technologies

- 6.3.1 No alternatives to a CCUS have been considered given the need for the Proposed Development as outlined in Chapter 7: Legislation and Planning Policy (ES Volume I, Document Ref. 6.2) and the Need Statement (Document Ref. 5.2) submitted with the Application. The consideration of alternative technologies therefore focuses only on the means of delivering a CCUS scheme.
- 6.3.2 A number of different technologies were therefore evaluated to identify the preferred technology to deliver a CCUS scheme, these were:
- development of a carbon capture network without the inclusion of power generation;
 - use of alternative fuels for the generating station; and
 - use of alternative carbon capture technologies including pre-combustion and oxy-firing.
- 6.3.3 The need for a low-carbon electricity 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.
- 6.3.4 Low-carbon electricity generation also provides an anchor to enable investment in the proposed carbon transport and storage infrastructure to facilitate the capture of carbon emissions from industrial sources. Without that anchor source, there is currently no mechanism for facilitating the development of an industrial carbon capture network.
- 6.3.5 While other fuels such as coal, biomass and waste derived fuels are available for generating stations to which Carbon Capture and Storage (CCS) technology can be fitted, the use of natural gas in a high efficiency combined cycle plant was considered to provide the most effective balance between

generating capacity, fuel availability, dispatchability and efficiency. Coal was ruled out at the outset due to sustainability concerns.

- 6.3.6 Various low-carbon solutions are being developed in the UK for dispatchable generating stations, but the most mature low-carbon technology for large scale electricity generation 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.
- 6.3.7 A number of solvent licensors are available in the market, each having developed carbon capture solvents to optimise performance, in terms of carbon capture efficiency, minimising energy cost of solvent recovery and minimising environmental emissions. Many, but not all, solvents are based on amine solutions and amine-based carbon capture has therefore been included within the Proposed Development design considerations; as with the choice of post-combustion carbon capture this was to minimise technology risks in what is nevertheless a First Of A Kind full chain CCUS development. The selection of the preferred licensor will be informed by techno-commercial considerations and an assessment of Best Available Techniques (BAT).
- 6.3.8 The final decision has not yet been made on the choice of vendor for the generating station or licensor for the carbon capture equipment and solvent and is unlikely to be made until the end of the FEED 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 has been 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 (emissions performance, building dimensions or operational modes for example). As such, this ES represents a reasonable worst-case assessment of the potential impacts of the Proposed Development at its current stage of design.

6.4 Alternative Sites/ Locations

- 6.4.1 The key criteria that were assessed as part of the site selection process are:
- (1) East Coast site – due to proximity to a number of potential offshore CO₂ storage sites in the North Sea that have already been characterised for their potential and specifically the Endurance store;
 - (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;

- (5) Proximity to the coast to enable high pressure CO₂ export to be quickly directed offshore 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 Prior to the Applicants's involvement in the Proposed Development, the project concept was initiated and developed by the Energy Technologies Institute and other parties. As part of that development work, an initial site selection process was conducted at a UK scale which identified Teesside or Humber side as the most suitable locations for CCUS deployment given the proximity to the North Sea and to clusters of industrial facilities. Teesside was selected as the preferred location based on the criteria used at the time.
- 6.4.4 Within Teesside a number of sites were shortlisted including:
- the former Redcar steelworks site (now known as the STDC site or Teesworks site), and within that site four potential locations were considered, as discussed in Section 6.5;
 - a brownfield plot on the Wilton International site near to Lazenby; and
 - various sites within the Seal Sands area.
- 6.4.5 These sites were ranked based on a series of criteria including site area, use of brownfield land, proximity to the coast for the export pipeline, access to natural gas supply, the electricity transmission system and a source of water, and potential for minimising environmental effects.
- 6.4.6 Through this process, a preferred site was identified as being most suitable for the Proposed Development location – the STDC site (former Redcar steelworks site, now known as the Teesworks site). This location also enabled linking to the Tees Valley Combined Authority work, to develop the Teesside industrial cluster.
- 6.4.7 This preferred 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 including from port and jetty facilities.

6.5 Alternative Locations within the Teesworks site

- 6.5.1 Further evaluation was undertaken to determine the most appropriate location within the Teesworks site for the Proposed Development PCC Site, given that the wider Teesworks site encompasses an area of over 2,000 hectares (ha).

6.5.2 Four main locations within the Teesworks site were considered for the PCC Site, taking into account the strategic masterplan for the site redevelopment at that time, proximity to the North Sea, proximity to residential receptors, access, ground conditions, presence of existing structures and minimising land take adjacent to the river which was considered to be of higher redevelopment potential. A plot of land to the east of the former blast furnace was identified as the most suitable for the following reasons:

- (1) Proximity to the shoreline, thereby minimising the onshore high-pressure CO₂ export pipeline length;
- (2) Sufficient space available for the plant and also construction laydown;
- (3) Distance from residential areas / highly populated areas;
- (4) Few major existing structures requiring demolition and removal on the main site footprint;
- (5) Access to water supply (either Tees Estuary or public raw water supplies at the time of site selection);
- (6) Access to an existing effluent outfall and the existing Bran Sands wastewater treatment plant;
- (7) Proximity to construction access including jetties that could be used for delivery of abnormal indivisible loads;
- (8) Away from areas being allocated to other potential developments and river frontage;
- (9) Flat area when compared to other areas of the plot (e.g. Long acres); and
- (10) Away from the dusty port operations.

6.5.3 Since the preparation of the Preliminary Environmental Information (PEI) Report the location of the PCC Site within the Teesworks site and wider Proposed Development Site Boundary has been refined; a summary of the alternatives considered is presented in Table 6-1 below.

6.6 Alternative Connection Routeing and Corridors

6.6.1 At the PEI stage a number of options remained under consideration for the routeing of some of the connections required for the Proposed Development, as was shown on the Development Areas plan (Figure 3-2A-E, PEI Report).

6.6.2 These connections have been progressively refined (see ES Figure 3-2A-E, ES Volume II, Document Ref. 6.3) and a summary of the alternatives considered which has resulted in those now submitted with the draft DCO is presented in Table 6-1 below.

6.6.3 Where possible, the Proposed Development has sought to utilise existing pipeline corridors and connections – for example for the routeing of the CO₂ connection corridors, for the gas supply to the power station, and choice of sub-station to connect into the UK transmission system, so as to reduce the need for construction works. Reuse of existing pipelines and outfall are also

under consideration, subject to asset integrity testing. These options have been evaluated in terms of their environmental effects as well as taking into account constructability and landownership issues.

Natural Gas Connection

6.6.4 The Natural Gas Connection routing (see Figure 3-2B, ES Volume II, Document Ref. 6.3), has been refined from that presented in the PEI Report (PEIR Figure 3-2B) by:

- identification of three potential connection points: two at Seal Sands (connecting to National Gas Grid and Trafigura infrastructure) and one at Bran Sands (connecting to the Sembcorp gas pipeline);
- confirmation of the pipeline routing from the National Gas Grid through Seal Sands using a narrowed corridor occupied by a disused railway line and also that an open cut construction method would be used for its installation;
- use of a micro-bored tunnel across the River Tees, for the potential National Gas Grid and Trafigura connections, from Navigator Terminals direct to the Teesworks site followed by an open-cut pipeline to the gas reception area at the PCC Site;
- confirmation of the open-cut pipeline routing from the potential Sembcorp connection at Bran Sands to the gas reception area at the PCC Site, if this option is used for the gas connection; and
- narrowing of corridors based on a review of constructability, environmental constraints and land ownership boundaries.

Electrical Connection

6.6.5 The Electrical Connection routing (see Figure 3-2C, ES Volume II, Document Ref. 6.3), has been refined from that presented in the PEI Report (PEIR Figure 3-2C) by:

- the choice of the connection being to Tod Point sub-station only and that the connection to it will be underground except for the crossing of a site road and railway line using either existing or proposed third party infrastructure;
- the use of a 275 kV connection ruling out the need for upgrades of Tod Point sub-station or the wider transmission system in the area; and
- narrowing of connection corridors based on a review of constructability, environmental constraints and land ownership boundaries.

Water Supply Connection

6.6.6 The Water Supply Connection routing (see Figure 3-2D, ES Volume II, Document Ref. 6.3), has been refined from that presented in the PEI Report (PEIR Figure 3-2D) by reaching an agreement with Northumbrian Water Ltd for the supply of raw water to the PCC Site using the former steelworks supply infrastructure. This removed the potential requirement for use of the former steelworks abstraction from the River Tees and its associated pipeline

corridor. The corridors have been narrowed based on a review of constructability and environmental constraints.

Water Discharge Connection

6.6.7 The Water Connection routeing (see Figure 3.2D, ES Volume II, Document Ref. 6.3), has been refined from that presented in the PEI Report (PEIR Figure 3.2D) by:

- moving the location of the replacement outfall (if required) from parallel to the existing outfall to parallel to the CO₂ Export Pipeline, so as to reduce the crossings required of the internationally designated Teesside and Cleveland Coast Site of Special Scientific Interest (SSSI) /Special Protection Area (SPA) /Ramsar site; and
- adopting trenchless construction using a micro-bored tunnel to minimise the potential for impacts on Coatham Dunes and Sands and on the habitats and species at the Teesside and Cleveland Coast SSSI/SPA/Ramsar site.

CO₂ Gathering Network

6.6.8 The CO₂ Gathering Network routeing (see Figure 3-2E, ES Volume II, Document Ref. 6.3), has been refined from that presented in the PEI Report (PEIR Figure 3-2E) by:

- confirmation that the pipeline will use existing pipe racking, overbridges and culverts on the north bank of the Tees (where possible);
- crossing the Tees by sharing the micro-bored tunnel to the PCC Site with the Natural Gas Connection if that is constructed; or
- alternatively crossing the Tees by a newly constructed pipe constructed using Horizontal Directional Drilling (HDD) to the north bank of Dabholm Gut and then either along new pipe racking or underground to the PCC Site;
- narrowing of connection corridors based on a review of constructability, environmental constraints and land ownership boundaries.

CO₂ Export Pipeline

6.6.9 The CO₂ Export Pipeline routeing (see Figure 3-2A, ES Volume II, Document Ref. 6.3), has been refined from that presented in the PEI Report (PEIR Figure 3-2A) by:

- adjusting the geometry of the CO₂ Export Pipeline Corridor to allow a more north-easterly trajectory to increase the distance between the pipeline and the off-shore Teesside Windfarm; and
- adopting trenchless construction using a number of HDD to minimise the potential for impacts on Coatham Dunes and Sands and on the habitats and species at the Teesside and Cleveland Coast SSSI/SPA/Ramsar site.

6.7 Consideration of Alternative Design Options and Design Evolution

- 6.7.1 Throughout the ongoing design process, consideration has been given to a range of design options. These decisions have, where relevant and possible, been informed by environmental appraisal and assessment work and by consultation with stakeholders, and the design has evolved (and continues to be refined) through a continuous process of environmental assessment, consultation, and development.
- 6.7.2 Aspects of design that have been determined and fixed in the draft DCO include:
- Use of post combustion carbon capture technology;
 - Inclusion of high efficiency gas-fired generating station;
 - Development of a single combined cycle gas turbine (CCGT) train under this Application instead of up to three trains as considered at the PEI stage;
 - Site boundary;
 - PCC boundary;
 - Access routes for construction and operation;
 - the locations of construction laydown areas;
 - Maximum Building Dimensions;
 - Maximum stack height;
 - Grid connection location; and
 - Water supply connection location and routeing.
- 6.7.3 Other aspects have not yet been finalised, pending the detailed design so the draft DCO incorporates flexibility on these matters and the EIA has assessed options and/or 'worst case' scenarios where relevant, i.e.:
- the design and layout of the buildings and plant within the PCC Site;
 - the location of the absorber stack within Work No. 1C and the location of the HRSG stack within Work No. 1A;
 - the choice of CCGT, carbon capture and HP compressor technology and provider;
 - the inclusion of three alternative connection points to the natural gas grid (within the Natural Gas Connection Corridors);
 - the inclusion of two alternative routings for the electrical connection within the Electrical Connection Corridor to Tod Point sub-station;
 - the inclusion of two alternative routes for the discharge of treated effluent, cooling water and surface water to Tees Bay;
 - the inclusion of two options for the outfall, replacement (as described in Paragraph 6.6.7 above or refurbishment of the existing;

- the inclusion of two alternative routes for the CO₂ Gathering Network to cross the River Tees; and
 - the inclusion of a corridor for the CO₂ Export Pipeline route.
- 6.7.4 The Rochdale Envelope approach has been applied to address these options, as set out in each technical chapter of this ES.
- 6.7.5 The design and definition of the Proposed Development has continued to evolve since the publication of the PEI Report, partly in response to consultation responses, and also due to ongoing refinement of the design and Site boundary with reference to additional survey information and ongoing discussions with stakeholders including landowners. These changes are summarised in Table 6.1 below. This includes changes to the Site Boundary which are illustrated on Figure 6-1 (ES Volume II, Document Ref. 6.3).

Table 6-1: Summary of design changes and a comparison of environmental effects between the PEI Report and ES

| Topic | Reference on Figure. 6-1 | Status as Reported in the PEI Report | Status as Reported in the ES and draft DCO | Reason for Change | Comparison of Environmental Effects |
|---|---------------------------------------|---|---|--|--|
| Site Area and Boundary (Overview) | As shown on Figure 6-1 | Site was around 1482 ha and Site boundary as was shown on Figure 1-1 in PEI Report Volume II. | The Site is now 462 ha and Site Boundary is as shown on Figure 1-1 in ES Volume II, Document Ref. 6.3. In general, areas have been removed from the indicative application site boundary as it was reported in the PEI Report and the overall Site Boundary area has reduced. Areas removed are outlined in more detail below within this table. In addition, it has been necessary to include some areas of land that were not included at the PEI stage. These are further outlined in more detail below within this table. | Refined in response to feedback from consultation, ongoing evaluation and refinement of the Proposed Development design, to reduce construction corridors and land take. | Environmental effects are the same or lower than assessed at the PEI stage based on the reduced land take of the construction corridors and therefore increased distances to sensitive receptors. |
| Site Area and Boundary (Reductions- shown with black lettering on Figure 6-1) | A (CO ₂ Gathering Network) | Within Site boundary | Areas no longer included within the Site boundary. | Narrowing of CO ₂ Gathering Network Corridor. Use of shorter Tees Crossing Route. | Environmental effects are the same or lower than assessed at the PEI stage based on the reduced land take in the Teesside and Cleveland Coast SSSI/SPA/Ramsar site at Saltholme and in Seal Sands, across the Tees, along Dabholm Gut, at Bran Sands, and within the former Redcar Steelworks site. Increased distance from receptors. Reduced potential for impacts on protected species, vegetation and soils. |

| Topic | Reference on Figure. 6-1 | Status as Reported in the PEI Report | Status as Reported in the ES and draft DCO | Reason for Change | Comparison of Environmental Effects |
|-------|-------------------------------|--------------------------------------|--|---|---|
| | B (Natural Gas Connection) | Within Site boundary | Areas no longer included within the Site boundary. | Narrowing of Gas Connection Corridor. Use of shorter Tees Crossing Route. | Environmental effects are the same or lower than assessed at the PEI stage based on the reduced land take in the Teesside and Cleveland Coast SSSI site. Reduced land take in Saltholme, Seal Sands, across the Tees and within the former Redcar Steelworks site. Reduced potential for impacts on protected species, vegetation and soils. Increased distance from receptors. |
| | C (Construction Laydown) | Within Site boundary | Areas no longer included within the Site boundary. | Reduction in size of construction laydown areas in Saltholme and at Haverton Hill. | Environmental effects are lower than assessed at the PEI stage based on the decrease in area of arable land used for laydown. Reduced potential impacts on protected species, habitats, vegetation and soils. Increased distance from receptors. |
| | D (Use of Teesworks Land) | Within Site boundary | Areas no longer included within the Site boundary. | Reduction of areas of land within the former Redcar Steelworks site (Teesworks Site). Reduction of areas within Tees around steelworks abstraction. | Environmental effects are the same or lower than assessed at the PEI stage based on the reduced development on potentially contaminated land. Reduced habitat loss. Reduced impacts on protected species, habitats, vegetation and soils. Increased distance from receptors. Removal of abstraction from River Tees and associated potential for impacts in estuarine habitats and species. |
| | E (Crossings of Coatham) | Within Site boundary | Areas no longer included within the Site boundary. | Reduction in area of land required for Water Discharge Corridor. | Environmental effects are lower than assessed at the PEI stage based on the reduced land take in the Teesside and Cleveland Coast. |

| Topic | Reference on Figure. 6-1 | Status as Reported in the PEI Report | Status as Reported in the ES and draft DCO | Reason for Change | Comparison of Environmental Effects |
|-------|---|--------------------------------------|--|---|--|
| | Sands – Water Discharge Connection and CO ₂ Export Pipeline) | | | Reduction in area of land required for CO ₂ Export Corridor. | SSSI/SPA/Ramsar site. Reduced potential for impacts on internationally protected species, habitats, vegetation and soils. Increased distance from receptors. |
| | F (Abstraction from River Tees) | Within Site boundary | No longer included within the Site boundary. | Removal of need for water abstraction as water to be supplied by NWL. | Environmental effects are lower than assessed at the PEI stage based on the reduced land take in the Teesside and Cleveland Coast SSSI. Reduced potential for impacts on internationally protected species, habitats, vegetation and soils. Increased distance from receptors. |
| | G (Electrical Connection) | Within Site boundary | Areas no longer included within the Site boundary. | Reduction in area of land required for Electrical Connection Corridor due to selection of connection point and route. | Environmental effects are lower than assessed at the PEI stage based on the reduced development on potentially contaminated land, developable land, and farm land. Reduced habitat loss. Reduced impacts on protected species, habitats, vegetation and soils. Increased distance from receptors – particularly residential properties. Reduced potential for noise and EMF impacts. |
| | H (Access) | Within Site boundary | Areas no longer included within the Site boundary. | Reduction in area of land required for Site access. | Environmental effects are lower than assessed at the PEI stage based on the reduced development on potentially contaminated land, developable land, and landscaped areas. Reduced habitat loss. Reduced impacts on protected species, habitats, vegetation and soils. Increased distance from |

| Topic | Reference on Figure. 6-1 | Status as Reported in the PEI Report | Status as Reported in the ES and draft DCO | Reason for Change | Comparison of Environmental Effects |
|------------------------------------|---|--------------------------------------|--|--|---|
| | | | | | receptors – particularly residential properties. Reduced potential for noise. |
| Site Area and Boundary (Additions) | A/B (CO ₂ Gathering Network/Natural Gas Connection) | Not in Site boundary | Amendment to the Site boundary. | Change in area of land required for micro-bored tunnel for Natural Gas Connection and CO ₂ Gathering Network from Navigator Terminals to the PCC Site. | No significant impacts associated with MBT construction and operation at depth. |
| | B (Natural Gas Connection) | Not in Site boundary | Amendment to the Site boundary. | To allow connection to National Gas Grid infrastructure at Seal Sands. | No change. |
| | C (Construction Laydown) | Not in Site boundary | Amendment to the Site boundary. | Change in area of land in Saltholme and INEOS required for construction laydown using existing plant yard. | No change or potential reduction in environmental effects. Use of existing areas of hardstanding formerly used as plant yard (Saltholme) / car park (INEOS) means that previously developed land will be utilised for laydown instead of vegetated areas. |
| | H (Access) | Not in Site Boundary | Amendment to the Site boundary. | Use of additional tracks/roadways to provide improved construction access to Water Supply Corridor, Natural Gas Connection Corridor and CO ₂ Gathering Network. | No change. |
| | I | Not in Site boundary | Amendment to the Site boundary. | Change in area of land for upgrade or | Area increased to accommodate uncertainty in location of existing |

| Topic | Reference on Figure. 6-1 | Status as Reported in the PEI Report | Status as Reported in the ES and draft DCO | Reason for Change | Comparison of Environmental Effects |
|----------|--|---|--|---|--|
| | (Water Discharge Pipeline) | | | refurbishment of existing outfall. | outfall. No change in environmental effects as the works associated with any refurbishment would be the same. |
| | J (CO ₂ Export Pipeline) | Not in Site boundary | Amendment to the Site boundary. | Increase in area of land for CO ₂ Export Pipeline and potential replacement Water Discharge Pipeline. | Change in orientation of CO ₂ Export Pipeline to avoid potential conflict with offshore wind farm. Construction of CO ₂ Export Pipeline and replacement Water Discharge Pipeline in single corridor to reduce environmental impacts from those presented in the PEI Report. |
| PCC Site | | Number of CCGT Trains at the PEI Stage was 3 | Reduced to a single CCGT Train. | To enable deployment of a single train initially and demonstrate carbon capture can work on a single unit before considering whether to scale up the project to additional units. | Environmental effects are lower than assessed at the PEI stage based on the reduction in land take and potential emissions (noise, air, water). |
| | | No. of High Pressure Compressors at the PEI Stage was 5 | Reduced to 2 compressors to initially allow transport of 4Mtpa CO ₂ rather than 10Mtpa CO ₂ , with space provision retained for installing additional compressors in the future if demand is required. | Reduced size to accommodate a single CCGT train and phase 1 industrial connections. | Environmental effects are lower than assessed at the PEI stage based on the reduction in land take and potential emissions (noise). |
| | | Surface water retention and attenuation ponds sized for three power and capture trains. | Reduction in area of land required for retention and attenuation ponds to accommodate single train plant. | Reduced area required to manage surface water from a smaller development area. | No significant change. |

| Topic | Reference on Figure. 6-1 | Status as Reported in the PEI Report | Status as Reported in the ES and draft DCO | Reason for Change | Comparison of Environmental Effects |
|---------------------------------|--------------------------|---|--|--|---|
| Water Supply Corridor | | Cofferdam required during construction and upgrading of the existing cooling water abstraction point in the River Tees. | Requirement for abstraction from the River Tees has been removed along with the requirement for a cofferdam. | Water to be supplied by NWL. | Environmental effects are lower than assessed at the PEI stage based on the reduction in noise impacts and associated disturbance on marine life and bird life during cofferdam construction and works on the abstraction point. Removal of potential impact on fisheries and marine life from use of the abstraction during plant operation. |
| Water Discharge Corridor | | Open-cut techniques across Coatham Dunes and Sands assessed as a worst case during construction of the replacement water discharge pipeline | Use of trenchless technologies for crossings of Coatham Dunes and Sands and use of the same corridor for construction of the outfall as is proposed for the CO ₂ export pipeline. | Significant reduction in impacts on the Teesside and Cleveland Coast SSSI/SPA/Ramsar site. | Environmental effects are lower than assessed at the PEI stage based on the removal of potential for impacts associated with disturbance, noise, water table drawdown and potential for contamination. |
| CO ₂ Export Pipeline | | Installation using open-cut techniques assessed as a worst case during construction | Use of trenchless technologies for crossings of Coatham Dunes and Sands. | Significant reduction in impacts on the Teesside and Cleveland Coast SSSI/SPA/Ramsar site. | Environmental effects are lower than assessed at the PEI stage based on the removal of potential in impacts associated with disturbance, noise, water table drawdown, potential for contamination. |
| Gas Connection Corridor | | Installation using open cut techniques with use of HDD for the River Tees Crossing. | Installation using open cut techniques with use of micro-bored tunnel for the River Tees Crossing (if required). | Micro-bored tunnel required as design work has identified that direct crossing from Navigator Terminals to the PCC Site is too long for use of HDD techniques. | No change. |

| Topic | Reference on Figure. 6-1 | Status as Reported in the PEI Report | Status as Reported in the ES and draft DCO | Reason for Change | Comparison of Environmental Effects |
|-----------------------------------|--------------------------|---|--|--|--|
| CO ₂ Gathering Network | | Installation using open-cut techniques assessed as a worst case during construction. | Use of existing pipe racking, overbridges and culverts where possible with only limited use of open cut techniques (with use of trenchless crossings for some roads, water courses and water features). Removal of connection to Tees Renewable Energy Plant. | Reduce cost and environmental impacts and footprint of development. Easier installation and maintenance of the network. | Reduction in impacts associated with disturbance, noise, water table drawdown. |
| Electrical Connection Corridor | | Installation using either open-cut techniques for underground cables or overhead lines. Two alternative sub-station locations at Tod Point or Lackenby. | No overhead lines to be installed. Installation using predominantly open cut techniques for underground cables, with trenchless techniques used for watercourse and road crossings. Use of existing/proposed bridges for crossing some site roads and rail line. Connection to nearest sub-station to the Site at Tod Point. | Reduction in length of connection to sub-station and associated costs and risk of delay. Reduced environmental impacts and footprint of development. | Environmental effects are lower than assessed at the PEI stage based on the reduction in impacts associated with disturbance, noise, water table drawdown. Reduction in EMF effects due to removal of overhead lines and burial of cables. |

6.8 Conclusions

- 6.8.1 The 'Do Nothing' alternative scenario has been discounted on the basis that there is a clear need for the Proposed Development as outlined in the Need Statement (Document Ref. 5.2) and Planning Statement (Document Ref. 5.3) submitted with the Application.
- 6.8.2 It is considered that the choice of technology, the choice of fuel for the CCGT and the inclusion of the associated connections and extent of the CO₂ gathering network are appropriate based on the consideration of alternatives that has been undertaken as part of the EIA and based on the purpose of the Proposed Development, which is to develop a First Of A Kind carbon capture cluster for the collection and disposal of carbon dioxide emissions from a power station and industrial sources.
- 6.8.3 The Site is considered to be suitable for the Proposed Development on the basis of the reasons presented within this chapter.
- 6.8.4 More specifically the Teesworks site is deemed the most appropriate site for the electricity 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.
- 6.8.5 Alternative locations within the Site and alternative technologies have also been considered with consideration and comparison of environmental effects.
- 6.8.6 Effects on sensitive receptors such as the Teemouth and Cleveland Coast SSSI/ SPA/ Ramsar site and other environmental receptors can be mitigated by design.
- 6.8.7 The Proposed Development design and layout (including the routing of the connections) have continued to evolve following consultation and also consideration of access points, site layout, equipment sizing and capacity, land ownership, interaction with other developments and the phasing of construction, Site Boundary changes, biodiversity mitigation and enhancement proposals, water connection options, and environmental effects of each option have been appraised alongside technical and commercial considerations.

6.9 References

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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.