

# **Lighthouse Green Fuels**

## **Development Consent Order**

Preliminary Environmental Information Report

### **Chapter 6: Alternatives and Design Evolution**

Planning Inspectorate Reference: EN0110025

**2<sup>nd</sup> December 2025**

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# 1. Introduction

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- 1.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) 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 and Chapter 5: Construction Programme and Management (PEIR Volume 1).
- 1.1.2 The requirement to consider alternatives for the Proposed Development is established under Regulation 14(2)(d) of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (EIA Regulations) which states that an Environmental Statement (ES) should include:
- “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.”*
- 1.1.3 This legislative requirement is reflected in paragraph 4.3.15 of Section 4.3 (Environmental Effects/ Considerations) of the Overarching National Policy Statement for Energy Infrastructure (EN-1) (Ref 1). Paragraph 4.3.15 of EN-1 states that:
- “applicants are obliged to include in their ES, information about the reasonable 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”.*
- 1.1.4 This chapter provides preliminary reporting of the consideration of alternatives and design evolution that has been undertaken with regard to the development of a Sustainable Aviation Fuel (SAF) production facility to meet the identified national need for such a facility, while seeking to minimise adverse environmental effects while maximising its wider benefits
- 1.1.5 The design of the Proposed Development will continue to be developed through further engineering design work, engagement with stakeholders and with reference to surveys and technical studies that are being undertaken. Detailed design work will proceed after Final Investment Decision (FID), which is forecast in 2027, although any changes that result from the detailed design work are expected to remain within the design parameters that will be set by the draft DCO.

## 2. The Do Nothing Alternative

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- 2.1.1 The “Do Nothing” alternative would mean that one of Europe’s largest and most technologically advanced SAF production facilities would not be developed. The SAF Production Facility is forecast to produce 180 million litres of SAF and 30 million litres of renewable naphtha each year, equivalent to the fuel required for 25,000 short haul flights from the UK to Europe or 2,500 long haul flights. The technology would help to avoid approximately 350,000 tonnes of carbon dioxide (CO<sub>2</sub>) a year compared with conventional aviation fuel.
- 2.1.2 In the instance that the plant is not built, it will not be a significant contributor to achieving the UK Government’s Jet Zero Strategy (Ref 2) and SAF Mandate. In this case, domestically produced SAF would not be available, which could also mean increased imports from overseas, with fewer of the environmental and economic benefits as well as indirect socioeconomic effects (e.g. supply chain formation, indirect spend) offered by the Proposed Development.
- 2.1.3 The development of SAF production facilities is recognised as being essential to meeting the targets set out within the Jet Zero Strategy and the overall strategic target of delivering net zero aviation by 2050.
- 2.1.4 Given the urgent need for SAF production facilities, the “Do nothing” alternative scenario is not considered appropriate.

### 3. Site Requirements

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- 3.1.1 A primary consideration for the selection of the Proposed Development is an area of sufficient size and access to suitable connection opportunities for the chosen technology.
- 3.1.2 The Main Site is well suited to the SAF Production Facility as it comprises an existing predominantly brownfield site of sufficient size in an industrial area and located some distance from the nearest residential properties. The Main Site also has access to the River Tees to allow construction of a quay for import of modular plant and materials during construction, and for import of sustainably sourced biomass during operation. The Proposed Development facilitates potential connections to bulk liquids handling rail, road and marine infrastructure which may be used for the export of SAF and renewable naphtha and also necessary utility connections including supplies of natural gas, industrial gases and water, as well as an electricity transmission network and wastewater treatment facilities.
- 3.1.3 The identified Main Site is large enough to enable a biomass-fired Combined Heat and Power (CHP) plant to be built and operated, providing secure low carbon electricity and steam to the process, thereby further reducing the carbon intensity of the produced SAF.
- 3.1.4 The Proposed Development is also located close to the proposed Northern Endurance Partnership's (NEP) Carbon Dioxide Gathering Network which will run through and adjacent to the Main Site. This will provide the potential for future connection to NEP's off-shore carbon dioxide (CO<sub>2</sub>) transport and storage infrastructure, further reducing the greenhouse gas emissions associated with the Proposed Development.
- 3.1.5 A previous site was under consideration for the Proposed Development<sup>i</sup>, the northern boundary of its main site was located approximately 100m south of the southern boundary of the current Main Site. This was actively considered and a DCO application was being progressed (PINS Reference EN010150) with both EIA scoping and statutory consultation exercises carried out. However, that site did not have direct access to the River Tees and therefore was less suitable for delivery of construction modules and biomass feedstock. The site was also smaller in size, which would have meant that the biomass feedstock pre-treatment would have had to be undertaken off-site. These important technical reasons contributed to the decision to discontinue use of the previous site and change the location of the SAF Production Facility to the Main Site.

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<sup>i</sup> <https://national-infrastructure-consenting.planninginspectorate.gov.uk/projects/EN010150>

## 4. Alternative Feedstocks Considered

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- 4.1.1 The Proposed Development will utilise sustainably sourced biomass as the raw input feedstock. This allows the production of advanced SAF without the need for carbon capture or access to the NEP CO<sub>2</sub> transport network. Biomass will primarily be imported by ship and received at the proposed quay. The biomass will be thermally pretreated on-site prior to being used in the SAF production process.
- 4.1.2 Sustainably sourced biomass has been chosen as the main feedstock over other alternatives such as waste as there are ongoing uncertainties over the timing and availability of a connection from the Proposed Development to the NEP CO<sub>2</sub> Infrastructure which could be used for the future capture of CO<sub>2</sub> emissions from the Proposed Development. The processing of sustainably sourced biomass would produce only biogenic CO<sub>2</sub> as opposed to the processing of waste feedstocks which also produces non-biogenic CO<sub>2</sub>.
- 4.1.3 Once a connection to the NEP infrastructure can be made, use of alternative feedstocks can be considered, initially through engagement with the potential supply chain. The captured biogenic fraction of the CO<sub>2</sub> would then also become negative emissions under the carbon accounting rules.

## 5. Alternative Technologies

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- 5.1.1 The Main Site has been designed to use a gasification and Fischer-Tropsch (FT) technology that converts feedstocks into liquid fuels, namely SAF and renewable naphtha (Annex Aa.i.Ref 3).
- 5.1.2 Alternative SAF production technologies are available including other gasification technologies that use different conversion and refinement processes. Upon review of these alternatives, the Applicant considers that the proposed technology represents the most proven and the least technology risk to enable the facility to be successfully developed and commercially operated.
- 5.1.3 Use of gasification and FT to produce SAF has been identified as being able to produce the lowest carbon intensity SAF compared to other technologies such as Hydrotreated Esters and Fatty Acids (HEFA). Combined with carbon capture and storage (CCS), the gasification and FT production route can offer appreciable negative emissions. The produced SAF also meets the requirements of the aviation industry for suitability for blending with conventional jet fuel.
- 5.1.4 In addition, there are also alternative fuel products which can be produced from sustainably sourced biomass feedstocks such as methanol, bio-synthetic natural gas and green hydrogen (H<sub>2</sub>). However, these would not meet the defined need for volumes of SAF to meet aviation decarbonisation targets and therefore have not been considered further for this Proposed Development.
- 5.1.5 The Applicant is exploring options for the future use of hydrogen within the SAF production process, as this could further improve production yields. The Applicant is aware of several proposed or potential low carbon hydrogen production and transport projects being developed in proximity to the Proposed Development. Should a supply of H<sub>2</sub> become available later, this may be incorporated into the process but it does not form part of the Proposed Development.

## 6. Design Evolution

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- 6.1.1 As part of the on-going design process, consideration has been given to a range of design options. Decisions taken regarding the design of the Proposed Development have been informed by environmental appraisal and assessment work and by consultation with stakeholders.
- 6.1.2 The Rochdale Envelope approach has been applied to address any outstanding design uncertainty and options have been evaluated in terms of potential environmental effects and constructability. The approach taken has been described within each topic specific chapter.

## 7. Summary

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- 7.1.1 In summary, alternatives to the Proposed Development have been considered with regards to alternative feedstock and technologies in line with the requirements of Regulation 14(2)(d) of the EIA Regulations and Paragraph 4.3.15 in EN-1.
- 7.1.2 The chosen location at Seal Sands in North Tees is considered to offer a highly suitable location with good access to road, rail and marine transport options. It also has good access to potential electrical, natural gas, industrial gases and raw water supplies. Waste water treatment and industrial gas supplies are located in South Tees but these can be connected to the Proposed Development using a mixture of existing and newly constructed pipelines using existing infrastructure to cross under the River Tees.
- 7.1.3 The Proposed Development's location is also well placed to connect to a future carbon transport and storage network.
- 7.1.4 The choice of feedstock has been considered against alternatives. A decision has been reached that sustainably sourced biomass will provide the most suitable feedstock to facilitate the deliverability of the Proposed Development.
- 7.1.5 Additionally, the chosen technology can produce SAF and renewable naphtha. This provides a commercially viable production of certified SAF for use in the decarbonisation of aviation.

## References

- Ref 1 HM Government. (2024). 'National Policy Statement for energy (EN-1).' Available at: <https://www.gov.uk/government/publications/overarching-national-policy-statement-for-energy-en-1>
- Ref 2 Department for Transport. (2022). 'Jet Zero Strategy.' Available at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/1095952/jet-zero-strategy.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1095952/jet-zero-strategy.pdf)
- Ref 3 BioTfuel®: Successful advanced biofuels production from woody biomass on demonstration units | IFPEN (ifpennergiesnouvelles.com). Available at: <https://www.ifpennergiesnouvelles.com/article/biotfuelr-successful-advanced-biofuels-production-woody-biomass-demonstration-units>



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