Chapter 5

Alternatives Considered

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5. Alternatives Considered

5.1 Introduction

5.1.1 Schedule 4, Part 1 of the EIA Regulations (Ref. 5.1) requires that an ES provides *'An outline of the main alternatives studied by the Applicant [APL] and an indication of the main reasons for the Applicant's [APL's] choice, taking into account the environmental effects*'. Under the EIA Regulations applicable to this Project there is no requirement to assess alternatives, only a requirement to provide an outline of those alternatives that have actually been considered. In this case, the need to consider alternatives is not engaged under the Habitats Regulations or pursuant to a policy requirement under Section 5.3, 5.7 and 5.9 of NPS EN-1.

5.1.2 This chapter therefore describes the site selection process followed by APL and the key factors that led to the identification of the Project Site, and provides an outline of the main generating equipment technologies, layouts and access, and Gas Connection and Electrical Connection route options, considered for the Project.

5.2 Project Site Selection

5.2.1 APL's site selection process began in 2010 and considered a range of factors, including key factors identified in (Factors influencing site selection by developers) of NPS EN-2. As recognised by NPS EN-2 (**Chapter 2: Regulatory and Policy Background**, Section 2.7), it is for energy companies to decide what applications to bring forward and the Government does not seek to direct applicants to particular sites. In addition, the specific criteria considered by applicants, and the weight they give to them, can and will vary from project to project.

5.2.2 The process followed by APL included the following main phases, in order to first identify a number of potentially feasible sites and thereafter refine this set of sites through increasingly detailed selection criteria:

- Identification of a large number of potential sites across the UK through existing data sources;
- Refinement of this set of sites, driven mainly by the need for electrical generation capacity to be located as closely as possible to the main sources of demand in the UK;
- Further refinement based on the layout of the electricity and gas transmission networks in the UK, to ensure proximity to these networks; and
- Assessment of the remaining sites based on technical, environmental and economic factors, as well as consideration of whether or not a proposed Project would be in accordance with local planning policy and with the availability of the sites.

5.2.3 Within the final phase, the key technical considerations included the size of the site (i.e. is a sufficient area available to support a power generation plant of up to 299 MWe and integral infrastructure) as well as any geographical or network-related constraints to accessing gas and electricity connections.

5.2.4 From an environmental perspective, consideration was given to the proximity of sensitive receptors, such as residential properties or sites of ecological importance (to avoid unacceptable impacts from noise and visual disturbance), the current nature of the surrounding area (to limit impacts on the landscape character of the area), previous site uses and land quality (to avoid sterilisation of the best and most versatile agricultural land) and proximity to sensitive ecological habitats.

5.2.5 The key economic criterion is the proximity of a site to appropriate gas and electrical connection points, in order to reduce the cost to the UK consumer and the environmental impact of the associated connections.

5.2.6 Based on these factors, the Project Site was considered suitable for the following main reasons:

- It is in close proximity to a suitable electrical connection point;
- It is in close proximity to a suitable gas connection point;
- The Project Site does not include any nationally important environmental designations;
- The land available is of an adequate size to accommodate the Power Generation Plant, Gas Connection and Electrical Connection;
- The Project Site is largely situated on poor quality agricultural land (improved grassland classified as Grade 4 agricultural land);
- It is in close proximity to similar industrial developments including the Felindre Gas Compressor Station and Substation;
- The surrounding network is within an area of net electricity import; and
- It is in close proximity to a well-developed road network to the Project Site.

5.2.7 As a result of the site selection process outlined above, Drax is bringing forward three other power generation projects through the PA 2008 process. They are: Progress Power Ltd at Eye Airfield in Suffolk (www.progresspower.co.uk): Hirwaun Power Ltd at Hirwaun in South Wales (www.hirwaunpower.co.uk): and Millbrook Power Ltd in Bedfordshire (www.millbrookpower.co.uk). The first two projects listed received DCOs in July 2015. A DCO application for Millbrook Power Limited was submitted to the Planning Inspectorate in October 2017.

5.3 Power Generation Plant

5.3.1 The following technology options have been considered for the Power Generation Plant: OCGT plant; Combined Cycle Gas Turbine (CCGT) plant; Reciprocating Gas Engines (RGE) plant and CHP Plant.

5.3.2 The operation of OCGT plant has been described previously in Section 3.4. CCGT plant consist of the same plant items as OCGT, although they also utilise a heat recovery steam generator (HRSG) which uses the waste heat from the exhaust gases to produce steam which is used to power a steam turbine. RGE plant are similar in operation to a large internal combustion engine, with a crankshaft driven by pistons. CHP utilises waste heat from the combustion process to feed to other industrial users (deemed off-takers) within the vicinity of the plant. Further information is provided in a separate report prepared regarding the use of CHP at the Project (Appendix 5.1).

5.3.3 OCGT is considered to be the most suitable technology choice for generating up to 299 MW as a peaking plant and operating at up to 2,250 hours at the Project Site based on the following environmental, technical and feasibility considerations:

- Visual impact: OCGT plants require shorter stack(s) compared to CCGT plant and therefore are less visually intrusive in views from the surrounding environment;
- Water resources: Since no cooling is required for the condensing of steam, the cooling requirements of OCGT plants are significantly lower than, for example, CCGT plants. The auxiliary cooling requirements (for lubrication oil, etc.) would be met via dry air cooling through the use of fin-fan coolers or Air Cooled Condensers (ACC). The water requirement of a OCGT plant is therefore significantly lower than for CCGT plants;
- Noise and available space: noise levels from an OCGT plant would typically be lower than for an RGE plant. A larger number of RGE units would be required at the Generating Equipment Site to generate up to 299 MW. Spatially this may not be possible;
- Financial: based on the anticipated electricity market, it is essential that the Power Generation Plant of the size proposed would be particularly cost effective, as it would be called upon to operate flexibly to balance out the National Grid and meet changing demands of customers; and
- Start-up times: OCGT plants are able to start up and shut down much quicker than similar sized CCGT plants and are, therefore, better suited to meeting variable demands.

5.3.4 Uncertain market conditions in 2014 led to the consideration of a number of different OCGT technologies and, as such, the 2014 PEIR and associated formal consultation process was based on the construction and operation of between 1 and 5 Gas Turbine Generators. However, greater clarity on the capacity market rules, further engagement with the equipment manufacturers, and consultation with the local community and relevant stakeholders has led to the decision that a single Gas Turbine Generator is the best technology solution for the Project. These changes have been reflected in the updated preliminary EIA and are reported on in this PEIR.

a) Layout

5.3.5 The design of an OCGT is dictated by its operational requirements. A limited range of site layouts were examined before culminating in the final design of the Project taking into account the following constraints:

- Avoidance of utilities such as the 1.68 m cast iron Water Main and National Gas Transmission System (hence bisects site under the Gallops);
- Avoidance of landfill to north;
- Avoidance of higher topography to the north west which would be more visible in key views;
- Avoidance of woodland to the East;
- Avoidance of solar farms to the north, south, east and west; and
- Avoidance of field boundaries, ancient woodland and mature trees as far as reasonably possible (being wildlife/ heritage features).

5.3.6 The final layout of the Project Site has also been determined by the following main factors in relation to each of the components, as discussed below.

i. Generating Equipment

5.3.7 The Gas Turbine Generator and stack require the largest area of land-take as compared to the other components. It is also best practice for the layout of the Generating Equipment Site to make the Generating Equipment easily accessible by the operators and maintenance staff from the control and administration building. These were key considerations which influenced the siting of the Generating Equipment Site.

5.3.8 However, the subsequent identification of the Water Main, which crosses the Generating Equipment Site and Laydown Area from northwest to southeast (see Figure 3.4), has influenced where the Generating Equipment will be located within the Generating Equipment Site. The Water Main is owned by Welsh Water, who has advised that typically a 30 m buffer (15 m either side of the Water Main) is required to be kept clear of construction activities. To accommodate this requirement, and to allow for uncertainty over the accuracy and digitisation of Welsh Water's archive drawings, a 60 m allowance has been incorporated in the configuration of the Generating Equipment.

5.3.9 Further investigation works are ongoing to determine the exact location of the Water Main but this is not expected to require any additional design changes due to the 60 m allowance being applied and agreed with Welsh Water.

5.3.10 The 2016 engineering review of the Project identified that the site for the Generating Equipment could be contained in one location instead of being separated by the Water Main by staging or raising the ground levels to create platforms. By applying the same 60 m allowance to the location of the Water Main and the reduction in gas turbine units to a single turbine unit, it was therefore possible to fit the Generating Equipment Site into a single location to the north of the gallops, thereby avoiding the requirement for splitting the Generation Equipment and increasing the land available for potential Laydown Area and Ecological Mitigation Area.

5.3.11 The majority of the Generating Equipment is therefore positioned to the north of the Water Main.

ii. Access

5.3.12 During Phase 1 statutory consultation, two options were considered for access to the Generating Equipment Site. Access Option 1 (so-called as it was identified first) would have involved taking access from the north via the Rhyd-y-pandy Road and the existing access road west of Brynheulog past Abergelli Farm which would need to be extended to the Generating Equipment Site, as shown between the points D and C on Figure 5.1. This option involved widening of the existing gravel track to 6 m and localised upgrades along the Rhyd-y-Pandy Road. The track crosses the National Gas Transmission System. It runs parallel to the Water Main but does not cross it.

5.3.13 Subsequently, a second access option, known as Access Option 2, was identified. This is from the west via the B4489, along the access road to the Substation and Felindre Gas Compressor Station, which will be widened to accommodate the abnormal loads required during construction, and then along a new section of purpose built access road to be constructed across undeveloped land to the Generating Equipment Site as shown between the points A and B on Figure 5.1. The purpose built extension from the existing access road to the Generating Equipment Site will cross under a 400kV overhead electrical line, two watercourses and a Local Transmission System pipeline.

5.3.14 Access Option 2 was the option taken forward and is referred to elsewhere in this PEIR as the Access Road. The main reasons for this choice were that the majority of the public consulted during 2014 supported Access Option 2 in preference to Access Option 1, as it would result in a lower adverse impact on traffic by using a shorter, more direct route and would avoid the roads leading to Morriston Hospital. This option would also minimise the amount of construction required, as part of the access is existing.

5.3.15 Two onsite options (Option A and Option B) are being considered for the internal new Access Road from the Substation to the Generating Equipment Site. These are detailed in **Chapter 3: Project and Site Description** and shown on insert in Figure 5.1. Further investigations and engineering reviews are ongoing, and so the choice of route will be subject to consultation with interested parties. The final route design will be confirmed at DCO submission, taking into account consultation feedback.

b) Combined Heat and Power (CHP)

5.3.16 The potential for using CHP opportunities with these technologies was also considered (Appendix 5.1). However, it is not technically or economically feasible with a peaking power station in this location for the following reasons:

- There is no existing regional heat market. From local searches, there are no suitable heat users of applicable scale available and none able to accept the unpredictable supply of heat available.
- The intermittent and peaking modes of operation of OCGT are incompatible with the likely continuous demands of heat users.
- No potential future heat requirements in the area have been identified and none are currently anticipated that would match the irregular operational pattern of a peaking plant.

5.3.17 Given the lack of applicable heat demand as outlined above, it is not considered reasonable to seek to make provision for exploiting potential future heat demand.

5.3.18 Based on the above environmental, technical and feasibility considerations, an OCGT is considered to be the most suitable technology choice for generating up to 299 MW as a peaking plant and operating up to 2,250 hours at the Project Site.

5.4 Gas Connection

5.4.1 A gas connection feasibility study was undertaken in March 2014 to define and evaluate the options available for connecting the Generating Equipment to a suitable source of fuel gas. This identified Feeder 28 of the National Gas Transmission System or a nearby Local Transmission System pipeline as possible connection points. The location of these connection points in relation to the Project Site is shown on Figure 5.2.

5.4.2 Investigations to identify specific route corridor options to the National Gas Transmission System or Local Transmission System pipelines within a predetermined Gas Connection Opportunity Area (Figure 5.2) were carried out, considering in particular the length, the number of crossings required, environmental effects and cost. The Gas Connection Opportunity Area was defined as a result of a gas feasibility study undertaken by Parsons Brinkerhoff in 2014.

5.4.3 The four principal potential connection route options (shown on Figure 5.2) listed below were explored further leading to the identification of a single preferred route for the Gas Connection. Due regard has been paid to relevant factors including environmental, planning, safety, engineering and constructability in selecting the preferred route.

5.4.4 Route 1 was approximately 1.7 km in length and included: no major road crossings; four minor road crossings; no major watercourse crossings; and two minor watercourse crossings. This route was a feasible route although it presented some major risks in regards to the potential for impacts on protected species and their habitats and proximity to the development of a Solar Farm at Abergelli Farm, to the west of the National Gas Transmission System.

5.4.5 Route 2 was approximately 1.2 km in length and included: no major road crossings; one minor road crossing; no major watercourse crossings; and one minor watercourse crossing. This route avoids pasture and deciduous woodland which have been identified as favourable for protected species. Although this route would not be as straight forward as Route 4 to implement, it is more viable than Route 1. A major risk remains in the possibility of routeing through the proposed solar farm or alongside and parallel to the National Gas Transmission System. Therefore, variations to this route were considered as Routes 2a and 2b. Route 2a would travel between the National Gas Transmission System and the edge of Abergelli Solar Farm and Route 2b as proposed would cross the National Gas Transmission System twice.

5.4.6 Route 3 was approximately 1.4 km in length and included: no major road crossings; one minor road crossing; no major watercourse crossings; and three minor watercourse crossings. Route 3 was considered the most viable alternative to Route 2. The route crosses the National Gas Transmission System and therefore would require the use of the HDD crossing technique.

5.4.7 Route 4 was approximately 0.4 km in length and included: no major road crossings; no minor road crossings; no major watercourse crossings; and one minor watercourse crossing. Route 4 would connect into the Local Transmission System. The route would allow little buffer capacity and would require negotiation with Wales and West Utilities in regards to their availability of fuel gas capacity.

5.4.8 Initially, Route 2 was chosen as the preferred option as it represented the shortest distance, whilst avoiding environmental constraints and risks associated with crossing the existing National Gas Transmission System.

5.4.9 Route 2a, which was the option to route the Pipeline between the solar park and the National Gas Transmission System, was also deemed unfeasible following discussions with National Grid who are owners of the National Gas Transmission System. Proceeding with Route 2a would involve working in close proximity with the National Gas Transmission System hence working under very constrained conditions over a longer distance compared to Route 2b which crosses the National Gas Transmission System at 2 locations over a shorter distance where working conditions would be more favourable.

5.4.10 Consequently Route 2b was chosen as the preferred route for the Gas Connection and is therefore the route which has been fully assessed in this PEIR. Although not the shortest route, it has lower risks and avoids ecologically significant habitats, such as rough pasture and deciduous woodland which were identified during the Phase 1 Habitat Survey (see Appendix 8.1).

5.5 Electrical Connection

5.5.1 A grid connection assessment was undertaken for the Project in March 2014 in order to define and evaluate the options available for connecting the Generating Equipment to the NETS for the export of electricity. The Project will connect into a Gas Insulated Switchgear (GIS) generator bay within the Substation. Agreements between NGET and APL to connect the Project into the Substation were signed on 21st September 2017.

5.5.2 Both underground cables and overhead lines were initially considered. However, underground cables were selected as the preferred option in order to minimise visual impact. In the 2014 PEIR, it was noted that the cable would be installed beneath the road. The cable is now being laid alongside the road for ease of maintenance.

5.5.3 The Electrical Connection Opportunity Area (see Figure 5.3), to the south west of the Generating Equipment Site, is the area within which the route for the Electrical Connection has been identified. In July 2014, the chosen route (as described in Section 3.6) was identified during a site walkover of the Electrical Connection Opportunity Area. A limited number of route corridor options for the Electrical Connection were considered, as the most appropriate option i.e. the shortest, most direct route from the Generating Equipment Site to the Substation, requiring the least amount of land take and avoiding any statutory designated sites or valued habitats, was available (see Figure 5.3). This negated the need to assess any less favourable options.

5.6 Ecological Mitigation Area

5.6.1 An area has been set aside within the Project Site boundary to be available for ecological mitigation if required. The location and area will be confirmed post-consultation once discussions with NRW and CCS have been undertaken. The area is likely to be commensurate with the extent of mitigation required and within the Order Limits of the Project.

5.7 References

Ref. 5.1 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 (as amended) ('the EIA Regulations').