

**Strategic Siting Assessment for  
the Development of New Nuclear  
Power Stations in the UK**

**Site Nomination Report for:**

**Bradwell**

**Report SSA/BR/001**

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**1.1 Question A1 – Site Description**

*Q. Please describe the location of the site.*

The nominated site comprises part of a former military airfield and land adjacent to the existing Bradwell nuclear power station. The site is located on the south side of the Blackwater estuary at the northern extremity of the Dengie peninsula some 15km east of the town of Maldon. The site is in the parish of Bradwell-on-Sea within the District of Maldon and the County of Essex. The grid reference of the approximate centre of the nominated site is 601000 209000.

The nominated site lies to the east and south of Bradwell nuclear power station, which is a twin-reactor Magnox power station that operated from 1962 to 2002 and is now being decommissioned. The site was previously proposed as a potential location for a Pressurised Water Reactor (PWR) power station.

The Dengie peninsula is a predominantly flat low-lying area of land between the River Blackwater to the north and the River Crouch to the south. At the east of the peninsula is marsh land. The site is mainly arable farmland and includes a former airfield. The River Blackwater is a Special Area of Conservation (SAC) and the intertidal area to the north of the site is a Site of Special Scientific Interest (SSSI), National Nature Reserve (NNR), Special Protection Area (SPA) and Ramsar site.

**1.2 Question A2 – Site Boundary**

*Q. Please set out, by delineating on an Ordnance Survey map at 1:10,000 scale, the boundary of the site.*

The nominated site boundaries are shown on Figure SSA/BR/001, Appendix H.

The nominated site boundary is drawn at the high water mark along the coast. It will be necessary to construct cooling water intake and outfall structures and possibly also coastal defences and marine off-loading facilities beyond this boundary. It is not possible to define these features in any detail at this time and their requirement, siting and design would be subject to detailed investigations at the local level. The appropriate measures to mitigate potential adverse environmental effects associated with these facilities would be considered during these detailed investigations.

**1.3 Question A3 – Credible Nuclear Power Operator**

*Q. Is your nomination accompanied by a letter of support from a Credible Nuclear Power Operator (CNPO)?*

A letter of support from EDF Energy is contained in Appendix A. In addition, a letter of support has been provided by Iberdrola which is contained in the same appendix.

## 1.4 Question A4 – Raising Community Awareness

*Q. Have you taken steps to raise awareness of the nomination with local communities living in the vicinity of the site, including the owner(s) of the nominated sites?*

The Nuclear Decommissioning Authority (NDA) and EDF Energy both own land at Bradwell. EDF Energy's land is adjacent to the existing Bradwell power station, which is currently being decommissioned, but the company does not have an operational presence. EDF Energy, which now incorporates British Energy, has assisted the NDA by raising community awareness of the proposed nomination.

Following the 27 January 2009 announcement from the Department of Energy and Climate Change (DECC) on the Strategic Site Assessment (SSA) nomination process, the NDA issued a press release to the national media confirming its intention to nominate the Bradwell site (see Appendix B).

EDF Energy has met with officials from Essex County, Maldon District and Colchester Borough councils to confirm that the Bradwell site would be nominated in the Government's SSA process.

Letters have been sent to Natural England and the Environment Agency confirming that the Bradwell site would be nominated to the Government's SSA process (see Appendix C).

Letters were also sent to the registered owners of land within the nominated area (see Appendix D).

A local advertising and media campaign was also completed in March 2009. The advertisements, as shown in Appendix E, were a quarter page size and appeared in the following publications:

- *Colchester Evening Gazette*
- *Maldon and Burnham Standard*
- *South Woodham Weekly News*
- *Essex County Standard*

A local press release (Appendix F) was issued to the following print and broadcast media in March 2009:

- *Colchester Evening Gazette*
- *Maldon and Burnham Standard*
- *South Woodham Weekly News*
- *Essex County Standard*
- *BBC Radio Essex*
- *Saint FM*
- *East Anglian Daily Times*
- *Essex Chronicle*
- *Radio Dream 100*
- *BBC Look East*
- *ITV*

A number of other local and regional stakeholders were contacted including the Bradwell LCLC, local MPs, councillors, key council (county and district/borough)

officers and chief executives, the East of England Development Agency (EEDA), members of the primary care trust, the director of public health, police and business representatives and the Chamber of Commerce as well as local residents who had registered an interest in being kept informed. All of these parties were sent a copy of the leaflet published by the Department of Energy and Climate Change (DECC) on 27 January which explains how new nuclear power station sites will be chosen and how people can have their say.

British Energy began an awareness raising programme in 2007. This included:

- *Meeting with the planning officials for the relevant local councils (Essex, Maldon and Colchester) and the local statutory bodies (Natural England and the Environment Agency). The purpose of these early meetings was to provide briefing on British Energy's proposals, raise awareness of the environmental impact assessment (EIA) work being undertaken on the land; gain an understanding of the local area likely to be affected and to seek a view on local attitudes to nuclear power and the prospect of a new nuclear build programme at Bradwell. The company has continued to provide regular updates to these organisations and other groups including briefings at open meetings arranged by Essex County Council during 2008.*
- *A series of six local public meetings in November 2008 held at Mundon, Tollesbury, West Mersea, Bradwell-on-Sea, Southminster, Steeple and Cold Norton. More than 240 people attended the public meetings in which British Energy stated that the Bradwell land was considered to be a good site for potential new nuclear development and that we intended to nominate the site when invited to do so.*

A copy of this nomination will be deposited with Essex County Council, Maldon District Council and Colchester Borough Council.

### **1.5 Question A5 – Consideration of Alternative Sites**

*To help the Government ensure that alternative sites for new nuclear build have been sufficiently considered at the strategic level, please set out (in a separate document if necessary) the process you followed for selecting this site for nomination, rather than any alternatives, together with the reason that led you to make this selection:*

The NDA undertook a market engagement exercise in March 2008. Expressions of Interest in NDA assets were sought. NDA were approached by a number of companies who expressed an interest acquiring NDA land at Bradwell, Oldbury, Sellafield and Wylfa for the purpose of new nuclear build. The organisations that approached NDA were all Credible Nuclear Power Operators. On the basis of the approaches made, and the status of the organisations who made the approaches, NDA decided to nominate the four sites listed above.

In addition, EDF Energy's process of identifying suitable sites for potential new build commenced several years ago. The starting point was to establish the key objectives in relation to site selection, each of which was relevant to one or more selection criteria. The relevant objectives were that sites should:

- *Meet requirements for health and safety (in relation to protecting the public, workers and the plant);*

- *Allow environmental protection and sustainable development requirements to be satisfied;*
- *Be suitable to meet the technical requirements of the chosen design (or designs);*
- *Be viable from a commercial perspective, taking account of the likely costs involved in realising the development.*

Based on EDF Energy's experience as an owner/operator and power station developer, and drawing on international guidance for siting nuclear power stations, a series of selection criteria was developed against which sites could be assessed.

The assessment identified potential sites in England and Wales via a series of steps. Areas which did not meet the criteria relating to demographics and infrastructure requirements were excluded on an initial high level screen. A further screen was applied, using criteria related to aircraft movements, military activities, topography, access to cooling water and local infrastructure. Potential sites not eliminated on these grounds were identified and assessed against additional criteria including environmental, planning and commercial considerations.

The conclusion reached, taking account of a range of safety, technical, planning and commercial criteria, is that the nominated site is suitable, at a strategic level, for new nuclear build by 2025.

It is on the basis of these assessments that the site has been selected for nomination.

### 2.1 Question C1 – Demographic Risk

*Q. Given the complexity of this calculation the Government has decided that it is not reasonable to expect nominators to carry out this calculation themselves; rather the calculations will be undertaken by the NII for the area of the nominated site.*

*Nominators therefore do not need to provide any further information, beyond the description of the site set out in A1 and A2, to support the consideration of this exclusionary criterion.*

Additional information is not required to be supplied for this question.

### 2.2 Question C2 – Proximity to Military Activities

*Q. Given the security considerations around the information for this criterion, the Government has decided that it is not reasonable to require nominators to provide it themselves; rather the assessment will be undertaken by MoD for the area of the nominated site.*

*Nominators therefore do not need to provide any further information, beyond the description of the site set out in A1 and A2, to support the consideration of this exclusionary criterion.*

*Please note that proximity to other military aerodrome is also covered in question D5 below as a discretionary criterion.*

Notwithstanding that additional information is not formally required to be supplied in respect of this question, EDF Energy wish to make the following points.

The nominated site is not in or adjacent to a Military Air Traffic Zone.

Bradwell is in the Thames Valley Avoidance Area and as a result there should be no low flying military aircraft in the vicinity of the site.

There are two military firing ranges located within 16km of the Bradwell site. The closer of the two is at Fingringhoe, about 7km to the north at its closest approach. This is designated as a Danger Area and covers an area approximately 4.5km by 2.5km. It is used for 'the firing of all descriptions of machine guns, machine carbines, rifles, revolvers, mortars, grenades, rocket launchers and infantry anti-tank weapons'.

The Fingringhoe Ranges are separated from the Bradwell site by the Blackwater Estuary. The town of West Mersea (estimated population 7000) lies roughly halfway between the two, on the north bank of the estuary. The weapons employed at Fingringhoe are used for relatively close combat, and are judged to have insufficient range to reach Bradwell (and do not affect West Mersea).

There is a larger firing range to the south of Bradwell, at Shoeburyness. This site covers a lozenge-shaped area approximately 40km by 10km, most of which projects over the North Sea. It is used for the test firing of large calibre ordnance with

ground-to-ground ranges up to 27km. The power station site is approximately 13km away from the closest land-based portion of the Danger Area.

The Shoeburyness range is also used by Unmanned Air Vehicles and is used for controlled destruction of redundant conventional munitions, using techniques that include controlled open detonation and open burning.

Weapons testing is carried out to defined procedures, which include an assessment of climate conditions and possible effects on local communities. Although noise and vibration due to explosions on the site may cause nuisance and possibly low-level building damage to the surrounding area, engineered structures such as power stations would not be adversely affected, given the separation between the two locations. Similarly, site procedures would ensure that long-range ordnance would be directed out to sea, within the Danger Area.

On the basis of the information provided above, it is reasonable to conclude at a strategic level, that the proximity of the two firing ranges to the nominated site should not rule out the site for consideration for a nuclear power station.

In our opinion the nominated site satisfies Criterion C2.

### 3.1 Question D1 - Flooding

*Q. Does the site (as set out in A1 and A2 above) fall within any areas of high flood risk – for example, within zone 3 of the Environment Agency flood risk categorisation?*

All development plans and proposals in England must take account of Planning Policy Statement 25 (PPS25) whose principal aim is to avoid inappropriate development in areas at risk of flooding. Where, exceptionally, development in such areas is necessary, PPS25 requires it to be designed and constructed so as to ensure that it is suitably flood resilient, with safe access and escape routes provided during flood events and with a residual flood risk that can be safely managed. The policy also requires that, where possible, development reduces the flood risk overall.

A preliminary flood risk assessment has been undertaken of the nominated site. This has utilised publicly available flood mapping available on the Environment Agency's website which has been used to prepare Figure SSA/BR/006 (Appendix H). This plan, which we understand does not show the effect of existing flood defences, indicates that approximately one third of the nominated area, centred on the former airfield, has a low risk of flooding (< 0.1% or a 1 in 1,000 year return period), the rest of the nominated area having a significant risk of flooding (> 1.3% or 1 in 75).

Being situated on the Essex coast, the flood risk is dominated by inundation from the sea, which is influenced by tidal and meteorological conditions.

The lowest ground level within the nominated site is approximately +3.0m Ordnance Datum (OD). The low lying land is currently protected from marine flooding by a clay revetment with a crest level at approximately +4.8m OD, which extends both to the east and west along the shore of the estuary. The existing coastal defences are understood to be of 18<sup>th</sup> century origin and so the viability of such structures in this area is well established, although the current structures have a limited residual life.

Current mean high and low water spring tide levels are +2.52m OD and -2.28m OD, respectively. The current 1 in 50 year surge is estimated as +4.24m OD whilst the estimate for 2105, incorporating sea level rise (SLR), is +5.91m OD (United Kingdom Climate Impacts Programme, UKCIP 06 SLR) or +6.11m OD (Defra SLR)<sup>1</sup>. 'The threat posed by tsunami to the UK' states that wave heights caused by tsunamis would be similar to those of major storm surges. Thus, low lying areas currently benefit from some protection from more extreme events, although the site would need to be made more flood resilient to accommodate a new power station.

An integrated approach would be applied to the design of the new power station incorporating land raising, flood defence improvements and coastal protection measures to protect the site from flooding over the full lifetime of the power station.

The nominated site is large enough for these protection measures to be accommodated on site and they would therefore be in control of the developer. No

<sup>1</sup> Review of medium to long term coastal risks associated with British Energy sites: Climate Change Effects. UK Met Office 2007.

assumptions have been made in relation to relying on third party schemes for flood protection.

Given the size of the nominated area and the variation in ground levels that occur across the site, we are confident that the site can be engineered to provide an adequate level of flood protection in line with the requirements of PPS25. The design would take account of all relevant hazards including still flood water, storm surge and tsunami, with allowance for climate change and sea level rise.

PPS25 Practical Guide Companion published by the Department for Communities and Local Government in February 2007 states that “*unless the development is located in an area that is subject to tidal flooding and which serves no conveyance function, land raising must be accompanied by the compensatory provision of flood storage either on or off-site*”. Given that the principal flooding risk at Bradwell is from tidal inundation, and given also that the site is located adjacent to existing coastal defences, it is unlikely to serve any flood conveyance role and therefore land raising should be possible without reliance on the creation of compensation storage.

It is recognised that there are a number of statutory ecological designations in the site’s vicinity (see response to questions D6 and D7). The proposals to protect the site from flooding would therefore need to be designed carefully in order to avoid, reduce or mitigate adverse impacts on these designations; we consider this is feasible, subject to the detailed proposals being investigated at the local level.

The immediate hinterland of the site is not at risk of flooding.

The existing access road to the site is in an area which falls outside the extent of the extreme flood zone. Generally this means that the chance of flooding each year from rivers or the sea is currently 0.1% (1 in 1,000) or less. Nonetheless, to prevent the nominated site becoming isolated by flooding, taking account of climate change and sea level rise, it may be necessary to protect existing and proposed new access routes, or to raise sections of the routes above predicted flood levels.

In summary, it is reasonable to conclude, at a strategic level, that a nuclear power station within the nominated site could be protected against flood risks, including the effects of climate change, throughout the lifetime of the power station.

In our opinion the nominated site satisfies Criterion D1.

### **3.2 Question D2 – Coastal Erosion or other Landscape Change Scenarios**

*Q. Does the site (as set out in A1 and A2 above) cover any areas that are at risk from coastal erosion or other landscape change scenarios?*

The Blackwater estuary is a coastal plain estuary bordered by mudflats and salt marsh. To the east of the nominated site a number of ridges are visible, up to 3m high and 25m wide. These ‘Chenier’ ridges are historical accumulations of sand and shell material winnowed by wave activity from the salt marsh and oyster and cockle-rich tidal flats. A large area of the estuary has, historically, been reclaimed for agriculture and other uses and some of this reclamation activity probably originally advanced behind these Chenier ridge formations.

Erosion is most rapid and widespread towards the lower levels of the inter-tidal mudflats and salt-marshes between the deep channel of the estuary mouth and the

upper shore. It is exacerbated by the existing flood embankments and is expected to increase in the future. Thus, a significant characteristic of shores adjacent to the nominated site is a progressive reduction, with time, in the width of the intertidal salt marsh ('coastal squeeze') and a consequent increase in the gradient of slope across that shore, seaward of the coastal defences. Estimates of the effect on sea levels associated with surge events and climate change in combination with other causes of sea level rise are provided in the response to question D1.

The outer Thames embayment experiences a mild wave climate, with the majority of waves approaching from the south east. Waves of up to 1.2m can propagate from the open sea but, as they move landward, their energy is dissipated.

The coastal defences at the nominated site comprise a clay flood embankment faced with 'Essex slabs', constructed in the 18th/19th centuries. These defences are deteriorating and have a limited residual life.

The current local planning policy on shoreline management is to hold the defence line until a monitoring and modelling program is complete in order to consider different defence options for the estuary as a whole.

Changes in local shoreline management may have a major influence on the erosion and flooding hazards at this site. A proposal by the Environment Agency (EA) in 2004 for managed retreat over a 70ha site on the Weymarks Farm immediately east of the nominated site was rejected after public consultation. However, the EA had assigned a negative cost-benefit ratio to the maintenance of the flood defence along this 3km foreshore and it is probable that, notwithstanding present public opinion, the proposal for retreat may be re-visited at some stage over the next 100 years.

There would be no need or intention to extend flood defences and coastal protection measures across the existing shore. The new coastal protection measures could be built either on or immediately behind the existing line of coastal defence and they would thus continue to benefit from the dissipative effects of the intertidal area immediately seaward. Such a layout would avoid any wider impact of the development on neighbouring shores and would mean that the defences could be established and maintained by the developer. No assumptions have been made in relation to relying on third party schemes for coastal protection.

A consideration of long term landscape change would primarily focus on the likely climatological and geomorphological evolution of the Blackwater Estuary with time as well as any other development proposals that might have a bearing. For example, it would be expected that the intertidal area would continue to narrow and gradients across that intertidal area would continue to increase with time, and that this trend would be exacerbated by relative sea level rise; this would give rise to the possibility that larger waves would reach the site frontage. In designing and constructing the coastal protection works a variety of long term scenarios, such as this, would be considered and appropriate allowance made both in terms of engineering design and the management arrangements applied.

It is therefore reasonable to conclude, at a strategic level that a new nuclear power station within the nominated site could be protected against coastal erosion and other landscape scenarios, for the lifetime of the power station.

In our opinion the nominated site satisfies Criterion D2.

### **3.3 Question D3 – Proximity to Hazardous Facilities**

*Q. Given the security considerations relating to the information for this criterion, the Government has decided that it is not reasonable to require nominators to provide this themselves. Rather the assessment will be undertaken by the Health and Safety Executive (HSE) for the area of the nominated site.*

*Nominators therefore do not need to provide any further information, beyond the description of the site set out in A1 and A2 above, to support the consideration of this discretionary criterion.*

*However, nominators may wish to put forward arguments in a separate document for countermeasures or mitigations, if they think that the nominated site will be affected.*

Bradwell is not believed to be affected by any existing or proposed hazardous installation, and is not at risk from shipping activities along the Essex coastline.

It is noted however, that a planning application was made for a wind farm with ten turbines, to be located approximately 1.5km from the nominated site boundary. The application was refused on a planning technicality in June 2008, but may be resubmitted in the future. Given the distance to the nominated site, the proposed wind farm development would not pose a threat to a new nuclear power station at Bradwell.

In our opinion the nominated site satisfies Criterion D3.

### **3.4 Question D4 – Proximity to Civil Aircraft Movements**

*Q. The Government recognises that not all the information for this criterion is available in the public domain and has therefore decided that it is not reasonable to require nominators to provide this themselves; rather the assessment will be undertaken by the Civil Aviation Authority (CAA) for the area proposed by the nominator.*

*Nominators therefore do not need to provide any further information, beyond the description of the site set out in A1 and A2 above, to support the consideration of this discretionary criterion. However, they are encouraged to check the proximity of civil aircraft movements to the nominated site (as set out in A1 and A2), where information is available in the public domain.*

*However, nominators may wish to put forward arguments in a separate document for countermeasures or mitigations, if they think that the nominated site may be affected.*

The nominated site is not located in or adjacent to a Public Safety Zone, a Safeguarded Area or an Air Traffic Control Zone of a major civil aerodrome.

There is a flight restriction zone with a radius of two nautical miles which prevents civil aircraft movements in the vicinity of the nominated site at heights of less than 2000 ft. Exceptions are made for helicopters which have permission to land at the power station, and for aircraft conducting an instrument approach procedure at Southend Airport, flying at not less than 1500 ft. Similar arrangements can be made for a new plant on the adjacent site without any significant effect on air traffic.

The existing air traffic control regime has been developed taking account of the existing flight restriction zone around the existing power station. It is envisaged that the zone would be extended in the event of the development of a new nuclear power station within the nominated site.

In our opinion the nominated site satisfies Criterion D4.

### **3.5 Question D5 – Proximity to Other Military Activities**

*Q. Does the site (as set out in A1 and A2 above) cover any areas that are in close proximity to or may affect MoD assets or activities not covered by criterion C2 above? Such assets and activities may include (but are not limited to) technical sites and transmitters, offshore danger areas, and nuclear facilities (including ports used by military vessels).*

The nominated site is not in close proximity to other military activities.

In our opinion the nominated site satisfies Criterion D5.

### **3.6 Question D6 – Internationally Designated Sites of Ecological Importance**

*Q. Is the nominated site (as set out in A1 and A2 above) in, or could its development impact, any areas that are designated for ecological protection under the Ramsar and Natura 2000 networks?*

Development of a new nuclear plant at Bradwell has the potential to affect a number of Natural 2000 and Ramsar designated sites (see Figure SSA/BR/002).

As can be seen from this plan, the site is adjacent to the Dengie Special Protection Area (SPA) and Ramsar Site and the Mid Essex Estuaries Special Area of Conservation (SAC). These sites are, in turn, part of a network of SPAs and Ramsar sites within the wider Essex estuaries system, many of which have shared or similar mobile qualifying interests (the Mid Essex Estuaries SAC covers the entirety of the Blackwater and Colne Estuaries as well as the Dengie SPA and Ramsar Site). There is therefore the potential for adverse effects on the qualifying interest of sites that are adjacent to and remote from the proposed nominated area.

In addition to the above, the development could potentially have adverse effects upon the red-throated diver, the likely sole qualifying interest of the proposed Thames SPA (the boundary of which is yet to be confirmed).

The reasons for the designation of the Natura 2000 and Ramsar Sites listed above include wintering raptors and waterfowl, breeding little terns, a notable invertebrate fauna, individual rare plant species and a range of intertidal and sub-tidal habitats. Potential adverse effects on the cited interest of these sites include:

- *Disturbance of breeding, foraging, roosting and loafing birds (particularly during the construction process);*
- *Disturbance to and degradation of sub-tidal features; modification of sedimentary and hydrodynamic processes as a result of construction;*
- *Local loss of intertidal and sub-tidal habitat as a result of infrastructure associated with the new plant; and*
- *Modification of the thermal regime of the estuary, which has the potential to affect the structure of plankton and benthic communities, which may in turn*

*affect bird distribution through changes in intertidal prey resources and disturbance to estuarine and migratory fish populations.*

Environmental measures to avoid, minimise or mitigate effects on the qualifying interest of Natura 2000 and Ramsar Sites are possible and could include:

- *Screening of the works area and control of the workforce to limit disturbance effects on birds, including the timing of activities;*
- *Positioning of associated infrastructure away from important bird breeding areas;*
- *Use of tunnels or burial of any outfall pipe and cabling required for remote infrastructure;*
- *Siting of any warm water outfall to limit the circulation of water within the estuary and any potential adverse alteration of the thermal regime (following extensive modelling of scenarios); and*
- *Reinstatement to original condition of any areas affected by construction works and, potentially, appropriate habitat creation and management.*

In addition, there are standard and tested measures that can be implemented to limit potential entrainment of fish and other marine organisms.

Detailed baseline studies will be required to inform the ecological assessment of the proposal. This assessment will consider all potential impacts, especially those which could affect the qualifying interests of the designated areas. Without prejudice to the results of these detailed studies, and following preliminary consultations with Natural England, we have concluded at a strategic level that it should be possible to avoid, reduce or mitigate potential adverse effects so as not to have a detrimental impact on the integrity of the designated sites.

In our opinion the nominated site satisfies Criterion D6.

### **3.7 Question D7 – Nationally Designated Sites of Ecological Importance**

*Q. Is the site (as set out in A1 and A2 above) in, or could its development impact, any areas that are designated for ecological protection at a national level?*

Development of a new nuclear plant at Bradwell has the potential to affect three Sites of Special Scientific Interest (SSSIs) whose locations are shown on Figure SSA/BR/003, Appendix H. The Dengie SSSI is adjacent to the site boundary, and there are two further SSSIs within the estuary (the Colne and Blackwater SSSIs – the latter of which is approximately 250m west of the site boundary).

The SSSIs share a great deal of common cited interest with the Natura 2000 and Ramsar Sites described and discussed in response to question D6. Therefore, the same potential for impacts to occur and the same outline mitigation measures apply.

The only additional cited interests are sea walls and other terrestrial habitats that are included within the Blackwater SSSI. Without prejudice to the results of these detailed studies, and following preliminary consultations with Natural England, we have concluded at a strategic level that it should be possible to avoid, reduce or mitigate potential adverse effects so as not to have a detrimental impact on the key features of the designated sites.

In our opinion the nominated site satisfies Criterion D7.

### **3.8 Question D8 – Areas of Amenity, Cultural Heritage and Landscape Value**

*Q. Is the nominated site (as set out in A1 and A2 above) in, or could its development have an impact upon, any area that is designated for their high amenity, landscape or cultural heritage value?*

The nominated site does not directly impact on any nationally designated site of high amenity. It lies to the west of the Bradwell Conservation Area which includes several listed buildings. A number of listed buildings are also situated to the south of the site. Situated at the eastern tip of the Dengie Peninsula are a Scheduled Ancient Monument No. 24883, the site of a Saxon Shore Fort and St Peter's on the Wall Chapel (Grade I) circa 654 (see Figure SSA/BR/004, Appendix H). It is considered unlikely that the development would cause an adverse impact upon the character and setting of the Bradwell Conservation Area or the setting of St Peter's Chapel.

An integrated management plan would be drawn up to mitigate potential impacts on the local landscape, historic features and biodiversity. It would identify opportunities for strengthening the local landscape character, conserving biodiversity and enhancing public amenity and enjoyment of the historic environment of the area.

In our opinion the nominated site satisfies Criterion D8.

### **3.9 Question D9 – Size of Site to Accommodate Operations**

*Q. Please explain why it is reasonable to conclude that there is enough land within the boundary of the nominated site for the secure operation of at least one new nuclear power station.*

The nominated site area identified on Figure SSA/BR/001 is approximately 298ha.

Sizewell B, the most modern nuclear plant constructed and operated under UK regulation, utilises a total site area of 26ha for the operational facilities, including spent fuel and waste storage. The footprints of the current designs (e.g. EPR) are expected to be similar to or smaller than for Sizewell B, depending upon power output, due to simplification of the design and the adoption of a single main turbine. The longer design life will result in increased spent fuel and waste generation, however efficiency improvements relative to Sizewell B are expected to partially offset this increase.

In the event that direct seawater cooling of the turbine condensers is not acceptable and indirect cooling systems are necessary for some or all of the cooling load, additional space will be required. Depending on the plant output and cooling systems that are used, this additional area could be up to 20ha per reactor unit. Therefore, a land area of between 30 and 50ha is expected to be required.

Modern plant designs, including those submitted for Generic Design Assessment (GDA), make provision for the storage of spent fuel in ponds within the standard plant configuration. The capacity of these ponds is not sufficient for lifetime arisings but does allow for sufficient decay and cooling of the fuel to simplify subsequent storage. Both pond and dry storage techniques are feasible for subsequent storage of the lifetime fuel inventory and the area allowed for the permanent works allows for either approach, together with storage of lifetime arisings of intermediate level waste.

Before the operational site area is finalised, a review of the site layout will be conducted against the requirements of the regulators, in both generic and site-specific assessments, to confirm that these requirements have been met. Such a review is expected to include:

- *The design and layout of plant on the site to secure safety in the event of accidental or deliberate challenges and natural or contrived external hazards;*
- *The ability to monitor and control access to the site and within the site and control access to nuclear materials.*

Whilst detailed work on site layout has yet to be undertaken, comparison of the area with the area utilised for Sizewell B gives confidence that the site provides sufficient space for a new nuclear development comprising at least one reactor with associated plant and facilities. The optimum layout for efficient operation of a particular design may utilise additional land if this available within the nominated area.

In our opinion the nominated site satisfies Criterion D9.

### **3.10 Question D10 – Access to Suitable Sources of Cooling**

*Q. Please provide information about the cooling technologies that are feasible for likely nuclear power station developments within the nominated site.*

All power stations with steam turbines need cooling to condense the steam leaving the turbines. The steam should be condensed at as low a temperature as possible, as this has a significant effect on efficiency. Since the reactor thermal output is fixed, any reduction in efficiency causes a reduction in output of the power station.

The possible cooling options are:

- **Direct Water Cooling.** *This option would involve pumping sea water through the turbine condensers and returning the water to the sea at a temperature slightly warmer than the intake. This option would give the lowest cooling water temperature, thereby maximising plant efficiency.*
- **Indirect Cooling.** *This option would also use sea water as the cooling medium, but the sea water would be cooled with air in cooling towers. The resultant cooling water temperatures would be higher than those achieved with direct cooling, and plant efficiency would therefore be lower and the output significantly reduced. Much less water would need to be abstracted than in a direct cooled system. There are a number of PWR stations worldwide with indirect cooling systems, with designs appropriate to their location.*
- **Air Cooling.** *This option would involve condensing the exhaust steam in large air cooled condensers (ACC), over which air is drawn using fans. An ACC produces a very high steam condensation temperature and would require considerable use of electric power to operate the fans. Use of such a system would cause a significantly greater reduction in plant efficiency and output than indirect cooling. No ACC of the size that would be required at Bradwell has previously been built. Due to both the efficiency losses and the technical risk of developing novel plant, this would not be a preferred option where alternatives are available.*

From the above, it can be seen that the efficiency advantages of direct cooling mean that it would be the preferred option if it can be achieved. The use of indirect cooling systems or ACCs causes a substantial reduction in plant output.

The existing Bradwell power station was itself direct cooled. There is a considerable history of environmental studies undertaken by a variety of parties at the site, and there is considerable operating experience of the power station, which provides evidence on which to base future assessments.

Thorough technical and environmental impact studies would be conducted in order to determine the optimum configuration of the cooling system for the Bradwell site. These studies would consider all aspects of the project, including the effects of construction, operation and decommissioning. The plant design would use the latest technologies to minimise the impact of the water abstraction and the thermal discharge of the cooling system.

The direct cooling option will require long cooling water culverts to reach deep water to obtain the coolest water and to permit dispersion of the thermal plume to avoid any significant impact on designated ecological sites. To minimise the impact on the ecologically sensitive foreshore areas, it would be preferable to construct the large culverts for the direct cooling system by using tunnelling techniques so that there will be minimal impact at the surface.

Direct cooling is therefore the preferred option for the cooling load for a new nuclear station within the nominated site, depending on its final output. However, if in the detailed studies carried out at the local level it is found that there are environmental, technical or commercial limits to direct cooling, a suitable indirect cooling system could be developed for all, or part, of the cooling duty.

In our opinion the nominated site satisfies Criterion D10.

#### 4.1 Position of Signatory

*Q. Please provide evidence that the individual signing this declaration is a Director of the Company, Company Secretary, Partner or otherwise duly authorised to signatory.*

The person signing the nomination form is Acting Chief Executive of the NDA. The evidence is provided in Appendix G.

## Appendix A - Letter of Support from CNPO

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## Appendix B - NDA Press Release

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## Appendix C - Letter to Natural England / Environment Agency

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## Appendix D - Letter to Landowners

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## Appendix E - Advertisement

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## Appendix F - Local Press Release

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**Appendix G - Evidence of Position of Authorised Signatory**

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## Appendix H - Figures

The following figures are included in this appendix:

- SSA/BR/001 Nominated Site Area
- SSA/BR/002 International Statutory Designations
- SSA/BR/003 National Statutory Designations
- SSA/BR/004 Environmental Features
- SSA/BR/005 Site Location
- SSA/BR/006 EA Flood Zones

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## Appendix I - References

There is only one document referenced in the Nomination Report, which is:

- *Review of medium to long term coastal risks associated with British Energy Sites: Climate Change Effects. UK Met Office 2007*

Due to the size of the document, it is included as an electronic copy only with the nomination pack. A hard copy of the document can be provided on request.

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