CLEVE HILL SOLAR PARK

STATEMENT OF NEED – ADDENDUM

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Summary

Cleve Hill Solar Park Ltd, a joint venture between Hive Energy Ltd, and Wirsol Energy Ltd, has made an application for a development consent order ("DCO") under the Planning Act 2008 for a solar and energy storage generating station project, connecting to the National Electricity Transmission System ("NETS") at Cleve Hill Substation in Kent. A Statement of Need was prepared and submitted in support of that DCO application, this Addendum should be read in conjunction with that Statement of Need and the other documents submitted with that application

Like the Statement of Need, this Addendum has been prepared by Simon Gillett, M.A.(Oxon), M.Sc.(Dist) of New Stream Renewables and provides further support for the Cleve Hill Solar Park, by way of describing two significant withdrawals from large energy infrastructure developments in late 2018 / early 2019.

Contents

CHAPTER 1: THE UK HAS ENERGY SECURITY, AFFORDABILITY AND LOW-CARBON NEEDS

1.1 The Cleve Hill Statement of Need [1] makes the case that the UK's legally binding carbon reduction targets require significant investment in low-carbon generation assets, in order to facilitate removing carbon emissions from industry, home heating and transport.

1.2 Government priority [2, Para 1.7.9] is actively to encourage industry to accelerate progress towards a low-carbon economy. The backbone of any such transition is the prioritisation of cleaner power generation, although 'it is for industry to propose new energy infrastructure projects within the strategic framework set by Government' [2, Para 3.1.2].

1.3 Table 1.1[1] shows elements of the Government's Low Carbon Transition Plan, made in 2009, which were expected to make significant contributions to reducing the carbon intensity of electricity generation, and a status on these initiatives as of November 2018.

1.4 Carbon Capture and Storage (CCS) technology has not yet progressed to industrial scale, and no new carbon generating power stations with CCS capability have yet been proposed for GB. Wave / Tidal power has been proposed at a number of locations in the UK, although wave technology development has experienced both cost and operational challenges. Tidal power remains difficult to consent, and expensive to deliver, a position made clear by Governments' controversial rejection of the Swansea Bay Tidal Lagoon in June 2018 [5].

1.5 Nuclear power has attracted significant government attention over the last decade, and until recently nuclear projects have achieved much more progress than those of alternative large-scale low-carbon generation technologies. Two recent events however have cast a long shadow over the timeliness and quantum of any such contribution, these will be discussed later in this Addendum.

1.6 The argument made in this Addendum is that, given recent events relating to the bringing forward of large-scale nuclear power generation projects in the UK, any contribution nuclear power may make to the GB power mix is likely to be significantly later than even the most recent plans. If nuclear power is not able to make significant and confident contributions to decarbonisation, security of supply or energy affordability over the next decade, it is vitally important that other deliverable, fundable, affordable and beneficial technologies are consented as a priority in order to avoid the possibility of a power crunch later this decade. It is important to clarify that this Addendum does not seek to justify or promote the exclusion of any non-solar generation technologies from the future generation mix. The Statement of Need concludes that circa 300 – 400 MW of unsubsidised low-carbon solar generation is needed in the UK, and developing the asset as planned, will meet Government

[1] Reproduced from the Cleve Hill Statement of Need [1, Table 3.1]

objectives of delivering sustainable development, ensuring our energy supply is secure and providing benefits to GB consumers. The emerging risks associated with a forward nuclear capacity growth plan strengthen this conclusion.

Initiative	**Projection**	**Status**
New Nuclear	2013: construction of new nuclear commences. 2018: first new nuclear operational	2017: HPC construction commenced, with a Commercial Operation date currently not before 2025. 2018: Government advised to permit only one more GW+ nuclear before 2025 [13, pp10, 42]. Existing nuclear stations edging closer to decommissioning
Wave / Tidal	2014: Larger-scale wave and tidal energy generation (>10MW) starts to be deployed	2018: No larger-scale wave and tidal energy generation yet to be deployed. The second Severn Estuary / Swansea proposal was denied public funding this year
Carbon Capture & Storage	2020: up to 4 carbon capture and storage demonstration projects operational in the UK	2018: no CCS projects yet operational in GB. CCS at industrial scale remains technologically and economically uncertain
Renewable Energy Share	2020: Around 30% of electricity is generated from renewable sources	2018: Wind, solar, hydro, bioenergy accounted for 30.1% of generation for (Jan to Mar 2018). Nuclear accounted for 17.9%.

Table 1.1: Projections from 2009 for a low carbon power sector; and a 2018 status, Summarised from [4]

CHAPTER 2: NUCLEAR PROJECTS HAVE LONG DEVELOPMENT TIMEFRAMES

2.1 A series of Government white papers and consultations through 2007/8 was pre-cursor to an enabling framework for a Great British nuclear renaissance. Over the subsequent 5 years, Government removed successive barriers to nuclear development. This covered: site selection (the National Policy Statement for Nuclear Power Generation); regulatory approval of reactor designs (the Generic Design Assessment process); and revenue and back-end cost certainty (the Contract for Difference, a key element of the 2013 Electricity Market Reform, and the Funded Decommissioning and Waste Management Plan). The Energy Act 2013 also created a body corporate, the Office for Nuclear Regulation ("ONR") to regulate, in Great Britain, all nuclear licensed sites. These policy instruments clearly signalled that the UK was open to nuclear business and that it was now for commercial entities to bring new nuclear to market. The process which needs to be followed however is neither easy, nor short.

2.2 From a regulatory perspective, the Generic Design Assessment (GDA) of a reactor is a voluntary process undertaken by the Office for Nuclear Regulation (ONR) taking 4–5 years to complete, and may be applied for ahead of an application for a Nuclear Site Licence (NSL). GDA gives a clear indication of whether the design would meet safety, security and environmental regulatory requirements, and simplifies the necessary NSL and Planning Consent applications. The site-specific NSL is granted by ONR, who may take up to 18 months to assess the capability and resources of the applicant organisation, the site safety case and other site-specific factors. Planning consent should be quicker having secured GDA approval, assuming appropriate and successful community consultation has taken place.

2.3 Aside from achieving these consents, the applicant must confirm its commercial arrangements. There are three main agreements: Shareholder investment agreements (if the applicant is a JV); the Contract for Difference (CfD) or equivalent commercial arrangement which provides increased revenue certainty for the applicant; and the Secretary of State Investor Agreement (providing protection for the applicant and (ultimately) consumers, against significant changes to project economics or market arrangements). Once secured, the real task of digging dirt and pouring concrete can begin. During construction and commissioning, the NSL introduces at least 5 separate hold points. These may only be moved past when consent has been granted by the ONR.

CHAPTER 3: EDF ENERGY'S PROJECT DEVELOPMENT TIMELINE FOR THE HINKLEY POINT C EPR

3.1 Hinkley Point C is now under construction in the UK by an EDF Energy / China General Nuclear (CGN) partnership: Nuclear New Build Generation Company (NNB). The technology employed will be an UK EPR, designed by EDF and Areva. Following a request to the Health and Safety Executive in 2007 to commence the GDA process, nuclear construction at Hinkley Point B commenced in late 2018 – a project development timeframe lasting 11 years. Original aspirations were for the station to come on line in 2017, and as recently as 2016 commercial operation was slated to commence in 2023. Commercial Operation is now forecast for late 2025 [6]. In 2016, the Low Carbon Contracts Company signed a CfD with NNB for the Hinkley Point C project, guaranteeing power price for a 35–year term. Since signing this agreement, there has been a shrinking appetite for another Hinkley Point C-style CfD contract in the UK energy market, and a growing view that a different approach is needed.

3.2 The Sizewell C project, another EDF / CGN EPR, remains a viable project which is progressing through its development phases. Conversations with government on an alternate funding model are ongoing and not yet concluded, but being an identical copy of the Hinkley Point C plant, with a very similar operating organisation, it may proceed through planning, consenting and construction more rapidly than did / will Hinkley Point C. Sizewell C has unofficially been forecast to come on line by 2031, however EDF have formally stated that: 'the project does not currently have a timeline and although construction work could overlap with Hinkley Point C, it would not be at full capacity on both at the same time.' An optimistic squeeze of the timelines above might suggest nuclear construction starting in 2025 with commercial operation in 2031 being at least feasible.

3.3 In summary, potential commercial operation dates for these reactors *may* be:

- Hinkley Point B, 3.2 GW, 2026;
- Sizewell C, 3.2 GW, 2031.

Figure 3.1: Hinkey Point C Timeline, New Stream analysis

CHAPTER 4: EARLY DELIVERY OF OTHER NEW NUCLEAR PROJECTS NOW APPEARS LESS LIKELY

i) Moorside

4.1 Toshiba planned to develop three Westinghouse AP1000 reactors at Moorside in Cumbria, commissioning from 2026 onwards. In March 2017, the failure of two AP1000 developments in the US to keep pace with time and cost schedules came to a head. This directly resulted in Westinghouse (a Toshiba-owned subsidiary) filing for Ch. 11 bankruptcy in 2017. International AP1000 construction experience outside of the US has also been challenging with four AP1000s closing in on Grid Connection in China (Sanmen and Haiyang) after an expected construction duration of approximately 9 years for each reactor: more than twice their initial planned durations. A divestment of the UK project was at this time all but inevitable. Unable to find a new owner (both CGN (China) and KEPCO (South Korea) were reportedly interested in the site for their own technologies, but neither was in the end able to secure a deal) Toshiba announced their withdrawal from the project in November 2018.

4.2 As of March 2017 the Moorside project had secured GDA approval for their AP1000 reactors and progressed planning, consenting and site licence applications, placing them on a timeline to commence nuclear construction in around 2024, with commercial operation therefore being achieved at the earliest around 2030. With Toshiba's exit, because a different reactor design would likely be constructed at Moorside (if at all), the clock will reset on GDA. Planning (which is also dependent on reactor choice) and consenting (due to the necessity of proposing a new Nuclear Site Licensee) will also need to be recommenced by any new development company, introducing (based on Hinkley Point C experience) an indicative 11 year wait until nuclear construction commences.

4.3 In summary, potential commercial operation dates for this reactor may be:

- • Moorside, 3.0 GW, 2039

ii) Wylfa Newydd and Oldbury

4.4 Hitachi are the parent owners of Horizon Nuclear Power, who until recently ahve been working hard to develop two ABWR[2] at Wylfa Newydd. The ABWR is not a new reactor design: 4 Japanese plants have already commenced operation, and more are under construction internationally. Critically, each of the 4 completed reactors were built in less than 5 years. The ABWR received its GDA in late 2017; secured many of the necessary EA permits through 2018; and started commercial discussions with Government on funding arrangements in June 2018. Horizon's forecast commissioning date for Wylfa has remained at or around 2026 throughout the project development process. Commercial conversations with Government ground to a halt in January 2019 however, prompting Hitachi to announce a suspension of the project under grounds of 'economic rationality as a private enterprise' [7] Greg Clarke presented to the House of Commons the UK government significant commercial offer [8]:

[2] 1Advanced Boiling Water Reactor

- Government was willing to consider taking a one third equity stake in the project, alongside investment from Hitachi and Government of Japan agencies and other strategic partners;

- Government was willing to consider providing all of the required debt financing to complete construction; and

- Government agreed to consider providing a Contract for Difference to the project with a strike price expected to be no more £75 per megawatt hour.

4.5 Clearly the search for an acceptable commercial funding solution between Government and industry is set to continue, and it seems unlikely that any new nuclear projects will make significant progress with their development plans until such a solution has been finalised.

4.6 Wylfa Newydd was seen by many as the brightest light in the UK new nuclear world, being unique in the build list. Because Horizon was not trying to do something that has not been done before, their progress has been swift and their proposition compelling. Certainly given momentum and past history, commissioning Wylfa Newydd in the mid-2020s – possibly ahead of HPC – was a distinct possibility, with a second location, Oldbury, following perhaps as soon as 5 years later. Following Hitachi's suspension however, a 2029/30 timeframe now looks more realistic for Wylfa. This assumes that Hitachi's project suspension is lifted within 2 years, and allows some time for the remobilisation of resource, supply chain and planning activities.

4.7 In summary, potential commercial operation dates for these reactors may be:

- Wylfa Newydd, 2.6 GW, 2029;

- Oldbury B, 2.6 GW, 2035.

iii) Bradwell B

4.8 Taking the lead on the Bradwell B project from EDF, their partners at Hinkley Point C and Sizewell C, CGN have entered their reactor into the GDA process, and may be expected to emerge from that process in 2022 or shortly thereafter. With Hinkley Point C and Sizewell C receiving dedicated attention from the parent companies through their construction phases, a commission date before the mid-2030s seems unlikely for Bradwell B. No indications of intended project timelines have been published by the developer.

4.9 In summary, potential commercial operation dates for this reactor may be:

- Bradwell B, 3.0 GW, 2037.

iv) Small Modular Reactors (SMR)

4.10 Government remains committed to ensuring all technologies have a part to play in the future energy mix, providing that they offer value for money for consumers. One way of achieving scale and efficiency in nuclear power, is through the delivery of bigger projects, e.g. those listed above. SMRs offer an alternative approach, delivering economic efficiency through the production of multiples of units rather than the development of single units of immense scale.

4.11 In 2015, the Energy Technologies Institute (ETI) published a report into the enabling framework required to realise such a vision. This included a 'manufacturing line' capability to deliver efficiency and accuracy in the modular construction techniques [9].

4.12 ETI's analysis showed (for a more conventional light water-based reactor (LWR) design) a minimum 17-year development timeframe from the initial design concept through to commissioning of the first production unit. ETI do note that some SMR concepts may be some way along this timeframe. The earliest delivery of a first of a kind reactor is not likely to be before 2026, although given recent announcements from Government on the investigation of potential alternate funding arrangements, a more conservative timeframe may be more realistic. ETI consider that this timeframe may push out by up to an additional 9 years for more evolutionary designs.

4.13 In summary, potential commercial operation dates for these reactors may be:

- LWR SMR, 0.5 GW, 2029, with 0.5 GW every other year thereafter.

v) Decommissioning of the Existing Nuclear Fleet

4.14 By their initial lifetime expectations, almost all of the UK's existing reactors should by now have closed, however successive lifetime extensions have kept them running for longer than expected. Current operator expectations for plant closure dates for the Advanced Gas-Cooled Reactor (AGR) fleet are displayed in FIGURE 4.1. The UK's only Pressurized Water Reactor, Sizewell B, is currently scheduled to close (after 40 years operation) in 2035; but 20-year life extensions to PWRs are globally commonplace.

4.15 Further life extensions may be possible at these AGR, but they should not be viewed as a certain, or firm, option. Any contribution made by extending operation of the existing fleet to a shortfall in new build nuclear capacity coming forwards will be limited by plant reliability and safety case justifications for continued operation.

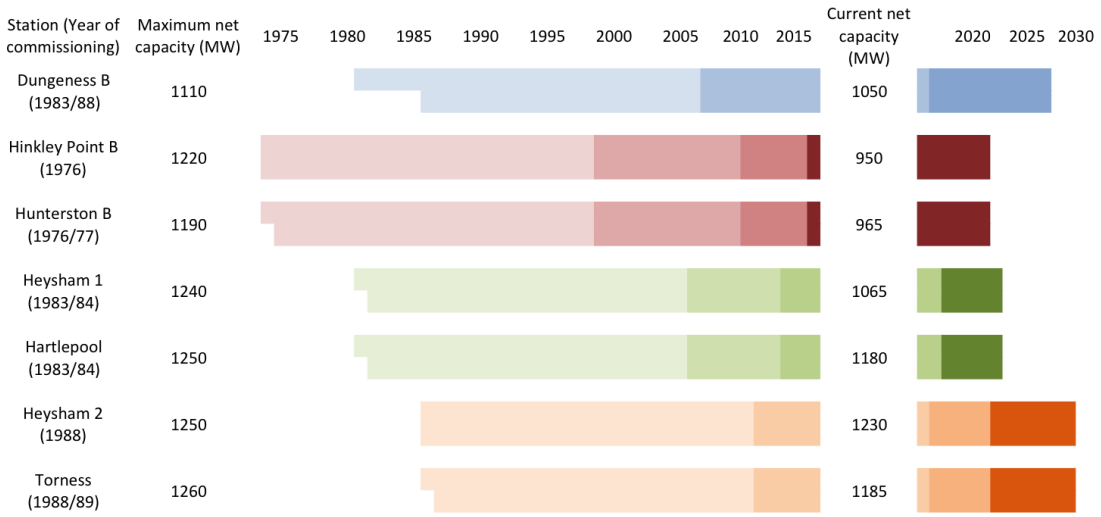

Figure 4.1: Generating capacities and announced closure dates for each AGR station [www.edfenergy.com]

CHAPTER 5: A SYNTHESIS OF NEW NUCLEAR COMMISSIONING DATE PROJECTIONS

5.1 Toshiba withdrew from Moorside. Hitachi suspended Wylfa and Oldbury. Little recent progress has been made towards enabling the development or deployment of SMR, and funding issues – including affordability and value for money – are yet to be resolved across the sector with Government.

5.2 The long lead times and significant public / private funding complexities of all of these projects, leads to an obvious conclusion: that nuclear power should not be strongly relied upon to make a significant contribution to low carbon generation in the UK over the critical pre– 2035 timeframe.

5.3 This is of relevance to the Cleve Hill Solar Park project, because of the importance of bringing forward significant capacities of low carbon power in contributing to the UK's legal carbon reduction targets.

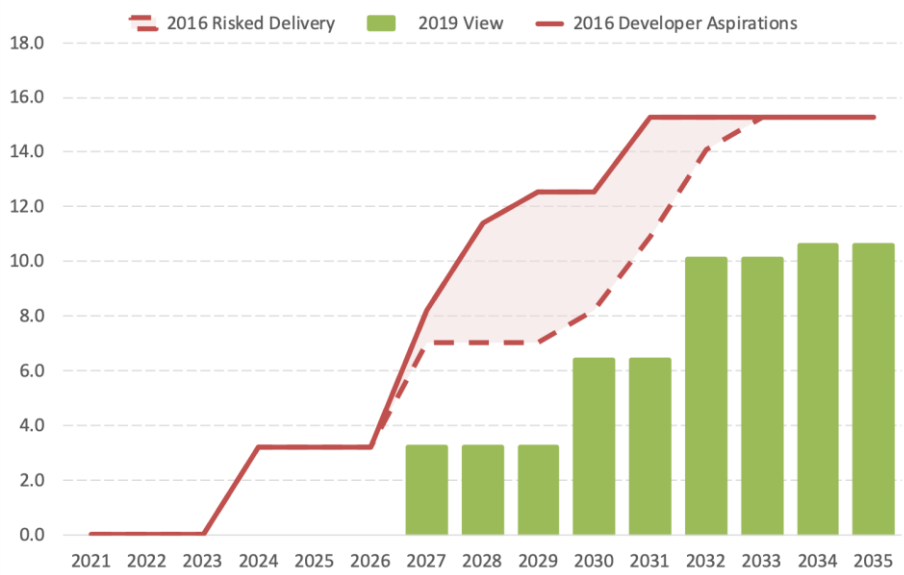

Figure 5.1: Projections on Nuclear New Build Capacity (2016, 2019). Source: New Stream Analysis and [10, 11]

5.4 Solar power has the credentials to deliver valuable low-carbon electricity in the critical pre-2035 timeframe and beyond. Solar power is economically and technically viable, and it is economically and technically preferential for the GB electricity consumer. In summary:

1. Solar offers a cost-effective contribution to decarbonising the GB electricity sector;

2. As part of a diverse generation mix, solar contributes to improving the stability of capacity utilisations among renewable generators;

3. Solar, when coupled with electricity storage, can offer many important ancillary services to the System Operator, supporting the integration of its renewable profile into the GB energy system;

4. Development timeframes will be short in comparison to other technologies, and the technology elements are proven. Subject to planning consent approval, solar has a high probability of being able to deliver low-carbon electricity from the early 2020s and beyond;

5. Internationally, solar generation assets are getting bigger and cheaper, providing a real-life demonstration that size and scale works for new solar, and providing benefits to consumers in the process.

5.5 CHSP is an investible project. It is a deployable technology at the right scale, with the investment backing to make meaningful and timely contributions to GB decarbonisation and security of supply, while helping lower bills for consumers throughout its operational life. Solar competently addresses all important aspects of emerging Government energy policy.

CHAPTER 6: BIBLIOGRAPHY

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Freepost: Cleve Hill Solar

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info@clevehillsolar.com

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