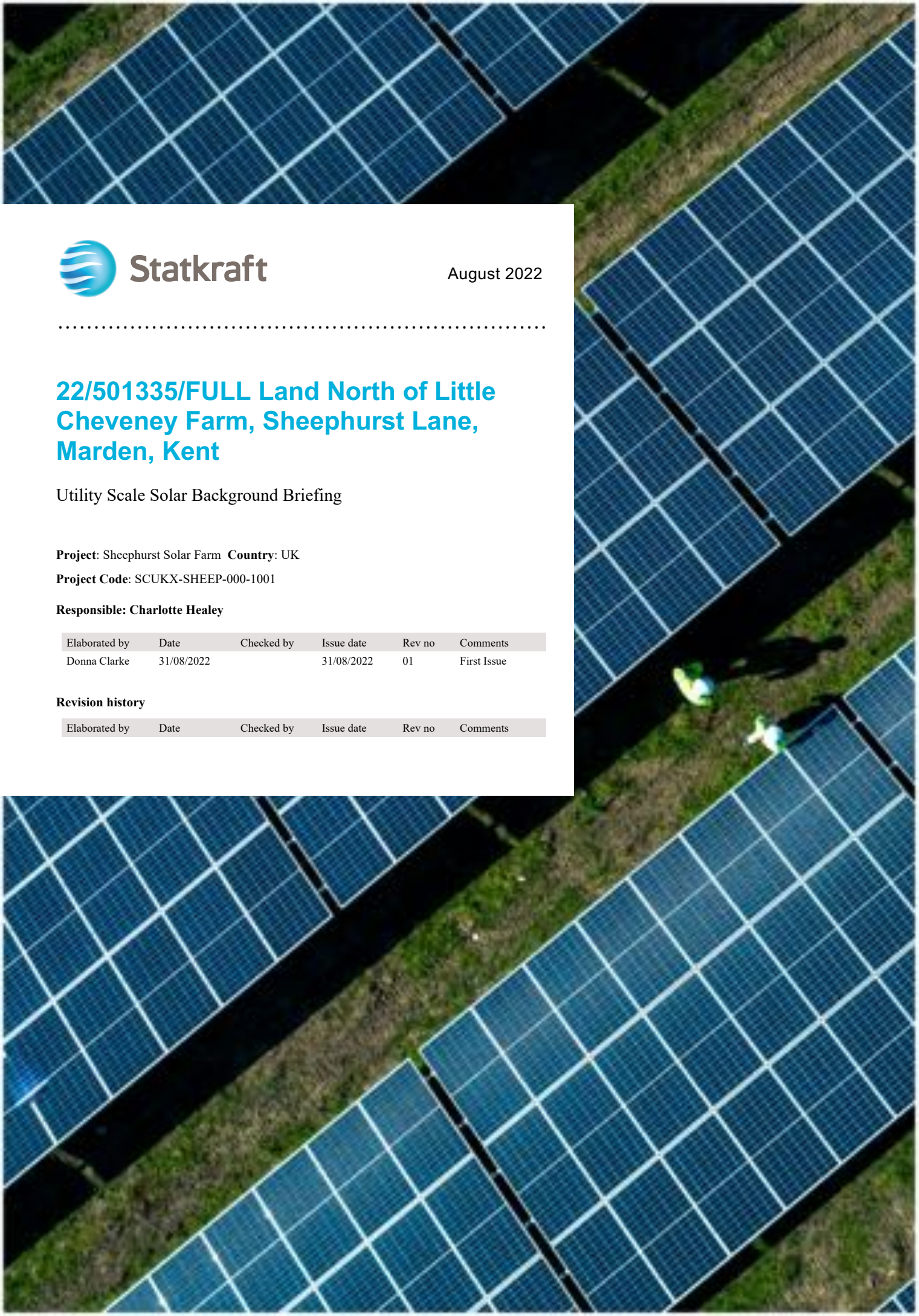

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August 2022

22/501335/FULL Land North of Little Cheveney Farm, Sheephurst Lane, Marden, Kent

Utility Scale Solar Background Briefing

Project: Sheephurst Solar Farm **Country**: UK

Project Code: SCUKX-SHEEP-000-1001

Responsible: Charlotte Healey

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Donna Clarke	31/08/2022		31/08/2022	01	First Issue

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1 Introduction

1.1 Solar energy represented a very small part of UK electricity production until 2010 when the UK Government introduced a feed in tariff (FIT) to support the development of a UK solar industry. The FIT stimulatid the development of utility scale solar across the UK.

1.2 Between 2010 and 2014 most solar projects were less than 20MW in size. From 2012 following the introduction of a progressive reduction in the FIT coupled with the need to achieve economies of scale, the size of solar farms began to increase. By the end of 2015 when the FIT was fully withdrawn for solar farms over 5MW, the UK had 140 operational solar farms of between 20-70MW in size. The largest being 69.8MWm in Wiltshire.

1.3 From March 2015 fewer utility scale solar farms of significant size were constructed. Most solar installations were either domestic rooftops or commercial installations backed by a private wire to energy users or a power purchase agreement with energy markets.

1.4 2021 was potentially the most significant year to date for the UK solar industry, with each of the three market segments – residential rooftop, commercial and utility scale - experiencing stable, subsidy-free growth. According to a report from Solar Energy UK, 730 megawatts (MW) of solar photovoltaic (PV) capacity was installed in 2021. This represents an increase in growth of 36 per cent on 2020,when 538 MW was deployed. The total installed capacity in the UK now stands at 14.6 GW.

1.5 The reasons why utility scale solar has shown significant growth since 2020is due to several factors. They include:

- stronger policy support for low carbon generation;
- technological improvements;
- economies of scale and cost reductions;
- investor confidence and the availability of finance.

1.6 At its peak current solar in the UK – whether rooftop or utility scale - has contributed 30% of UK electricity demand.

2 Overview of Utility Scale Solar

2.1 How does solar work?

Solar Photovoltaics (PV) is a technology for conversion of solar energy to electricity via the use of semiconducting materials. The photovoltaic effect is an electrochemical process that takes place when solar light comes into contact with a semiconductor; this results in atoms being ionised and generating direct current electricity. PV systems have no moving parts and consist of a panel made

up of solar cells, a ground mounting frame and electric cables, and an inverter to convert Direct Current (DC) electricity to Alternating Current (AC) that can be exported to the electricity grid.

2.2 What is a solar farm?

Solar farms are the large-scale application of solar photovoltaic (PV) panels to generate green electricity at utility scale, usually to feed into the grid. They can cover anything between 1 acre and 500 acres. They are differentiated from most building- mounted and other decentralised solar power applications because they supply power at the utility level, rather than to a local users. In the UK utility scale solar is ground mounted on either agricultural or brownfield land.

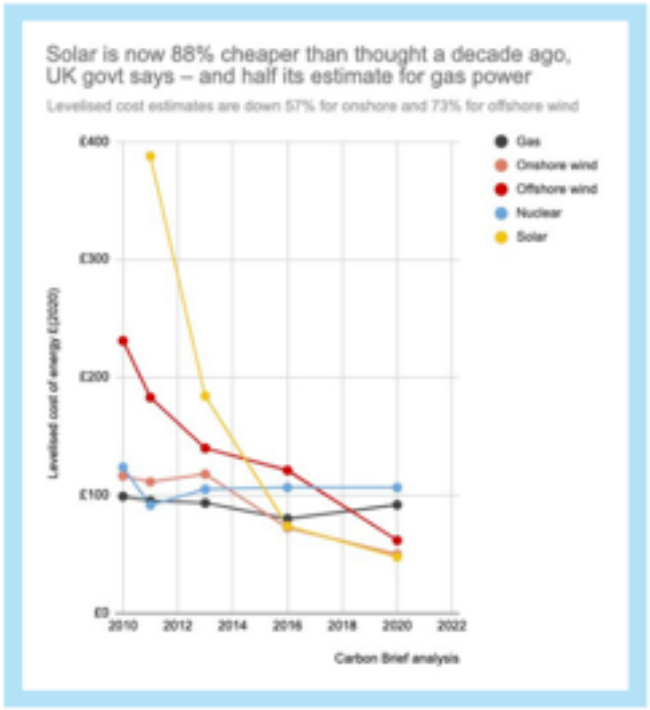
The largest consented utility scale solar farm is the 250MW Cleve Hill project in Kent which is 360 hectares. Currently, National Infrastructure Planning for England has 7 solar projects > 50MW in process with the largest being 750MW in size.

2.3 Cost reduction and technological improvements

The price of solar technology has plummeted around the world in recent years. The UK government estimates that utility scale solar has fallen in cost by 88% since 2010 and the cost of rooftop solar has declined by as much as 60% since 2010. The most recent Electricity Generation Costs Report published by the Government predicts that large scale projects commissioning in 2025 will be £44 p/MWh on a levelized cost base compared to £85 p/MWh for new gas plants. Solar is, and is expected to remain, one of the cheapest form of all electricity generation.

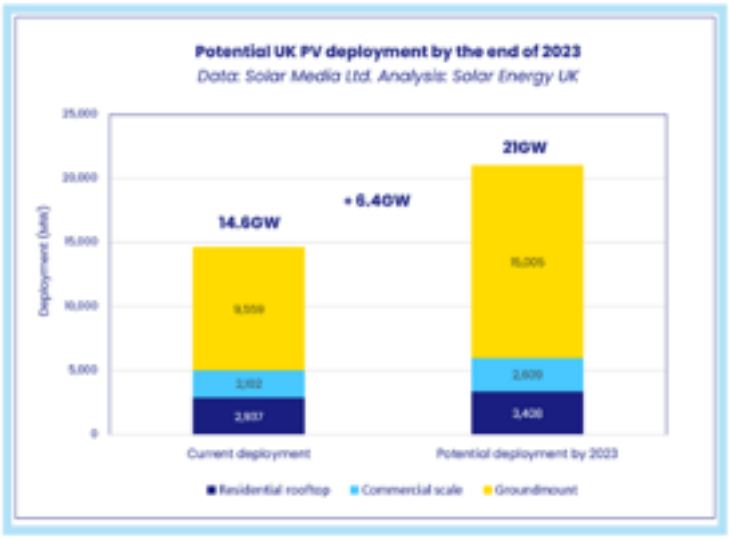
Cost reduction has meant that utility scale solar is now being built again after a lull when the Government removed the FIT subsidy. In the last two years 1.3GW of subsidy free solar has been built with over 700MW in 2021 alone. 6.4GW of subsidy-free solar could be deployed before the end of 2023 - more than double the capacity of Hinkley Point if the current pipeline of solar projects are built out. Furthermore, because utility scale solar can be built out quickly it can make a contribution to reducing energy prices and achieving net zero a lot faster than other renewable energy and conventional generation technologies.

Technological developments have been the main factor in cost reduction. Prior to 2019 technological developments were confined mainly to incremental increases in power as the quality and technology of the solar cells that make up the solar panel improved. In 2010 a typical solar panel would have been 180-200W and by 2015 at the end of the feed in tariff this had risen to 220W. From 2019 modules of over 400W started to appear and became standard but more recent technological advancements has resulted in modules of up to 800W becoming commercially available.



Source: Carbon Brief

The technological improvements directly result in significant economies of scale. A 50MW utility scale solar farm at West Raynham, Norfolk developed in 2015 occupied a land area of 225 acres. In 2022 a utility scale solar solar farm in Cambridgeshire is due to be built on only 60 acres. This is a significant reduction in land take which is mainly due to improvements in solar panel power rating and efficiency.



Source: Solar Media Ltd + Solar Energy UK

The only area where costs have not fallen is grid connection. Here continued transmission and distribution network constraints have driven significant increases in connection costs for all new generation whether renewable, nuclear or fossil fuel. In addition, timelines for a grid connection in order to export the electricity generated are being extended by National Grid – the transmission network operator. This is in part due to a historic lack of investment in critical grid infrastructure to cope with the move away from centralised fossil fuel generation. Improving the availability and timeliness of grid availability and connection can only be resolved by the Government and OFGEM , the energy regulator.

3 National Energy Policy

3.1 The energy policy of successive UK Governments has been designed in line with the "energy trilemma" to:

- decarbonise electricity generation;
- ensure energy security; and
- minimise the cost of electricity to consumers.

3.2 The UK government has been keen to promote the UK as a climate leader and can point to considerable progress. Greenhouse gas emissions are down 48% on 1990 levels, dropping 3% between 2018-2019, driven in large part by expanding renewable power generation and a dramatic reduction in coal use. The UK also benefits from a strong institutional framework for climate commitments in the form of the Climate Change Act. The Act pushes the government to action. Having adopted a net zero target for 2050 and accepted the Climate Change Committee's 6th Carbon Budget for 2035 it Is incumbent on government to come up with effective plans to turn commitments into reality.

3.3 The Energy White Paper published in December 2020 referS several times to solar photovoltaic generation. For example, it remarked that:

"[a] low-cost, net zero consistent [electricity] system is likely to be composed predominantly of wind and solar".

The White Paper also explained why solar is again included in Contracts for Difference. It also discussed affordability and fairness, noting that:

"Gas will set the electricity price for some years to come but, over time, will do so less frequently, as more and more wind and solar connect to the electricity system. These are technologies which do not have a fuel cost. What we are paying for is the cost of building and operating the wind or solar farms, not the fuel cost."

3.4 In October 2021 the Government's Net Zero Strategy said that one of the Government's key policies for power is :

"40GW of offshore wind by 2030, with more onshore, solar, and other renewables – with a new approach to onshore and offshore electricity networks to incorporate new low carbon generation and demand in the most efficient manner that takes account of the needs of local communities like those in East Anglia".

One of the Government's stated key commitments was to "Accelerate deployment of low-cost renewable generation, such as wind and solar through the Contracts for Difference scheme by undertaking a review of the frequency of the CfD auctions.

3.5 In April 2022 as a result of European gas prices soaring by more than 200% in 2021 and coal prices increasing by more than 100%, the Government published a British Energy Supply Security Strategy. The Strategy sets out how Great Britain will accelerate greater energy independence building on the Prime Minister's 'Ten point plan for a green industrial revolution', and the 'Net Zero Strategy'. The central thrust being to wean Britain off expensive fossil fuels, which are subject to volatile gas prices set by international markets and boosting diverse sources of homegrown energy for greater energy security in the long-term which include wind, solar, hydrogen and nuclear. For solar the aim is to increase solar from its current capacity of 14 gigawatts to 70 gigawatts by 2035.

3.6 On the 30 May 2022, the BEIS Committee launched a new inquiry with a focus on 'Decarbonising the Power Supply sector'. Essentially, the aim of the inquiry is to scrutinise the proposals set out in the Energy Security Strategy. The Inquiry will examine what infrastructure the UK currently possesses, what else will be required to meet the Strategy's targets, and what actions need to be taken immediately to further these goals. As a secondary focus, it also plans to take a closer look at the relationship between these proposals and other policy objectives in the Government's 2020 Energy White Paper, as well as its Net Zero Strategy.

4 UK Food Production and Farming

4.1 The Department for Environment Food and Rural Affairs (DEFRA) publish annual farming statistics that includes figures on land use, livestock populations and the agricultural workforce. The 2021 statistics show the following:

- the utilised agricultural area in England decreased between 2020 and 2021 and now stands at just over 8.8 million hectares;
- the total croppable area accounts for just over half (55%) and has increased by 0.5% to just over 4.9 million hectares in 2021. In comparison, total croppable area in 2012 was just over 4 million hectares;
- permanent grassland accounts for 40% but decreased by 3.3% to 3.6 million hectares in 2021;
- the total area of arable crops ihas ncreased by 2.2% since 2020 to 3.7 million hectares in 2021.;
- cereals and oilseed crops account for the majority (80%) of the total arable crop area;
- cereal crops increased by 6.6% to almost 2.7 million hectares due to a rise of 31% in the area of wheat which increased to almost 1.7 million hectares and winter sown barley which increased by 36% to 345 thousand hectares.
- oilseed crops fell by 18%, from 381 thousand hectares to 313 thousand hectares mainly due to a 21% decrease in the area of winter oilseed rape, which accounts for the majority (84%) of all oilseed crops.
- horticultural crops account for 131 thousand hectares of land, a decrease of 4.7% compared to 2020.;
- 2.1% of arable land is used to produce crops for biofuels.

4.2 In December 2021 the Department for Environment Food and Rural Affairs published a UK Food Security Report. Key data from this report is:

- the UK is largely self-sufficient in the production of grains, producing over 100% of domestic consumption of oats and barley and over 90% of wheat;

- the UK produces roughly an equivalent volume of meat, milk and eggs to what it consumes;
- the UK produces a significant proportion of its other crop needs, including around 60% of sugar beet, 70% of potatoes and 80% of oilseeds;
- the UK produces over 50% of vegetables consumed domestically, but only 16% of fruit.;
- 93% of domestic consumption of fresh vegetables was fulfilled by domestic and European production, while fruit supply is more widely spread across the EU, Africa, the Americas, and the UK;
- prices for all main food categories except fruit have fallen in real terms in the last 10 years.

4.3 A large contribution to arable farm income is from the Basic Payment Scheme (BPS), a government subsidy for farming in a more environmentally friendly way. However, this will be phased out completely by 2027 to be replaced by the Sustainable Farming Incentive (SFI) under the new Environmental Land Management Scheme. SFI has three levels with £26 per hectare paid for the more basic level through to £60 per hectare paid for the advanced level. The reduction in farming subsidies s significant and is likely to result in farmers becoming more reliant on diversification in order to remain profitable.

5 Utility Scale Solar and National Planning Policy

5.1 Above a threshold (set out in Section 15 of the Planning Act 2008) of more than 50MW for onshore and more than 100 MW for offshore generation, utility scale solar will be treated as Nationally Significant Infrastructure Projects, for which a Development Consent Order must be sought from the Secretary of State. The Overarching National Policy Statement for Energy (EN-1) pursuant to Section 5(9) of the Planning Act 2008 provides the primary basis for decisions by the Infrastructure Planning Commission for energy infrastructure. A revised draft of EN-1 and supporting technology specific national policy statements, including a new NPS EN-3 specific to renewable energy, were consulted on in late 2021. Further drafts are expected in Q4 2022.

5.2 For energy infrastructure that falls to local planning authorities for determination, the relevant policy framework is the National Planning Policy Framework. It encourages LPAs to promote renewable energy development and identify appropriate sites for it. It says that - in meeting the challenge of climate change, flooding and coastal change - the planning system should support the transition to a low carbon future. It goes on (amongst other things) to identify ways in which Local Plans should help increase the use and supply of renewable and low carbon energy and heat.

5.3 The PPG on renewable and low carbon energy also sets out the factors to be considered when deciding a planning application for a solar farm and says that large scale solar farms should be focussed on previously developed and non-agricultural land, provided that it is not of high environmental value. For greenfield sites, the PPG says that the LPA should consider whether the proposed use of agricultural land has been shown to be necessary and the proposal allows for continued agricultural use and/or encourages biodiversity improvements:

5.4 Particular factors a local planning authority will need to consider include:

- encouraging the effective use of land by focussing large scale solar farms on previously developed and non agricultural land, provided that it is not of high environmental value;
- where a proposal involves greenfield land, whether (i) the proposed use of any agricultural land has been shown to be ***necessary*** and poorer quality land has been used in preference to higher quality land; and (ii) the proposal allows for ***continued agricultural use*** where applicable and/or ***encourages biodiversity improvements*** around arrays;
- that solar farms are normally temporary structures and planning conditions can be used to ensure that the installations are removed when no longer in use and the land is restored to its previous use;
- the proposal's visual impact, the effect on landscape of glint and glare and on neighbouring uses and aircraft safety;
- the extent to which there may be additional impacts if solar arrays follow the daily movement of the sun;
- the need for, and impact of, security measures such as lights and fencing;
- great care should be taken to ensure heritage assets are conserved in a manner appropriate to their significance, including the impact of proposals on views important to their setting;
- the energy generating potential, which can vary for a number of reasons including, latitude and aspect.

6 Utility Scale Solar and Agricultural Land

6.1 There is currently no national data on the land type where utility scale projects have been developed whether agricultural or brownfield. Best estimates are that utility scale solar occupies between 0.1 – 0.5% of the UK's land. It is also estimated that if there was a four-fold increase in utility scale solar, which the Climate Change Committee estimates would be necessary for solar to contribute to 15% of the UK's generation, it would take < 0.5% of UK land.

6.2 The key national policy requirements for solar farm developments on "best and most versatile agricultural land" are that the development must be ***necessary*** and supported by the most ***compelling evidence***.

6.3 The question of necessity is rarely questioned given the context of the climate emergency and national policy to reach net zero by 2035.

6.4 There is no specific guidance or test to be met with respect to the compelling evidence required for the development of utility scale solar on agricultural land.. In view of this most planning applications for utility scale solar include an agricultural viability assessment which assesses the land in the context of the local, regional and national agricultural land resource and a sequential analysis or alternative site assessment which assesses site availability in relation to the available grid connection.

6.5 Many potential renewable energy projects, not just solar, will fail not due to the use of greenfield sites or its agricultural land grade but the lack of a suitable grid connection. This is because securing an economic grid connection and available land is a balancing act which is not assisted by aging and constrained electricity grid infrastructure. It is therefore this factor which is likely to be the key determinant that will restrict the development of land based renewable energy projects in the UK.

7 Utility Scale Solar and Brownfield Land

7.1 "Brownfield" land is known in planning terms as "previously developed land". Previously developed land is defined in the Government's National Planning Policy Framework as:

"Land which is or was occupied by a permanent structure, including the curtilage of the developed land (although it should not be assumed that the whole of the curtilage should be developed) and any associated fixed surface infrastructure. This excludes: land that is or has been occupied by agricultural or forestry buildings; land that has been developed for minerals extraction or waste disposal by landfill purposes where provision for restoration has been made through development control procedures; land in built-up areas such as private residential gardens, parks, recreation

grounds and allotments; and land that was previously-developed but where the remains of the permanent structure or fixed surface structure have blended into the landscape in the process of time."

7.2 There is a total of 26,202 hectares of brownfield land listed on local authority brownfield land registers. This represents an increase in brownfield land of 6.1% since 2020. There is a clear regional spread of brownfield land. Particular concentrations are in London, the south east, the Midlands,the North west, Yorkshire and the Humber and the West Midlands. CPRE have calculated that this land could provide 1.2 million homes. In the October 2021 budget, the Chancellor earmarked £11.5bn for the construction of up to 180,000 affordable homes, with brownfield sites targeted for development.

[Source CPRE Recycling our Land State of Brownfield 2021]

7.3 These brownfield sites are often close to where people already work and live, with infrastructure such as public transport, schools and shops already in place. They are therefore considered to be well suited to housing, a permanent development.

7.4 Whilst there are several examples of utility scale solar on brownfield land, in particular on old airfields, landfill sites and in former coal mining areas, many brownfield sites in the UK would be unsuitable for utility scale solar. This is because most brownfield sites are < 10ha, or designated for other uses such as housing or employment or are located where there is no access to a grid connection or receive insufficient irradiation for solar. Brownfield sites are therefore unlikely to be able to deliver utility scale solar at the scale proposed by the Energy Security Strategy.

8 Utility Scale Solar and Biodiversity

8.1 In 2013, a study of biodiversity levels at utility scale solar sites in comparison to similar plots of agricultural land was undertaken in the UK. The study selected four utility scale solar sites. Two had been seeded with wildflower meadows, and two were pastures with agricultural grasses. Biodiversity was measured using three indicator groups: grassland herbs, bumblebees and butterflies, as these are important markers of wider biodiversity. For each site, a control plot was selected next to the utility scale solar site with the same land use prior to its construction.

The results were as follows:

- All four solar farms showed increased biodiversity in at least one of the three indicators, in comparison with the control plots;
- Sites re-seeded as wildflower meadows showed a significant increase in all three biodiversity indicators (herbs, bumblebees and butterflies); pasture sites showed change in one or two of the indicators;
- All sites displayed a degree of colonisation by herbs – there were more herbs present than originally sown;
- In general, bumblebees and butterflies observed were feeding whereas those observed in control plots were in transit. This indicates that herb-rich grasslands have greater value as foraging sites;
- A wide range of wildlife was observed within the sites, including brown hares, small mammals, invertebrates and a number of endangered birds of conservation concern in the UK.

8.2 The study also underscored inherent features of utility scale solar that are beneficial to wildlife; they are relatively undisturbed by human activity once constructed and are in place for decades, which is sufficient time for appropriate land management practices to really take effect.

8.3 Utility scale solar can also increase biodiversity by installing mammal gates, to allow for continued access; insect hotels which encourage and support populations of invertebrates; bird and bat boxes around the perimeters specifically selected to suit common species in the local area to provide additional safe nesting habitats; small piles of logs to provide havens for lizards and other reptiles. and beehives and species-rich grass and wildflowers to encourage pollinators.

9 Utility Scale Solar and Landscape

9.1 The key objectives in terms of landscape for all utility scale solar projects are to minimise impacts on landscape and visual amenity as well as on surrounding communities. Landscape impacts are therefore a key consideration at an early stage in the design process with consideration given to the character and quality of the existing landscape, the extent of the physical change involved and the ability of the landscape to accommodate change. A Landscape and Visual Impact Assessment will therefore always accompany a utility scale solar planning application.

9.2 Solar farms are highly unlikely to be located within statutory designated sites such as National Parks, Sites of Special Scientific Interest, Areas of Outstanding Natural Beauty, World Heritage Sites and Conservation Areas.

9.3 The planting of new woodlands, trees and hedgerows and the reinforcement of existing tree lines, woodland and hedgerows for landscape mitigation and enhancement are likely to be a key component of most utility scale solar projects. Trees and hedgerows are also important in screening the site from immediate view.

10 Utility Scale Solar Economic Benefits

10.1 The solar industry recruits for roles ranging from business development experts, data analysts, distribution and logistics specialists, electrical engineers, energy finance professionals, environmental planners and natural capital experts, maintenance advisors, product researchers and developers, scientific and technical staff, solar cleaning specialists, and system designers, planners, and installers.

10.2 There are currently around 6,500 people employed in the UK solar industry, across a wide range of jobs. Solar Energy UK's analysis suggests this could increase to more than 60,000 if the UK commits to 70GW of solar by 2035. These jobs will be spread across the whole UK and not solely concentrated in any one region, the skills gained will be transferable to the fast-growing global renewable sector.

10.3 Solar Energy UK also estimates that the deploying 70GW of solar would make a £10 billion contribution to the UK economy.

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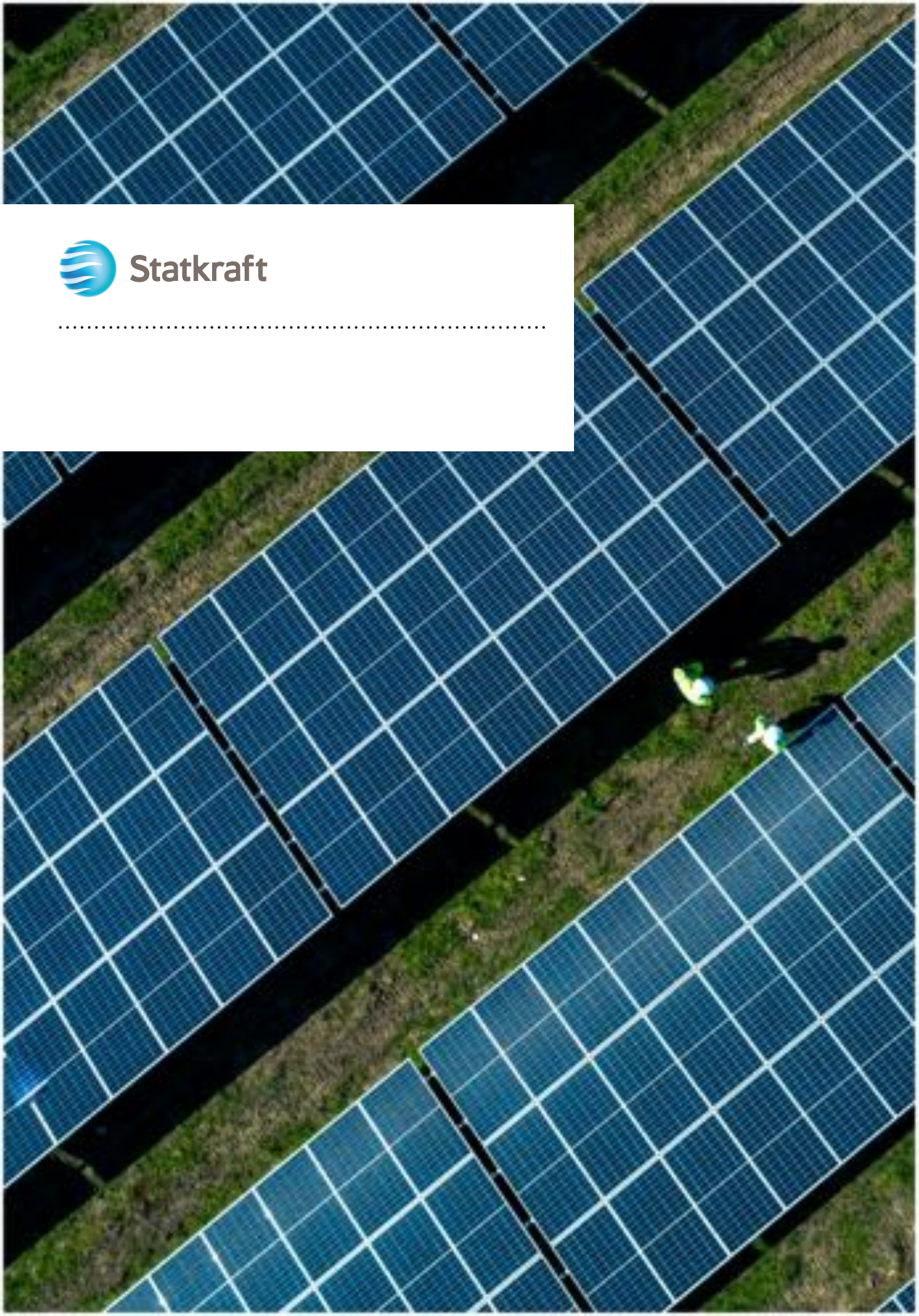

1 The Application Site – Land Use

1.1 The Application site comprises mainly arable land. The total site area, at 74.5 hectares represents just 0.0012% of the total 6.1 million croppable area in England. With a 0.5% increase in total croppable area and a 2.2% increase in the area for arable crops between 2020 and 2021, the sites temporary change of use will therefore be negligible at a national scale.

1.2 Within Kent 85% of land is classified as rural and 224,535 hectares is farmed. This is substantially higher than the average across England. As such, Kent has a much greater capacity to accommodate alternative land uses on its arable land compared to other areas in England.

1.3 The Ministry of Agriculture Forestry and Fishing have published ALC statistics at a district level based on the Provisional ALC mapping originally published in 1977, Ordnance Survey Mapping and reconnaissance surveys. Whilst only suitable for considering agricultural land quality at a strategic level, the statistics are useful when considering BMV land more widely within Maidstone District.

1.4 The MAFF statistics highlight that more than 90% of Kent's agricultural land is Grade 1, 2 and 3. These statistics predate the subdivision of Grade 3 into A and B. The site area therefore represents only a small percentage of agricultural land falling within Grades 1, 2 and 3 in Kent. In addition, it should be noted that within both Kent and Maidstone Borough Council the development of some proportion of BMV land is challenging to avoid. For all proposed developments including housing.

1.5 The development, whilst not proven through any specific research, is likely to benefit agricultural land in the long term as there is no loss of fertility through intensive arable operations. The 40 year period on which the solar panels will be sited on the land will undoubtedly have benefits as no harmful insecticide will be used, margins will be able to flourish and an extensive agricultural grazing use can continue to take place. Understanding that the loss of BMV land is not permanent, is also a fundamental consideration in the overall planning balance.

2 Utility Scale Solar in Kent and Maidstone Borough Council

2.1 The latest BEIS and OFGEM data on renewable energy published in July 2022 showed that within Kent there is currently 625.45MW of renewable energy generation of which 337.30MW is ground mount solar. Within Maidstone Borough Council the total renewable energy generation is 562.90MW with only 11.9 MW of this being ground mount solar and 51MW an energy from waste incinerator.

2.2 The current installed and operational capacity of utility scale solar in Kent is:

	Kent MW Operational Ground Mount Solar
Ashford	24.5
Canterbury	93.0
Dover	36.5
Folkestone and Hythe	20.0
Gravesham	0.0
Maidstone	11.9
Medway	12.0
Sevenoaks	0.0
Swale	64.0
Thanet	30.6
Tonbridge and Malling	9.7
Tunbridge Wells	35.1