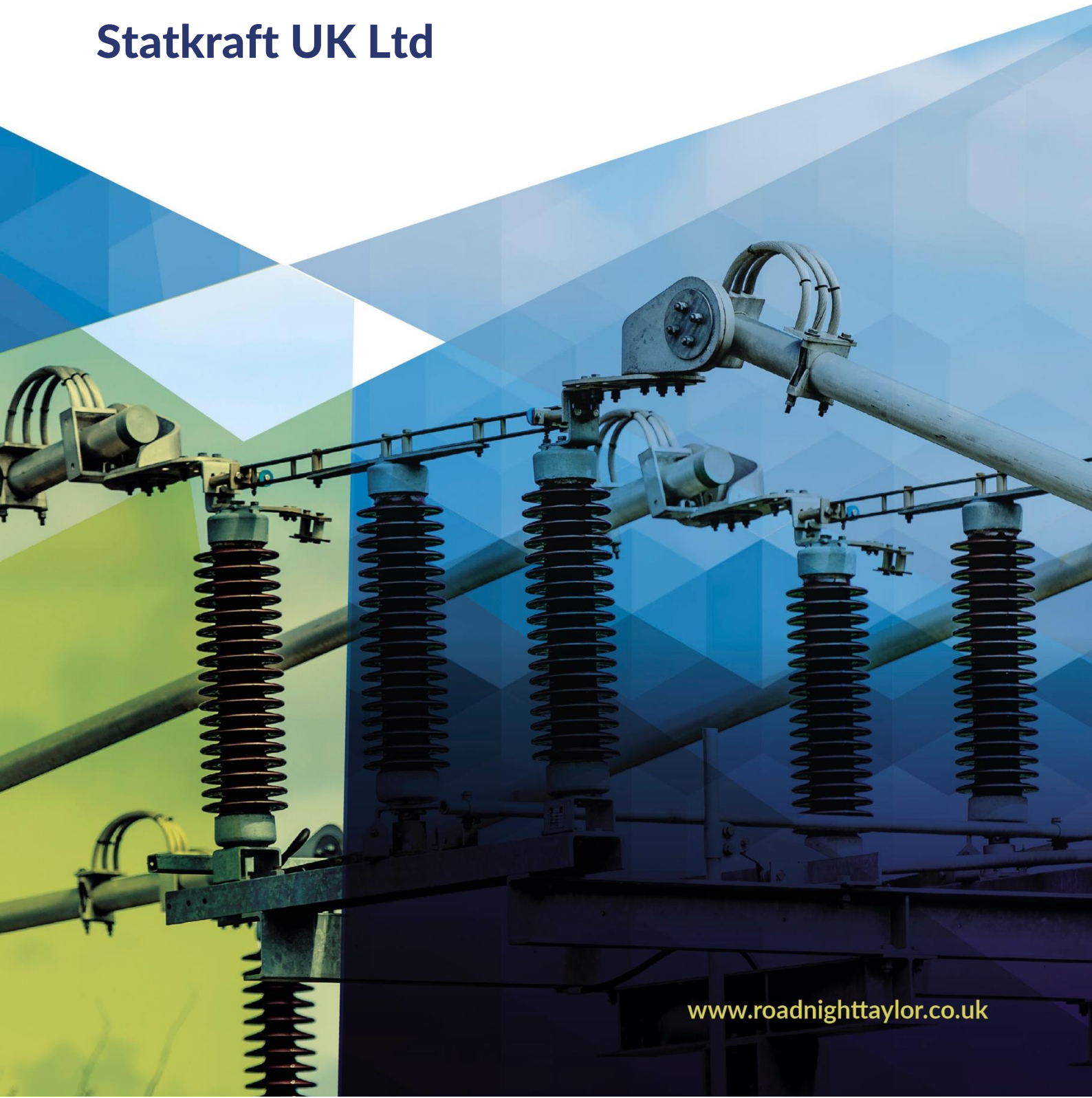
Roadnight Taylor

THE INDEPENDENT SPECIALIST GRID CONSULTANCY

Grid Review Planning Report

Statkraft UK Ltd



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Client	Statkraft UK Ltd
Site name and location	Sheepwash, Marden
DNO	UKPN
Author	Nikki Pillinger
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Date	31/03/2023

Executive Summary

Sheepwash is a 50 MW solar park connecting into Southern Power Networks 132 kV grid infrastructure. The site is well suited to the project for the following reasons:

- There is a grid connection into the 132 kV network onsite. Much of the 132 kV overhead line infrastructure in the South East passes over nationally designated landscapes such as National Parks and Areas of Outstanding Natural Beauty. This connection point avoids that.
- The onsite connection also avoids the need for lengthy and disturbing offsite cable routes.
- There is no need for wider network reinforcement so there is no additional offsite infrastructure being put in as a result of this connection.
- There is currently no thermal capacity headroom at Northfleet East, the National Grid owned substation that Sheepwash feeds into. Any new applications under Northfleet East will likely see delays due to reinforcement and potential curtailment. Sheepwash avoids that as it has already secured the capacity on the network.
- Due to securing its grid connection early, Sheepwash will be able to export its full potential output at times of normal network operation without the need for onerous constraints.

The grid connection arrangement will facilitate timely energisation and the export of 50 MW of renewable energy to the national grid. The solar park will therefore be an important contributor to the Government's target that the UK will be powered entirely by clean electricity by 2035.

Introduction

The last decade has seen a vast change in the energy sector. Our electrical grid has traditionally been served by a small number of centralised fossil fuel or nuclear power stations. Some of these are still utilised, but all coal power stations are targeted to be closed by 2025, and the current ongoing energy price crisis is making the rapid move away from reliance on gas imports essential. The transition to a low cost, net zero energy system is an urgent priority for the UK.

National Grid ESO predict that to achieve our net zero ambitions, the UK's grid generation capacity needs to increase from 103GW today to between 189GW and 268GW by 2050. To achieve this, we require a diverse energy mix. Wind projects, while essential for our Net Zero ambitions, have long planning timescales and can often take 5 years or more to complete, usually with a requirement for lengthy grid connection routes. New nuclear can take over a decade to pass through the development process followed by a further decade to build, and while it is classified as low carbon, nuclear is not renewable and leaves a legacy of hazardous waste. Large scale solar and battery storage projects can potentially be delivered within three years from grid offer acceptance.

In the initial push to build renewable energy generators investment was mainly driven by subsidies. Since these were dropped in 2017 the era of subsidy free renewable energy has accelerated at a pace that was never predicted. The scale of projects is increasing both in volume and generating capacity. While this is positive for the UK's decarbonisation ambitions, it means that our existing grid system will need a considerable amount of investment and upgrading to keep up with this rate of development.

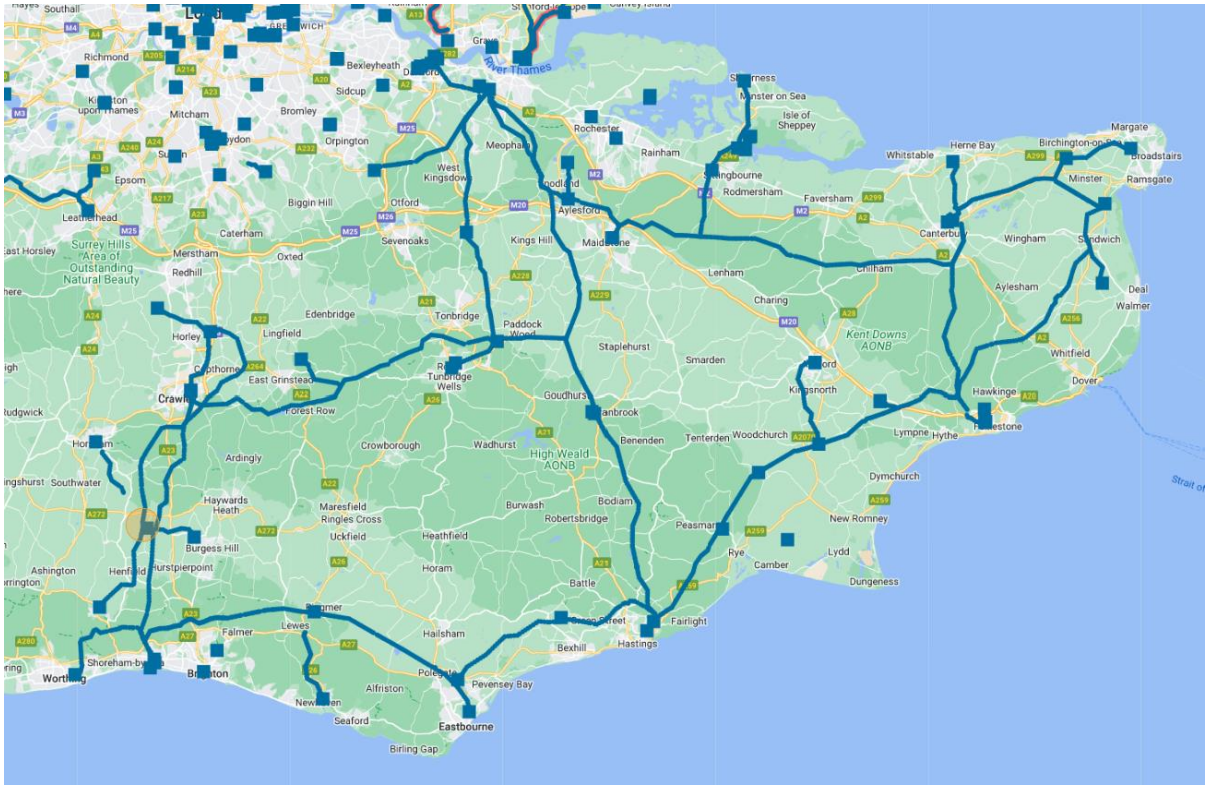
Due to the high volume of generation that has been connected onto the distribution grid over the last ten years, all the Distribution Network Operators (DNOs) are now seeing significant constraints on their existing infrastructure. There are also now hundreds of gigawatts (GWs) of generation contracted to connect onto the both the distribution and transmission networks that have not yet been built.

This combined with the planned electrification of heating and transport means that there are significant upgrades required for the electrical system to be fit for the zero-carbon era. These upgrades are needed at all levels of the grid, from the low voltage (LV) networks that come into people's homes, to transmission level infrastructure.

Why this site?

To make standalone solar viable it has to have an economic grid connection. A scheme of this size would be unlikely to fit onto a 33 kV circuit so it requires a 132 kV connection or a 33 kV connection back at a substation. Many of the available 33 kV direct substation connections that are viable and outside of AONBs have been utilised or reserved or are in areas that are not practical for a connection.

The map below shows the extent of the 132 kV network in the South. The blue lines are overhead electrical infrastructure and the blue squares are 132 kV substations. As is illustrated on the map, a significant amount of the 132 kV infrastructure is in the AONBs or national Parks so, under the assumption that these areas should be avoided, options for a connection for this site were limited.



The site is beneficially, right next to the Point of Connection to alleviate any need for disturbing offsite works associated with cable routing.

The site also has no requirement for any wider reinforcement such as transformer upgrades or board replacements. This is positive as it means that no additional infrastructure is needed to be produced or installed other than on the solar site itself.

Northfleet East Grid Supply Point

The point of connection into the existing 132 kV network for Sheepwash solar park is fed from Northfleet East Grid Supply Point (GSP). This is part of UK Power Networks Distribution Network License area, and is subcategorised into Southern Power Networks (SPN).

Sheepwash has gone through a transmission works assessment process with National Grid ESO on Appendix G Part 2, which allows customers to connect without the delay of waiting for any works to be completed on the transmission system. Many projects on other GSPs are now in Part 4, which means they have lengthy timescales and sometimes hefty costs for reinforcement of the transmission network. The most recent data published on UKPNs website on Appendix G suggests that there is no materiality (capacity) headroom available at Northfleet.

Therefore any subsequent applicants into the Northfleet GSP may have to wait for several years and pay significant reinforcement charges to connect. It is not clear exactly what these are at present.

This solar park can only be built within the original application boundary. This is in line with Energy Networks Association rules which dictate that a project must be built within the boundaries of the original application. Therefore, if the site needed to be moved the project would go to the back of the connection queue. It would also need to wait at least another 6-9 months for another transmission works assessment process result which would have an uncertain and likely burdensome outcome.

Wider regional issues

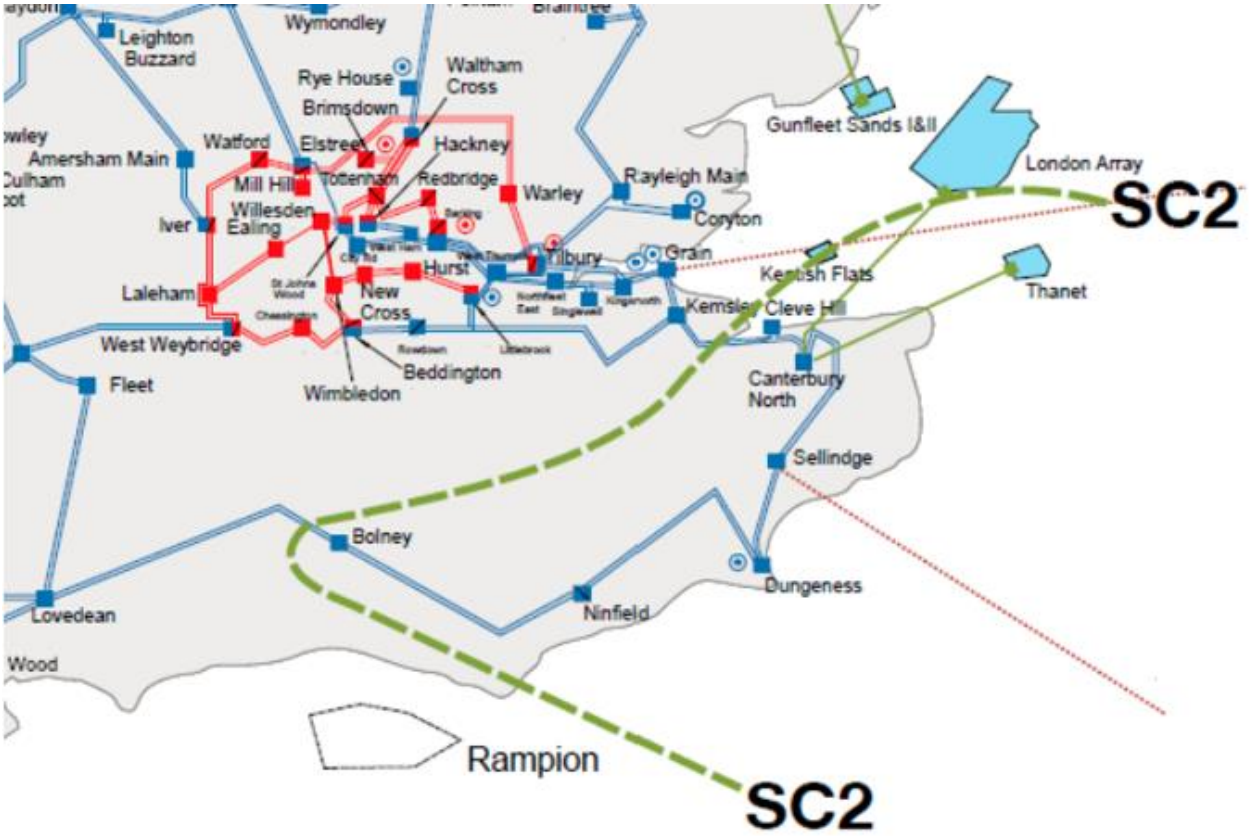
The south-east and the south coast of England is one of the most complex network areas in Europe. It has several interconnectors with other European countries, either currently in service or due to be commissioned, Dungeness B nuclear power station, and a significant amount of connected onshore and offshore renewable resources.

According to a recent National Grid ESO update there is 12.5 GW of new transmission projects that are contracted to be built, along with 8 GW of generation distribution connections that have active grid offers. The existing infrastructure in the south-east and the south coast now does not have the capacity to transport all the energy that is contracted to connect to it.

The network between Bolney and Kemsley, the SC2 boundary, is connected by a linear series of 400 kV double circuit transmission lines. The capacity in this area is limited by the number of circuits in the group and while historically the network has been able to be managed by an operational tripping scheme, that manages generators output during planned and unplanned outages on the network, there is now a need to upgrade the capacity of the group between Lovedean and Kemsley. Part of this will be 44 km of overhead line reconductoring between the 400 kV substations at Dungeness and Ninfield. This will likely take several years to complete.

The South Coast also has voltage stability issues. Voltage stability requirements, that all generators must abide by if they wish to connect to the network, stipulate that post any network disturbance, such as transmission circuit outages, customers need to remain connected and generating. Connected generation in the South is projected to reach a level where voltage stability is no longer within limits. National Grid TO is therefore planning to build a new HVDC circuit between Richborough and Sizewell. This is called Sealink and will be finished by 2030. Current offer dates in this area are 2030 and there is a major dependency on Sealink being completed in order for these to be able to connect.

The map on the next page illustrates the extent of the area affected by this, the SC2 boundary.



The site that Sheepwash is utilising sits outside of these network constraints. If it had to move to another part of the network affected by these issues it would see lengthy connection timescales and would be caught up in multiple National Grid reinforcement and upgrade works.

Curtailment and constraints

UKPN now utilise Active Network Management on their system. Active Network Management (ANM) is typically used by network operators to control energy generating schemes, so they can avoid having to upgrade the network. ANM keeps down the connection price for customers, but generators will have their output capped. At present this is an uncurtailed site. This means that other than for outages and fault conditions there will be no limit on the site export due to wider network overloads.

As this project applied before there were any constraints that required ANM on the network it will be able to export all the renewable energy it produces into the network without any need for its output to be curtailed. If Statkraft had to find a new site, then other developers may apply in the meantime and increase the level of export limitation. There may also be wider transmission constraints that mean the project cannot export at certain times.

Conclusion

This site is suitable for a 50MW solar park for several reasons. It avoids the long grid reinforcement timescales that many projects in the South East are now seeing, therefore meaning there is no limit on when the project can energise.

It has no limits on export, as the surrounding network was not oversubscribed for generation at the point of application for a grid connection. This is a benefit as projects with later grid connections, or in different areas will potentially see significant constraints on their export.

There is a 132 kV overhead line onsite, meaning that the project can connect without the constraint of third party land issues. It avoids lengthy and disturbing cable routes that can contribute to traffic issues in the local area. The point of connection is part of a limited amount of 132 kV infrastructure that is outside of National Parks or AONBs in SPN.

The current connection is ideal for the project to be able to deploy speedily and start exporting low cost, renewable energy onto the network within a couple of years of planning permission being granted.