7000 Acres Post-Hearing Submissions, including written summaries of oral submissions and any documents requested by the ExA

Deadline 4 Submission – 28th January 2025

Agenda Item 3a Water Environment including Flood Risk

7000 Acres raised the issue of the recent flooding on January 5th which affected not only the flood plain of the river Till, but also the river Eau with several villages being cut off and fields being flooded once again.

7000 Acres showed the hearing an aerial photograph of flooded farmland (from a series of photographs submitted previously by 7000 acres to the ExA), which occurred in November 2019 and affected several thousand acres of farmland from Odder to Corringham.

Flooding occurs when the Upper Witham Inland Drainage Board cuts off the transfer pumps into the Fosdyke Navigation Canal at Odder Pumping Station to protect the city of Lincoln, causing the river Till to overflow its flood banks and drainage ditches to inundate the adjacent farmland and roads.

It was pointed out that these flooding events are becoming more frequent due to climate change and not only lead to loss and damage to crops but also interrupt standard farming practices, which rely on soil conditions, timing and seasonal opportunity, resulting in a loss of agricultural output and revenue.

7000 Acres also showed the hearing a map of the flooded areas in Lincolnshire which a study by Climate Central climate change research group has predicted to occur in the next 25 years.

This climate research group has predicted the loss of 30% of the productive farmland in Lincolnshire, 56% of which is sited on the fertile soils of river floodplains.

It is noted that Tillbridge, along with the other 3 neighbouring schemes is not sited on land, which is prone to flooding.

Therefore, the loss of farmland due to inundation is **in addition** to the current estimated total of 30,000 acres of land being allocated, or under consideration for industrial ground based solar.

The Applicant's consultant hydrologist gave his opinions regarding the behaviour of surface water run-off and soil mitigation. which he claimed would remain the same as before the installation of the solar arrays.

7000Acres disagreed and pointed out that we were considering the surface water runoff from approximately 10 million square metres of glass under storm conditions from Tillbridge alone, without including the huge volume of storm water from Cottam, Gate Burton and West Burton solar schemes which also drain into the river Till.

7000 Acres pointed out that under storm conditions the water falling from the drip lines of the 3.5-meter-high solar panels would channel and run rapidly to the lowest point, without the soil mitigation currently occurring across the whole surface of the land, since much of this lies under the rain shadow of the panels.

The installation of swales to contain storm water runoff would not be a practical proposition due to the large volume of water involved and the area required to contain it.

Although the hearing agenda was the Water Environment and Flood Risk, 7000 Acres asked the hearing to consider the effects of hailstorms, where large hailstones could cause extensive damage to unprotected panels on a massive scale.

To illustrate these effects, 7000 Acres showed the hearing photographs of the damage to the 190-acre Porth Wen solar installation on Anglesey, which was recently damaged by 96 mph wind and hailstones by ‘Storm Darragh’.

The chances of such an event occurring during the 60-year life of Tillbridge Solar, is extremely high, particularly with the increasing frequency of extreme weather events, due to climate change.

Agenda Item 3b – Soils and Agriculture

The Applicant’s consultant agronomist considered that there would be negligible deterioration to soil quality by covering the land with solar arrays and suggested that sheep could be run beneath the panels.

7000 Acres disagree, as no commercial shepherd would consider it economically viable to graze sheep on poor quality grass, which has been deprived of sunlight. It is noted that the pastoral scene of sheep grazing in front of the panels, which has been used by many industrial solar power companies to promote industrial solar has been shown many times but is not a practical option.

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Agenda Item 3c – General and Other Planning Matters

Need

In the course of the hearing, the ExA rightly questioned the Applicant on the difference between the need and the degree of benefit the scheme may be able to deliver. In their reply, the Applicant attempted to conflate the two, by asserting that demonstrating need equated to demonstrating benefit.

In fact, the two are distinctly different concepts:

- “Need” is defined as a lack of something requisite, desirable, or useful.
- “Benefit” is defined, in this context, as providing help or advantage.

In this case, we understand the ExA was seeking to understand the benefit or contribution the scheme may provide.

Within EN-1, in considering the development and weighing impacts against benefits, the Secretary of State is directed to “take into account its potential benefits including its contribution to meeting the need for energy infrastructure”, i.e. within the NPS “contribution” (or benefit) is separate from “need”. Clearly, for instance, hunger (need), is not resolved by providing crumbs (i.e low benefit).

It should also be noted that while within the NPS, a range of technologies are described as being a “critical national priority”, although it is clear that some technologies, e.g. wind, will make a much more significant contribution at 70% of envisaged power production than others, e.g. solar at 7%.

Assuming the 500MW scheme yields an approximately 11.2% load factor, given the low UK solar gain, the scheme would provide slightly around 0.5TWh per year. This is approximately 0.16% of the UK’s current national demand (300TWh), and around 0.07% of the UK’s demand in 2050 (expected to be in excess of 700TWh). This power will be overwhelmingly produced at times when demand is lowest and prices are lowest, therefore this is some of the least valuable energy provided to the electricity system. The benefit of this development is therefore extremely limited.

In the context of 4 (or 6) NSIP-scale solar developments within the immediate area, this will potentially become the largest construction area in Europe, and one of the largest concentrations of ground-mounted solar panels on the planet. Even if all 6 schemes are consented, together they would provide around 0.42% of the country's 2050 electricity needs, despite occupying farmland the size of a city. These schemes therefore cannot purport to provide significant contributions of electricity supply or to decarbonisation.

7000 Acres have been consistent that the specific benefits of solar in terms of energy yield and crucially, when its energy is provided, do not outweigh the harms of such large-scale ground-mounted solar development.

Such development cannot be seen as an action of climate leadership in the quest for decarbonisation. The world will look on in astonishment at such swathes of productive farmland being replaced with some of the lowest yielding solar panels anywhere in the world.

The ExA questioned 7000 Acres representatives on the understanding of the need for solar schemes, as outlined in EN-1 and EN-3. 7000 Acres have been consistent that there is a need for decarbonisation and understand that EN-1 describes the need for infrastructure in the NPS, which includes solar.

The National Policy Statements include the installation of utility scale solar schemes as part of the overall solar plan to meet a target for 70GW of peak solar production by 2035. 7000 Acres are therefore not challenging the policy, but raising the point that there is a failure to consider how this policy is being implemented; specifically, successive governments have talked about promoting rooftop solar – most recently announcing a “rooftop revolution”, but the current circumstances of economics are driving predominantly ground-mounted schemes, which are on coursed to render any rooftop revolution redundant.

As the ExA rightly identified in their questioning of the Applicant, the fact that the case for need is satisfied does not mean that the contribution or benefit of the scheme should be overlooked when considering the adverse impacts the scheme may have. Given the very limited benefits highlighted, it is clear that minimal weight should be given to the contribution or benefit the scheme provides.

Furthermore, with regard to need, the number of solar applications for grid connections currently massively exceeds the government target by 100%. Therefore, over 50% of schemes can be refused and the Government's target still met. Due to its scale, local impact and cumulative impact on the region, the Tillbridge scheme can be refused to mitigate cumulative local effects without putting the Government's targets at risk.

BESS Associated Development

7000 Acres asked the Applicants' representative if the whole financial viability of the Tillbridge Solar development depended on having an onsite BESS. National Grid would also use the battery capacity not used by Tillbridge to store electricity, for which the Applicant would receive payment.

For much of the year, and through the entire winter, the BESS will not be used to store "excess" solar energy, as there won't be any. In this time, BESS is typically used to absorb other excess renewable energy – particularly in times of high winds, to sell back to the grid at peak times. It would be interesting to understand from the applicant the proportion of time the BESS may be genuinely in use from any excess solar the scheme may produce, as this may be only a relatively small proportion of the year. Fundamentally, the BESS operates as a trading instrument, its function as associated development is largely incidental.

In the hearing, the Applicant's answers to the ExA were not clear or meaningful regarding the relationship between the scheme's DC-coupled configuration and the extent to which the scheme is foreseen to be overplanted.

Comments on Overplanting

Within NPS-EN3, the only explicit reference to overplanting is in 2.10.55, which acknowledges that "generating capacity of a solar farm will decline over time in correlation with the reduction in panel array efficiency". It states that "Applicants may account for this by overplanting solar panel arrays".

In note 92, it explains that "This allows developers to take account of degradation in panel array efficiency over time, thereby enabling the grid connection to be maximised across the lifetime of the site".

This clearly does not amount to blanket permission to overplant for pure commercial advantage, in particular because overplanting is wasteful and inefficient as is described below. If the Applicant wishes to claim credit for the generating capacity of all the panels from day 1, then they should not use the term “overplanting”, nor rely on the overplanting provisions in EN-3. Instead, they should state they are seeking a circa peak 700MW generating capacity, which they believe necessary to maximise the utilisation of the grid connection, due to the intermittency and low efficiency of solar generation.

The Applicant has explained that it was typical to overplant to between 1.3 to 1.5 times the capacity of a “unitary” scheme. For the purposes of this discussion, a unitary scheme is described as one where the installed capacity exactly meets the capacity of the grid connection. In such an arrangement, the output of the scheme only reaches the capacity of the grid for a short period of time, only during the most sunny days in May or June, when the sun is strongest.

For an overplanted scheme, additional panels are installed, and the Applicant seeks to use the full grid capacity for a greater proportion of the time (as opposed to overcome performance degradation over time). The unfortunate consequence of this is that the electricity that would exceed the grid connection capacity is “clipped” or curtailed and effectively lost. This means that, while the volume of energy produced over a day is increased, because of the increased installation of panels, the yield of the installed capacity falls, and the effective output per-panel is reduced.

The Applicant has framed the topic in that a decision on overplanting is an economic trade-off between the extra cost of additional land and panels, the net gain in energy output and the reduced overall yield through clipping or curtailment. Despite producing a greater volume of solar energy, an overplanted scheme will therefore consume more resources, less efficiently, by using more land and more solar panels per MWHr than a unitary scheme.

In the UK, the yield per panel is already very low on a global scale, therefore it would seem counter-intuitive to seek to further reduce that yield by overplanting. It therefore is an indictment of the imbalanced economics between energy and farming that an overplanted solar scheme can be considered financially advantageous.

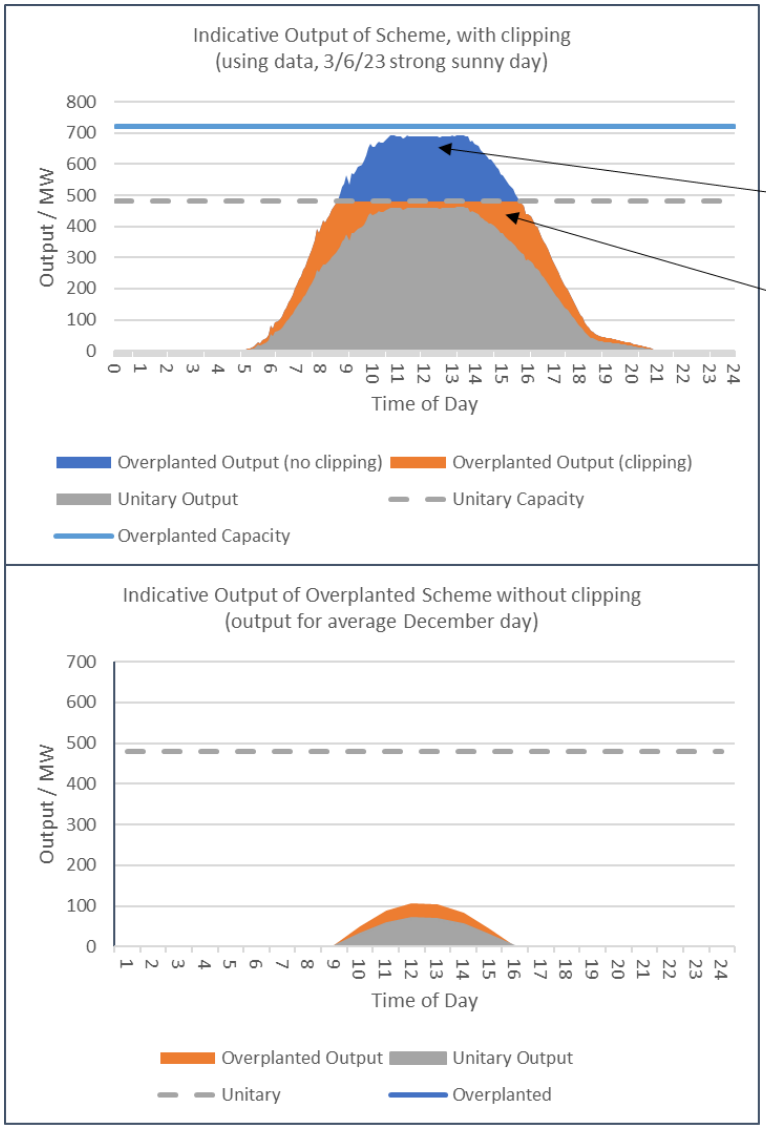
7000Acres do not have the data resources to model the overall effect of overplanting, but this is something the Applicant must have available and has used to assess the statistical range of days where curtailment will have an impact over a year. Nevertheless, the average

UK yield of 10.5% for a unitary scheme would be reduced by overplanting, the logic of which is as follows:

- The sunniest days, with potentially the greatest solar output will be most likely to be curtailed and therefore reduce yield. During these times, the volume of energy curtailed will significantly outstrip the additional energy overplanting delivers in the winter.
- Where curtailment is unlikely in the winter months, the full benefit of overplanting is delivered. However, this is from a very low base, i.e. the full % benefit of not very much is still not very much. The yield from the installed base of solar panels remains unchanged.

In the examples shown in graphs and tables below, an overplanting ratio of 1.3 has been used, i.e. an example 480MW scheme has been overplanted to 624MW.

As examples, 7000Acres have selected a particularly high solar output day, to illustrate the clipping effect of overplanting, and the likely average output of the scheme through December, where there would be no clipping. Data has been sourced from Global Solar Atlas and from a local domestic rooftop solar installation that has been used to indicate the likely output shape for a peak-output day.



30% overplanting is used in both examples, i.e. 480MW capacity scheme is overplanted to 624MW.

Volume of energy lost through clipping, c.10% of the day's output, 550MWhrs

Additional volume generated through overplanting 658MWhrs

For a unitary scheme, the average output would have been 168MW. Overplanting increases this to 195MW when clipped.

Without clipping, the capacity of the overplanted scheme could have delivered 218MW on average.

Clipping is not foreseen during winter months, because output is typically so low.

Although the "full benefit" of 30% increase in output is delivered in winter with no clipping, the additional volume gained through overplanting only increases the average output for the day from 13.3MW to 17.3MW.

	Output for day	Installed Capacity	Load Factor	Average MW O/P	Comment
Summer 3/6/23	*MWh*	*MW*	*%*	*MW*	
Unitary	4026	480	35%	168	
Overplanted (unconstrained)	5234	624	35%	218	550 MWhrs Lost through clipping
Overplanted (constrained)	4684	624	31%	195	658 MWhrs Gained by overplanting
Average December					
Unitary	320	480	2.78%	13.3	
Overplanted	416	624	2.78%	17.3	144MWhrs Gained by overplanting

The examples show:

- Load factor reduces with overplanting on high-output days in the summer (from 35% to 31%), even though the overall output increases.
- Load factor remains the same during winter – although the output increases in line with the overplanted capacity.
- Gains in winter are relatively modest (4MW average per day in winter) in comparison with gains and losses in the summer.
- On such a summer day, the scheme produces 16% more output, but having consumed 30% more land. (A scheme overplanted at 50% is even more wasteful, producing only 22% more output, having consumed 50% more land).
- During a winter day, the scheme will produce the full 30% more output, but because the winter yield is so low, the impact of that increased output is only 4MW – or 0.01% of an average mid-day national demand of around 40,000MW, and yet for that meagre benefit, 30% additional land has been used for overplanting.

Overplanting is therefore extremely wasteful of land resources as well as the resources required to deploy additional solar panels and associated infrastructure. Extensive areas of land potentially 30% to 50% beyond what is necessary to meet the grid connection agreement capacity are used, and only serve to reduce the yield per installed panel. While it may therefore be a commercially or technically rational decision to take, for schemes where such extensive use of land is already questionable, overplanting is not the rational choice for the environment.

Overall, overplanting is inefficient. It is only foreseen in EN-3 to overcome degradation of panel performance over time, not for developers to significantly overplant an area to maximise output at the expense of land use.

The Applicant is seeking to overplant the Tillbridge project, which would serve to reduce the yield per panel / per acre, and decrease the environmental credentials of the project. The potential for this reduced benefit must be considered in conjunction with the limited benefits of deploying solar in the UK.

Counsell for WLDC sought to ask why an overplanting ratio of 1.57 would represent an efficient and effective use of land. It is clear from the above, that while the economics of such overplanting may make financial sense to the Applicant, serves to significantly reduce the land use by providing extremely limited additional energy volumes for massive additional land requirements.

BESS Thermal Runaways

The Lincolnshire Fire & Rescue Officer expressed his concerns regarding the control of thermal runaway/chemical fires with large BESS and told the meeting that he was liaising with Anglian Water and Environment Agency regarding the water supply required to control such emergencies.

7000 Acres told the hearing that he understood the quantities of water to cool a large BESS during thermal runaway were enormous and that the West Yorkshire Fire & Rescue Dept had estimated around 5 million litres/day would be required.

It is doubtful if town main supplies to rural locations would be of sufficient size to deliver such large quantities or have the capacity to control and contain a BESS fire, no matter how many fire engines responded.

7000 Acres asked the hearing to give serious consideration to siting the BESS near the 400 kv switchyard at Cottam Power Station, which is supplied with two independent 300 mm trunk mains from Anglian Water and Severn Trent, has a borehole and access to cooling water from the River Trent.

The 300 mm trunk mains are capable of supplying considerably more than 5 million litres/day, since this was the quantity of water produced daily in the demineralisation plant when Cottam power station was operational.

7000 Acres asked the hearing to consider the environmental risks arising from huge quantities of contaminated cooling water entering drainage ditches and the rivers Till and Eau.

In runaway, one of the chemicals released into the atmosphere is hydrofluoric acid vapour, which is extremely hazardous to health, causing blindness, destruction of lung tissue and severe chemical burns to the skin, which can penetrate to the bone.

The applicant and the ExA must therefore ask themselves if large BESS are not better sited where there is adequate supervision, monitoring & control, essential infrastructure, access for emergency services, and the facilities to deal with thermal runaway.

The BESS should therefore be sited adjacent to the 400kv switchyard at Cottam Power Station and not in the countryside.