Technical Analysis of the Capacity of Hett Moor Farm

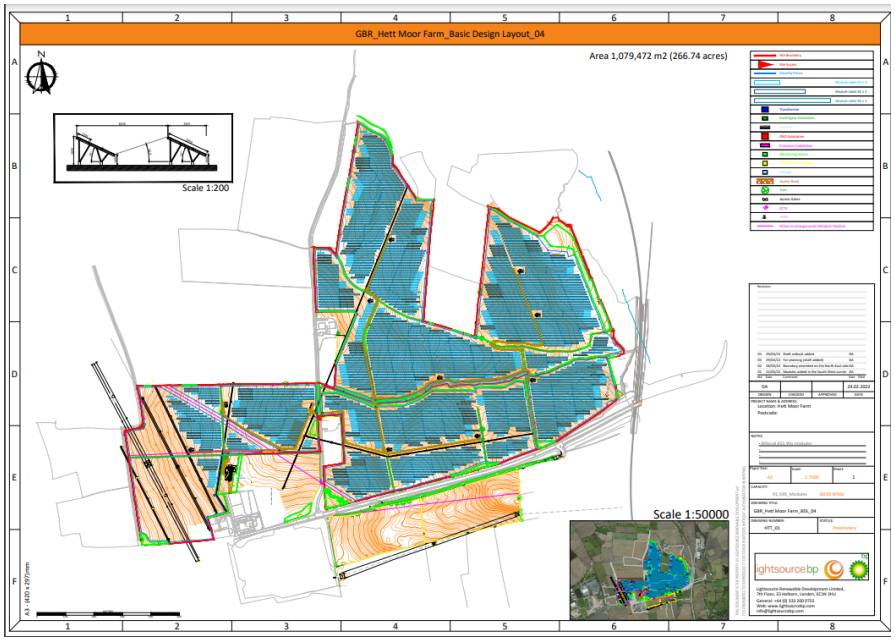
1. This technical analysis sets out the capacities of the original planning application at Hett Moor Farm, which was refused, and the new planning application for solar panel development at Hett Moor Farm, which has been passed by the Durham Council Planning Committee.

2. The facts and matters set out in this statement are within my own knowledge unless otherwise stated, and I believe them to be true. Where I refer to information supplied by others, the source of the information is identified; facts and matters derived from other sources are true to the best of my knowledge and belief.

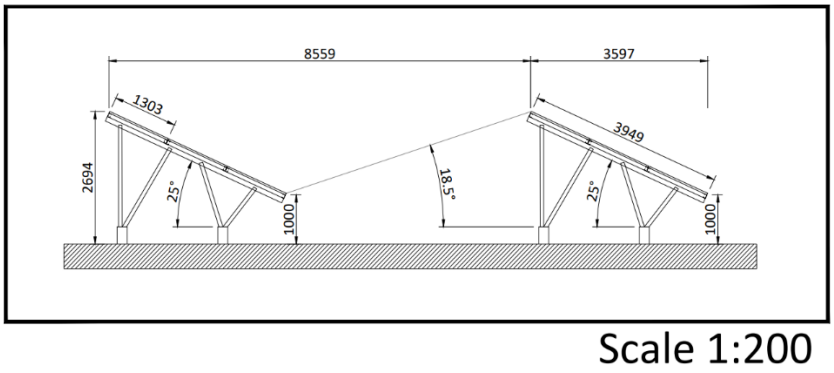
3. The original application at Hett Moor Farm is dated 17.08.2021. On the Durham planning website there are five drawings showing the layout of the panels on the site. These drawings demonstrate the variations made as the scheme progressed through the planning process:

Planning Website	Uploaded	Drawing Title	Date
FRA – Figure 6 Development Layout	19.08.2021	UK_Hett Moor Farm_LP2 – Preliminary Design Layout_05	24.03.2021
UK_Hett Moor Farm_ LP2 - PDL_08	19.08.2021	UK_Hett Moor Farm_ LP2 - PDL_08	14.07.2021
Revised Layout Plan	29.03.2022	UK_Hett Moor Farm_ LP3 – Basic Design Layout_02	28.03.2022
Revised Site Layout to Avoid Former Entry	04.05.2022	GBR_Hett Moor Farm_ BDL_04	29.04.2022
Layout Plan	26.05.2022	UK_Hett Moor Farm_ LP3-BDL_05	24.05.2022

4. The fourth layout plan, Revised Site Layout to Avoid Former Entry, is as follows:



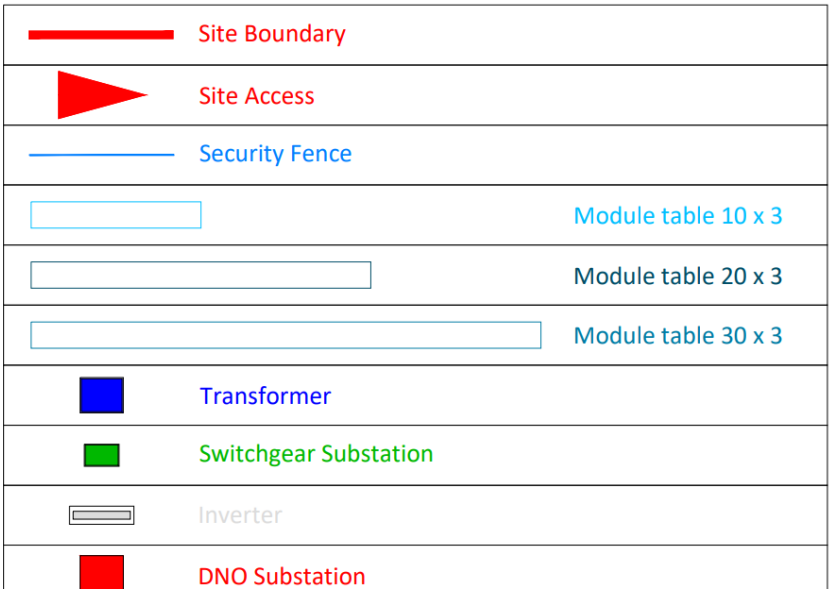
5. This plan contains a small insert in the top left hand corner that shows the detail of the panel modules:



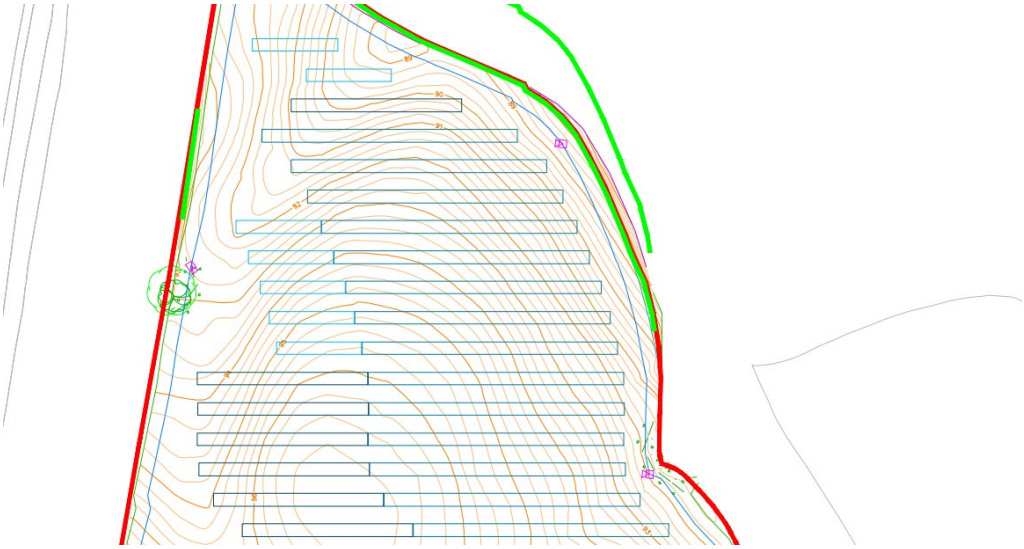
This gives the detailed dimensions of the panel modules:

- Panel orientation: 3 panels in landscape orientation
- Panel dimensions: The length is not specified in this drawing; the panel width is 1.303m
- Angle of tilt: 25 degrees
- Height from ground: 2.694m down to 1.0m at the lowest edge
- Width of module table: 3.949m
- Width occupied on the ground by tilted module: 3.597m
- Gap between the panel modules: 4.962m

6. The Key, in the top right corner, shows the three different lengths of the module tables in the drawing arranged in groups of 10 x 3, 20 x 3, and 30 x 3.



7. The dimensions of the panels in the insert correspond with those of the layout drawing. From the scale drawing at sufficient enlargement to 400% the gap between the panels can be confirmed as 4.9m and the width of the module tables across the ground is just short of 3.6m. The three lengths of module table can also be seen:



This allows the length of each of the module tables to be established. The 10 x 3 module is 24.18m which gives a panel length of 2.418m

8. The Revised Site Layout to Avoid Former Entry drawing also states, in the bottom right hand corner, the power output of each panel, the total number of panels, and the maximum power output of the whole scheme:

NOTES:

- Bifacial 655 Wp modules
-
-
-

Paper Size:	Scale:	Sheet:
A3	1:7500	1

CAPACITY:

91,590_Modules 60.00 MWp

DRAWING TITLE:

GBR_Hett Moor Farm_BDL_04

DRAWING NUMBER:	STATUS:
HTT_01	Preliminary

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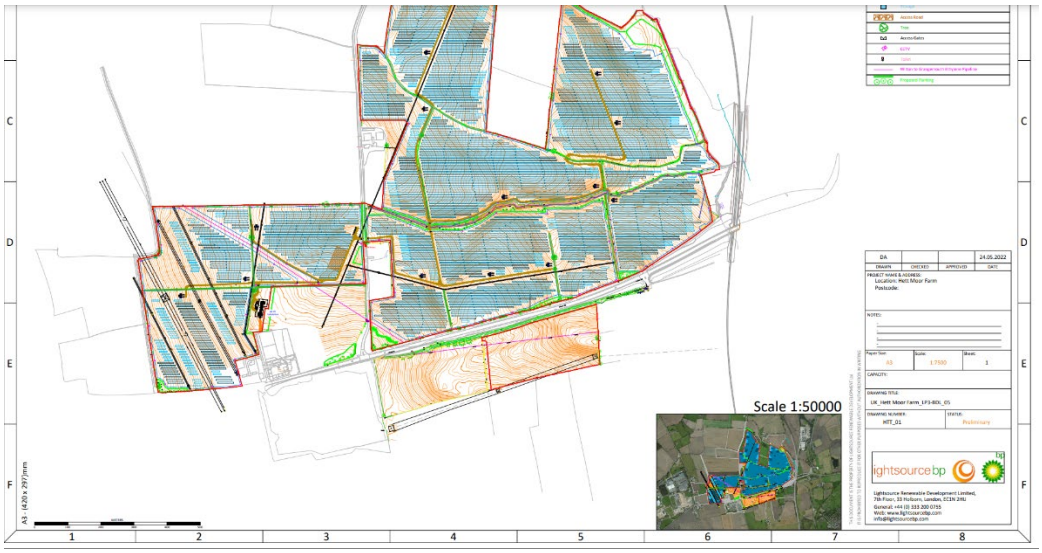
9. There are 91,590 panels on this drawing. They are bifacial panels with a maximum power output of 655 Wp. The maximum power output of the scheme is 60.0MW.

10. The one difference between this drawing (GBR_Hett Moor Farm_BDL_04) and the final drawing on the planning website (UK_Hett Moor Farm_LP3-BDL_05) is that more panels are added in the south-west corner of the site:



This extra section of panels contains 70 of the 10 x 3 module tables and 35 of the 20 x 3 modules tables which is an additional 4,200 panels. At the stated maximum output of 655 MW, the maximum power output of this final drawing is 62.75MW

11. In the Committee Report the Planning Officer, Chris Shields, refers to the site as being 108 acres:

    1. *The site of the proposed solar farm occupies an area of 108 hectares (ha) comprised of a series of agricultural fields, with some hedges and vegetation present adjacent to the site boundaries.*

    This corresponds to the site area of 266.74 acres in the fourth layout drawing, Revised Site Layout to Avoid Former Entry, (GBR_Hett Moor Farm_BDL_04).

12. However the Committee report states the development hereby approved shall be carried out in strict accordance with the following approved plans.

GBR_Hett Moor Farm_LP3-BDL-PL_05-A3	Site Layout Plan
P20-0319.005	Detailed Landscape Proposals
UK_EPD_RCS	Road Cross Section
UK_EPD_SWG	Switchgear / Production Substation
PNL.4L-25-6665	Panel Elevation
UK_EPD_FNC	Fence Detail
UK_EPD_GTD	Gate Detail
UK_EPD_DNO	DNO Substation
UK_EPD_CSS	Customer Substation
UK_EPD_MTR	GRP Cabinet
UK_EPD_INV	Inverter Detail
UK_EPD_MH/CB	Monitoring House

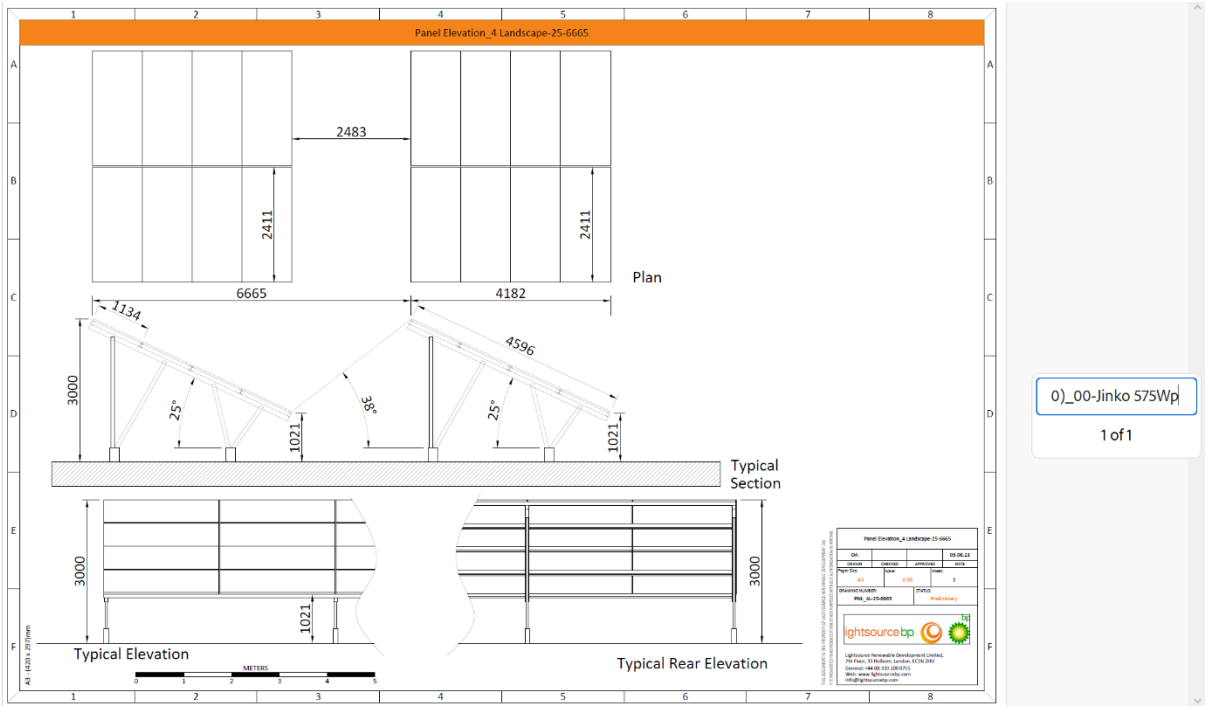
    It is not clear if the drawing in this list, GBR_Hett Moor Farm_LP3-BDL-PL_05-A3, corresponds to the drawing uploaded to the planning website on 24.05.2022, UK_Hett Moor Farm_LP3-BDL_05.

13. The Committee Report gives some brief dimensions of the module tables:

    11. Between each line of solar panels there would be a gap of approximately 3.6m to avoid overshadowing from one solar panel to another. The solar panels would be tilted at 20 degrees from the horizontal axis and orientated south. The height of the solar panels would be to a maximum height of 3 metres above ground level, with the lower edge of the solar panel elevated to 1.4 metres off ground level.

    It is not clear where these dimensions have come from.

14. The Panel Elevation drawing referred to in the list of plans in the Committee Report is as follows:



This drawing is dated 03.08.2021 and was uploaded to the planning website on 19.08.2021. It shows 4 panels in landscape orientation with panel dimensions of 2.411m x 1.134m, arranged at 25 deg. tilt and a gap between the panel modules of 2.5m. This does not correspond to any of the layout drawings. And it does not correspond to the detail in the Committee report

There is a lack of correspondence between the dimensions of the module tables in the layout drawings, the dimensions of the modules tables in the Elevation Panel drawing and the dimensions of the module tables reported to the Committee.

15. What we do know is that the Panel Elevation Insert in the fourth layout drawing does correspond with all the dimensions of the module tables in the Revised Site Layout to Avoid Former Entry, and the subsequent revision of that drawing, Layout Plan. This drawing does correspond to the acreage stated in the Committee Report.

16. This gives a maximum power output of 62.75MW.

17. However in the Planning Statement, the maximum power output is stated at 49.9MW

    3.10 The proposed solar PV installation of 49.9MW is the equivalent to the energy needs of approximately 13,861 homes within the UK

18. The Design and Access Statement also states the maximum power output as 49.9MW

This Design and Access Statement has been prepared in support of the full temporary planning application for a Solar Installation and associated infrastructure at Hett Moor Farm, Hett, County Durham, DH6 5LJ. The proposed 49.9MWp Solar Installation would result in a reduction in carbon emissions associated with energy generation equating to approximately 14,341 tonnes of CO2 per annum or the removal of approximately 7,908 family cars from the road each year. The proposal would provide the equivalent energy needs of approximately 13,861 homes within the UK. (page 18)

19. The Committee report repeats these statements:

    3.10 The proposed solar PV installation of up to 49.9MW is the equivalent to providing for the energy needs of approximately 13,861 homes within the UK.

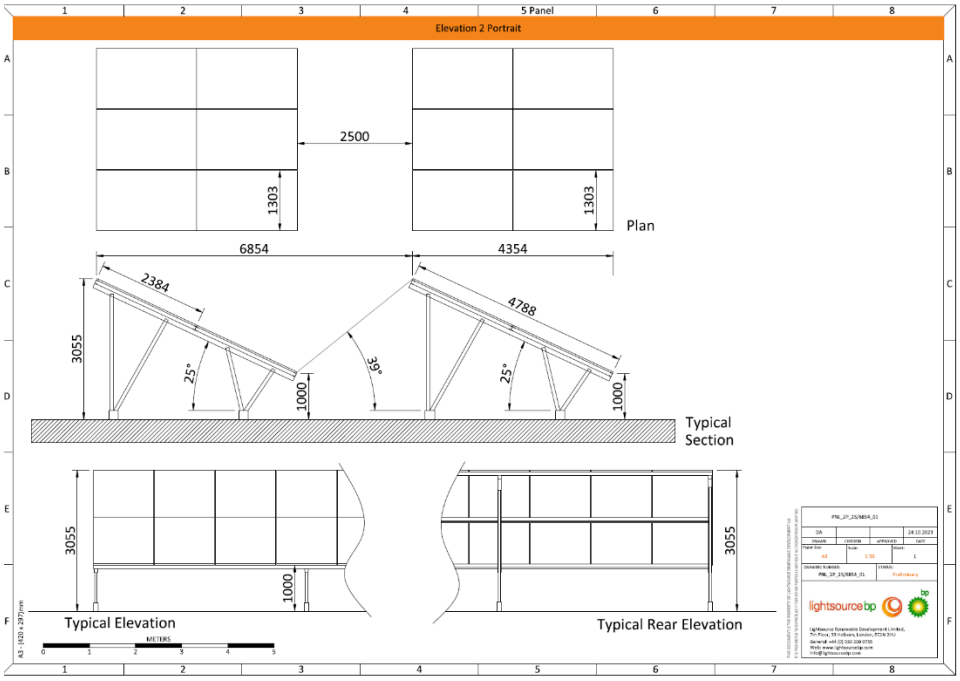
20. But the Planning Officer does not report to the Planning Committee on the number of panels, 91,590, increasing to 95,790 in the final drawing. The Planning Officer does not report to the Planning Committee on the power output of each panel, and therefore the maximum output of the scheme, 60.0MW, increasing to 62.75MW in the final layout.

21. It appears that BP knew that the application was well above the threshold for approval by a Local Authority and the Planning Officer seemingly has either ignored or overlooked this fact in drafting the report. The output of 60MW is stated on the drawing. But at no point does BP inform the Committee that their application is above the threshold. And at no point does the Planning Officer inform the Committee that the scheme is well above the threshold for approval by a Local Authority.

22. In the event, the Committee refuse the scheme and the matter never arises.

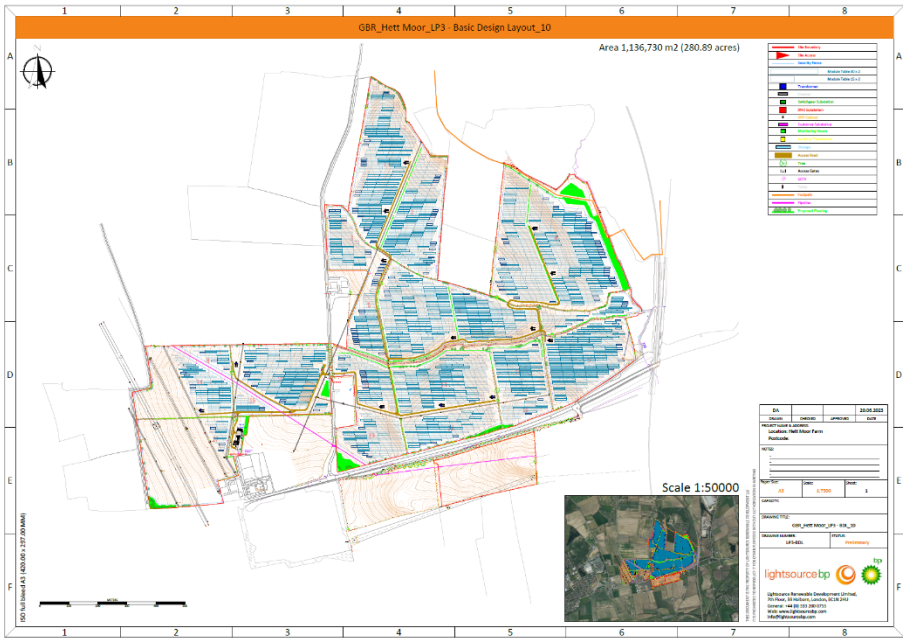
23. BP did not appeal this refusal. They simply apply again on 20.06.2023.

24. In this second application the Panel Elevation drawing is as follows:



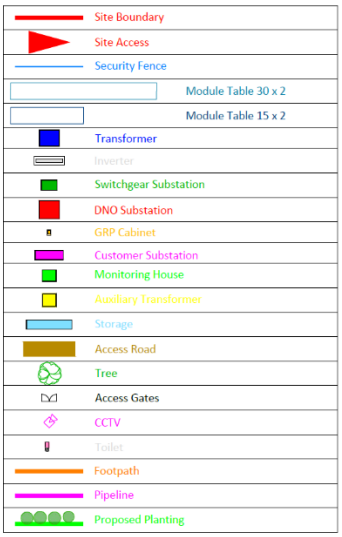
This drawing, PNL_2P_25/6854_01, dated 24.10.2023 shows a layout of 2 panels in portrait orientation with dimensions of 2.383m x 1.303m angled at 25 deg. and with a gap between the module tables of 2.5m. The total of width of the module table on the ground is 4.354m. The height of the module table from the ground is 3m falling to 1m at the lowest edge.

25. The layout plan is as follows:



This drawing, GBR_Hett Moor_LP3 - Basic Design Layout_10, is dated 20.06.2023 and was uploaded to the planning website on 21.06.2023. The panels in the south-west corner have been removed again, but otherwise the layout is broadly unchanged from the first application, except that the gap between the panels has now been reduced to 2.5m.

26. The different module tables can be seen in the key on the top right hand corner of the drawing:

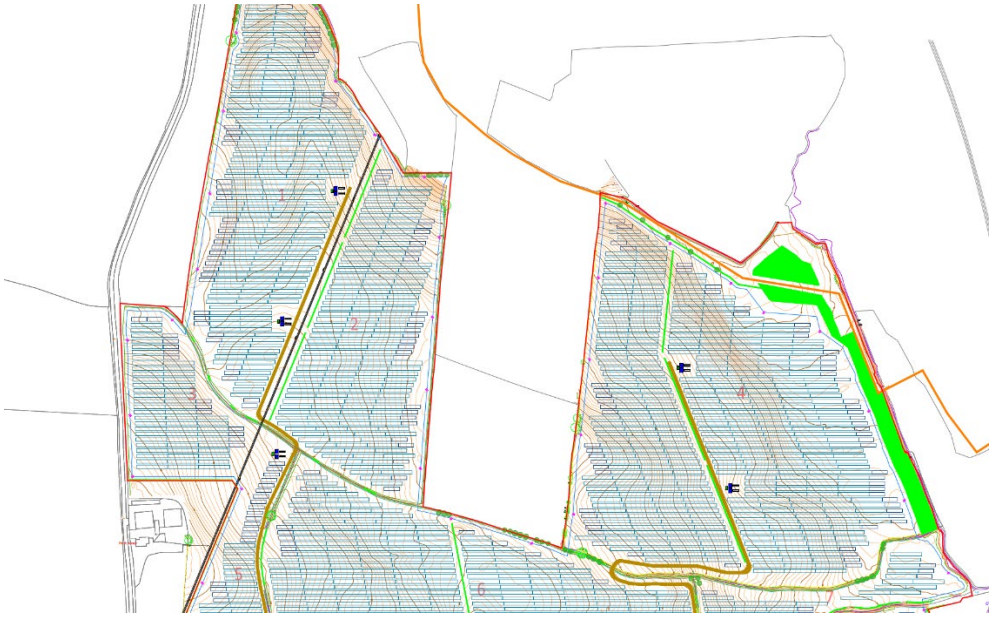


27. This enables the size of each module table to be calculated. The length of the module table 15 x 2 is 19.545m, and the length of the module table 30 x 2 is 39.09m. Both module tables are 4.354 wide across the ground.

28. The module tables can be seen in the layout drawing. The dimensions correspond exactly to the panel elevation drawing:

29. This enables the number of panels to be calculated.

30. The field areas have been given numbers:



31. The number of panels in each area of field is as follows:

Area	Rows	15 x 2	30 x 2	Panels	m2	MW
1	78	43	204	13,530	42,029	9.46
2	59	29	158	10,350	32,151	7.23
3	28	14	57	3,840	11,928	2.68
4	65	63	380	24,690	76,696	17.26
5	45	30	45	3,600	11,183	2.52
6	45	21	308	19,110	59,362	13.36
7	17	9	31	2,130	6,617	1.49
8	10	5	14	990	3,075	0.69
9	40	20	167	10,620	32,989	7.42
10	29	14	147	9,240	28,703	6.46
11	27	21	53	3,810	11,835	2.66
12	27	3	89	5,430	16,867	3.80
13	29	11	168	10,410	32,337	7.28
14	29	12	62	4,080	12,674	2.85
15	8	5	10	750	2,330	0.52
16	11	4	25	1,620	5,032	1.13
17	15	8	13	1,020	3,168	0.71
18	20	10	84	5,340	16,588	3.73
19	23	8	76	4,800	14,910	3.35
TOTALS		**330**	**2,091**	**135,360**	**420,476**	**94.61**

The number of panels has been increased from the first application to 135,360. The total surface area of the panels is 420,476m2. The Government state that the average solar panel gives a maximum output of 225W per m2. This gives a maximum output capacity of 94.61MW, which is nearly double the threshold permitted for Local Authorities to give planning permission. The increase in maximum power output from the first application has come about largely by the increase in panel numbers from 91,590 panels to 135,360 panels. There is also a modest increase in the maximum output per square metre of panel, brought about by an increase in the efficiency of the panels. The original application has a power output per square metre of 208W. The Government currently stipulates that the average power output of a solar panel is 225W per square metre.

32. In his report to the Committee the Planning Officer, Chris Shields, states:

18. The proposed solar PV installation of up to 49.9MW is the equivalent to providing for the energy needs of approximately 14,400 homes within the UK. The numbers shown here represent a modest increase in benefit above the previously submitted scheme. This is not a change to the proposed power output but a recalculation based on latest datasets.

33. It is difficult to make sense of how a scheme which has been increased so substantially can still be producing the same output of 49.9MW.

34. In the Committee report the Planning Officer gives a further statement:

    194. Solar farms are typically overplanted by a factor of 1.25 – 1.8, equivalent to approximately 62MWp-90 megawatt peak (MWp) on a 49.9 megawatt alternating current (MWac) connection. The proposed solar farm covers of approximately 114 hectares and consists of approximately 135,420 panels, with a built development area of 1.7 hectares per MW. The Hett Solar Farm installed solar panel capacity would be approximately 77MWp with maximum combined capacity of the installed inverters of 49.9MWac.

35. The Planning Officer states that the solar panel capacity is approximately 77MWp. In doing so, Chris Shields quotes the supplementary statement from BP.

    7. The Hett Solar Farm installed solar panel capacity is ~77MWp with maximum combined capacity of the installed inverters of ~49.9MWac.

    No calculations are provided to substantiate this either by BP or by the Planning Officer.

36. The combined capacity of the inverters is stated as 49.9MW. But there appears to be no good reason for enlarging the number of solar panels on the site if the output is still going to be the same, unless there are plans to increase the output.

37. Installing solar panels with a maximum output of 94.61MW DC and inverters with a maximum output of 49.9MW AC is a ratio of 1.9 to 1.0. What this means is that as soon as the panels start to produce over 49.9MW the inverters will not be able to convert that power from DC and AC and the power being produced by the solar panels will be lost or what the industry calls “clipped”.

38. One reason that developers choose this ratio of panel power to inverter output is because the panels are often operating with a very low output. An inverter with a lower maximum power than the panels, starts to produce AC power quicker when the panels are operating at low power, and therefore can produce more power when the panels are operating at a low output than an inverter the same size as the panels. However this ratio of panel power to inverter output is a commercial choice and can readily be varied.

39. Even though there is a gain in output when the panels are operating in lower power, it it appears unlikely that BP will use inverters that simply let half of the power of the output of the panels be “lost” when the panels are producing their maximum power

40. Allowing the developer to decide the ratio of panel power to inverter output is not a sound means of measuring the maximum capacity. Simply accepting the developer’s choice of panel to inverter ratio to arrive at a maximum output figure does not give a basis for a sound

long-term planning decision, as the number and output of the inverters can easily be changed, as noted above. Maximum capacity ought to be based on a calculation on what the maximum can be at the maximum, whatever design choices are made about the inverters, or whatever commercial agreements are agreed with the grid.

41. It is well established that the loss of power when converting DC to AC is around 5%. Therefore, the maximum AC output of this application is 89.9 MW AC. This is way above the threshold. The scheme appears to be unlawful.

09 July 2024