Request to include an Electrical Engineer in the examination procedure (Preliminary Meeting oral submission).

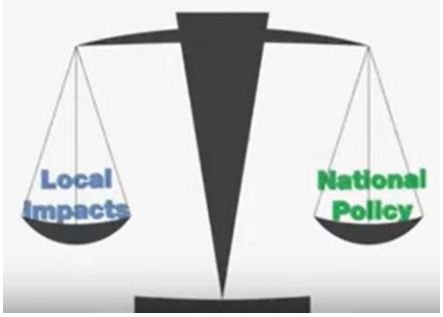
Based on previous NSIP solar farm examinations and their outcomes, it appears that the electrical aspects of the applications are not always being subjected to sufficient scrutiny. The presence of an experienced Electrical Engineer – ideally on the panel, or as a consultant – would mitigate potential weaknesses in the examination process.

Legislative context

In his Rule 6 letter, the examiner explains that the purpose of this examination is to assess the merits and disadvantages of the proposed development.

This echoes the central question posed in the 2008 Planning Act for NPS power generation:

Do the benefits of the proposed scheme outweigh its adverse impacts? [1]



© Planning Inspectorate (video)

The Planning Inspectorate has unquestionable expertise in assessing the **Local Impacts** of NPS and other NSIP proposals. Quantifying an NPS proposal's technical merits against the aims of **National Policy** Statements is a new responsibility.

Previously, major electrical infrastructure projects were examined and approved by the CEGB[2] directors. It is not obvious that the Planning Inspectorate alone has the skillset to arrive at the best engineering judgements.

Offshore windfarm NSIPs

This scrutiny is not always necessary. When Orsted proposed a 2600 MW offshore windfarm extension at Hornsea, it was reasonable to assume that the applicant had designed this down to the last detail. Orsted is a national energy company with decades of operational experience and billions in turnover: it will not commit this investment without scrupulous prior planning and analysis. Orsted's business model (maximum return over the coming decades) meshes perfectly with the UK government's ambition (maximum renewable electricity over the coming decades).

[1] This is implicit in the section 105 requirements and articulated in section 104(7).

[2] Central Electricity Generating Board (see Wikipedia). The CEGB ran electricity generation in England and Wales throughout the latter half of the 20th century. It created the National Grid, and it designed, built, owned and operated all the generating stations. The board and senior positions were held predominantly by engineers – the repository of British electrical engineering excellence. Today, Britain's infrastructure is designed, built, owned and operated by (mostly excellent European) electricity companies. The executive role is entrusted to the Secretary of State (BEIS, now DESNZ) supported by the Planning Inspectorate.

The minimalist Hornsea 4 DCO, "over 100 MW comprising up to 180 wind turbine generators," is appropriate. If the applicant is also the long-term operator, the Inspectorate may be confident that the development will meet expectations.

Should this courtesy be extended to all NSIP applicants?

An alternative business model

The solar installation industry has also risen to the government's challenge: rapidly to expand the country's portfolio of solar capacity (70 GW by 2035). The experience of the applicants is mostly in the 5 MW solar league, so it's a big ask. But they have a business model that is well-adapted to the NPS procedure and the DCO structure.

How is this working out? It depends on who is asking (Appendix 1).

The pipeline of pending Solar NSIP applicants suggests that Cleve Hill will not prove to have been an isolated case. And experts are now on hand to smooth the passage of DCO procurement and ease the examiner's task (Appendix 2).

Where there is vulnerability in legislation, there is a risk of exploitation. The Planning Inspectorate would be well advised to review its procedures.

Planning Approvals and DCOs

LPA planning applications are similar to DCOs, but they are more restrictive.

Like DCOs, planning applications contain environmental limitations: visual impact, flood mitigation, fauna habitat, etc. They also place specific constraints on the proposed construction: number of rooms, location of windows, slope of roof, colour of bricks, etc. The LPA knows what it will be getting. If the applicant (or a subsequent owner of the land and permission) builds something different, the LPA has the authority to enforce compliance.

Solar farm DCOs lack such technical electrical constraints, beyond the token "more than 50 MW." The applicant (or a subsequent owner of the land and permission) is compliant if the farm can demonstrate a peak output of 51 MW.

This clearly conflicts with the government's aim [EN-3 (2024), 2.10.17] to extract maximum solar electrical yield from a given area of land. This oversight is particularly troubling where compulsory acquisition is involved.

An LPA-style Consent Order that specifies a minimum power output value would at least address this defect. Further technical constraints could result in a robust DCO that guarantees the final outcome.

A technical problem

An interested observer with a distant memory of the Physics classroom will read the solar NSIP submissions with interest. The Physics was much easier in the old days of on-demand generation (coal, gas, etc).

The experience is disappointing. Despite concerning multi-million-pound electrical installations aimed at meeting the country's growing electricity demand and eliminating CO_2 from the grid, the examination process rarely touches on electrical system design or assessment methodologies.

Where it does, the evidence is disturbing. What at first appeared to be just poor attention to detail rapidly evolved into a comic performance by *dramatis personae* who are blissfully unaware that they have minimal grasp of basic electricity theory or its application to solar farm specification (Appendix 3).

We can do better.

In an adversarial forum a non-specialist adjudicator is in a position to arrive at a just decision.[3] In an inquisitorial setting, the examiner must have both rudimentary technical competence and access to technical expertise. We might not need the CEGB, but we do need an experienced electrical engineer.

Some suggestions

Happily, the government recently instructed what should have been obvious all along [EN-3 (2024), 2.10.56]:[4] that generator power should not be constrained in the DCO; the government's aim is *maximum* electricity for whatever environmental disruption is deemed acceptable. Hopefully examiners will no longer contemplate this option, and applicants will not have to make the request.[5] Further improvements could be considered:

1) Get an Electrical Engineer. Few town planners have the expertise to characterise a solar electrical installation (Appendix 4). Avoid engineering consultancy firms. Find, for example, an engineer who designs and commissions grid substations – one who is up at 3 am tracking down an anomalous transient on a transformer secondary winding and identifying the offending component.

2) The two headline figures in an NSIP solar application are power produced and land area requested. These may alter over the duration of the examination (elimination of some land packets; unexpected new PV product), but this is the starting point for the examiner. A

[3] E.g. EWHC 895 (Comm), 2021. In a 300-page judgement following an 18-day examination, Mr Justice Henshaw rejected Toucan's ludicrous compensation claim but ordered Wirsol to upgrade a number of transformers and switchgear to meet contractual obligations. What was interesting was that in this adversarial setting, the High Court judge achieved a remarkable understanding of technical detail including real and reactive power and Power Factor. It was also a rare (unique?) occasion where solar performance data was put into the public domain.

[4] The amalgamation of three distinct power ratings into "AC installed export capacity" was unfortunate, but the instruction is nevertheless clear.

[5] Non-Technical Summary [APP/6.4, 4.2.2], DCO Explanatory Memorandum [APP/3.2, 1.4.5-6], ES The Scheme [APP/6.1, 2.5.4]

proposal that promises just “over 50 megawatts” should be rejected at the pre-application stage (Appendix 5).

3) A performance index should be evaluated for each proposal (e.g. power density; Appendix 6). The Inspectorate should maintain a database of indices for known and prospective solar installations. At an early stage, an applicant whose design shows a poor index could be advised to review the proposal before proceeding.

4) Having approved an Export Power rating for a proposal, a minimum value (e.g. minus 10%; ‘Rochdale envelope’) should be specified in the DCO to allow the SoS to enforce compliance. (The value can always be reduced later by the SoS if unanticipated problems are encountered during construction.)

5) A technology training day for potential solar examiners, for example:

> Morning session. *GCSE Physics revision*: voltage, current, power, energy; alternating and direct current; common units; application of electrical quantities and mathematical relationships; phase shift in power AC circuits; power–time graphs and ‘area under the curve.’
>
> Afternoon session. *Solar and related electrical systems*: components of the solar electrical chain; implications of panel configuration and undersizing options; solar simulation software; role of batteries in solar designs and their parameters; peak power, annual energy data and monthly power profiles; Capacity Factor (Load Factor) of generating stations.

An examiner who has a sound grasp of the underlying electrical issues will make best use of advice provided by the electrical engineer.

6) Consult a legal authority concerning clauses in the DCO that might impede DCO resale and ensure prompt renewable energy construction.

A planning officer working with an electrical engineer can arrive at a sound judgement.

BOOM: the solar Orsted?

The Planning Inspectorate may, or may not, decide to review its procedures. The question that the ExA faces is whether it is satisfied that BOOM intends to Own and Operate this solar farm for decades to come. If so (the Orsted business model), there is little need to introduce technical constraints into the DCO. If not (the Cleve Hill model), then the ExA should seek to include safeguarding clauses.

There is good reason for the ExA to have confidence in BOOM’s intentions. Concerning their schedule: *operation* [is] *therefore anticipated to commence in 2027* [Statement of Reason 1.2.5, APP/4.1; authored by Pinsent Masons]. This thankfully precludes the delays associated with DCO resale, fundraising and appointing a solar farm designer, as witnessed for Cleve Hill.

Most reassuringly, Pinsent Masons is bound by SRA regulations not to mislead (or allow its client to mislead) the examination.

But there are red flags.

1) How can the solar farm be producing electricity in 2027 if the grid connection date is 30th September 2029?[6] Judging by the tone of NG's recent submission [AS-022] they won't be doing BOOM any favours in the near future; they are preoccupied with getting BOOM to abandon its bizarre attempt to gain compulsory acquisition of part of NG's Drax substation (and other critical NG land).

2) Might BOOM's resources become overstretched? In addition to this NSIP farm, there is Fenwick (237.5 MW) 10 miles to the southwest, as well as another 400 MW south of Birmingham on the horizon. For a company of 20 (mostly planning/contract/ admin positions) this is a daunting workload. They may have no choice but to sell off some (or all) of their DCOs. According to the BOOM website, they also have some smaller solar farm projects, all with LPA permission but none of which appears to have started construction. Osgodby (43 MW), close to the East Yorkshire site, received its permission two years ago. In contrast, the Crays Hall project (25 MW) has just been sold to ["aligned with" in BOOMspeak] asset manager Aukera UK Ltd.[7]

3) The Planning Inspectorate's digital database has probably already flagged up that BOOM has the same business address as Cleve Hill's Wirsol. The MD, Mark Hogan, is the same, and so are most of the employees. It looks like the same outfit, now free from the former parent company (Wircon GmbH) and with a more appealing business model: Build, Own, Operate, Maintain. Hogan, who had a 10% stake in Cleve Hill, has a 40% share of East Yorkshire.

In an abundance of caution, the ExA should ask an electrical engineer to scrutinise the technical elements of the East Yorkshire proposal. Additional safeguards in the DCO might improve the chances of the resulting solar farm aligning with government policies.

At the Preliminary Hearing, the Lead Solicitor remarked that I have a background in Electrical Engineering, [redacted] I teach some piano. I was never an electrical engineer. I achieved Grade B at Physics A Level, and I have an internet connection. I am enthusiastic about decarbonising the grid, but I am concerned that weaknesses in the regulatory process result in poor decision making and render it vulnerable to exploitation.

Michael Field BMus

[6] The Grid Connection Statement [APP/7.5] is forthcoming over the dates that NG letters were exchanged (17/12/2021 and 12/4/2022; who cares?), but forgets to mention the only date that interests the ExA: the agreed grid connection date. This can be obtained from NG-ESO.

[7] Aukera is owned by [redacted]. van Poecke (https://www.carlyle.com/about-carlyle/team/marcel-van-poecke) has enjoyed enormous financial success trading assets in the global oil and gas sectors over many years. He is now bringing his expertise to bear on the UK renewables sector.

Appendix 1. Cleve Hill: Then and Now.

The first solar farm DCO was a landmark achievement. Cleve Hill Solar Park Ltd was a 50:50 joint venture between Hive Energy Ltd (Timothy Giles Redpath) and Wirsol Energy Ltd (the UK branch of a German solar installation company). The target was a generating capacity in excess of 350 MW from 890 acres on the Thames estuary in Kent.[8]

The Scoping Report was submitted in December 2017 with the examination held in 2019 before a panel of three examiners. Legal representation was provided by Pinsent Masons. The DCO was awarded in 2020 for an east-west solar PV array of at least 50 MW with the option to include a battery of over 50 MW [*sic*]. Four years on, we are in a position to review its journey from approval to electricity production.

Immediately following the examination, the Cleve Hill newsletter ceased publication, and the website was no longer updated.

Eighteen months later, Quinbrook Infrastructures Pty Ltd announced in the press that it intended to construct *Project Fortress*, which would be Britain's largest solar farm at 350 MW. They had a DCO.

Six months later, they opened the Quinbrook Renewables Impact Fund, which offered a *holistic and differentiated approach to the energy transition* [by] *leveraging important innovations in the energy sector from the use of advanced data science and artificial intelligence*. Quinbrook was particularly keen to offer this unique investment opportunity to UK local government pension schemes.[9]

Quinbrook is not an engineering company. It is an investment asset fund manager set up a few years ago by two Australians. Its UK operation is run out of an offshore entity in Jersey.

Pension fund managers know even less than asset managers about the construction and economics of solar farms, but they are keen to get into renewables – even ones that do not yet exist or have guaranteed performance – if they have government endorsement. Armed with the DCO, the fund raised an impressive £620m in just six months.

Next, Quinbrook sought a company to design and construct a solar farm for them at Cleve Hill. They selected the Greek company Mytilineos. By early 2024, solar panels and transformers were finally starting to arrive at a water-sodden Cleve Hill/Fortress.[10] The projected production figure is now 373 MW.

Peak output is measured on a cloudless day in late June (maximum insolation). We shall have to wait till June 2025 to quantify the performance of Cleve Hill/Fortress.

[8] According to the 2017 Briefing Pack, https://static1.squarespace.com/static/5992b8d8bf629ad8f9d3048c/t/5a254c5924a6943d276b3a48/1512393821474/171027%2BCleve%2BHill%2BBpack_03-AW%2Bweb.pdf. The NSIP application is curiously silent on generating capacity. This evidently did not concern the ExA.
[9] https://www.room151.co.uk/151-news/project-fortress-enabling-lgps-funds-to-address-climate-change/
[10] https://www.youtube.com/watch?v=lhkTGph-R2E&t=27s

This is not what the government had in mind for NSIP procurement.

1) In this scenario, the DCO is foremost a financial award. Quinbrook paid an estimated £24.4m for it; you can understand the attraction to Wirsol of not having to go to the effort of building a solar farm and waiting 40 years to get their return. But this pales beside the DCO's value as leverage to obtain £620m from the pension funds. This is what used to be termed a "nice little earner."

2) The ExA was under the misapprehension that Wirsol/Hive were funding the project when it read their Funding Proposal. It later transpired that Quinbrook was the company they should have been addressing concerning Cleve Hill funding. Actually, Quinbrook was in a chicken-and-egg financial position: they had the money to justify the DCO *if* they first had the DCO.

3) Technical discussion with Wirsol at examination was largely pointless. The examiners should have been speaking to Mytilineos if they wanted insights into the design details.

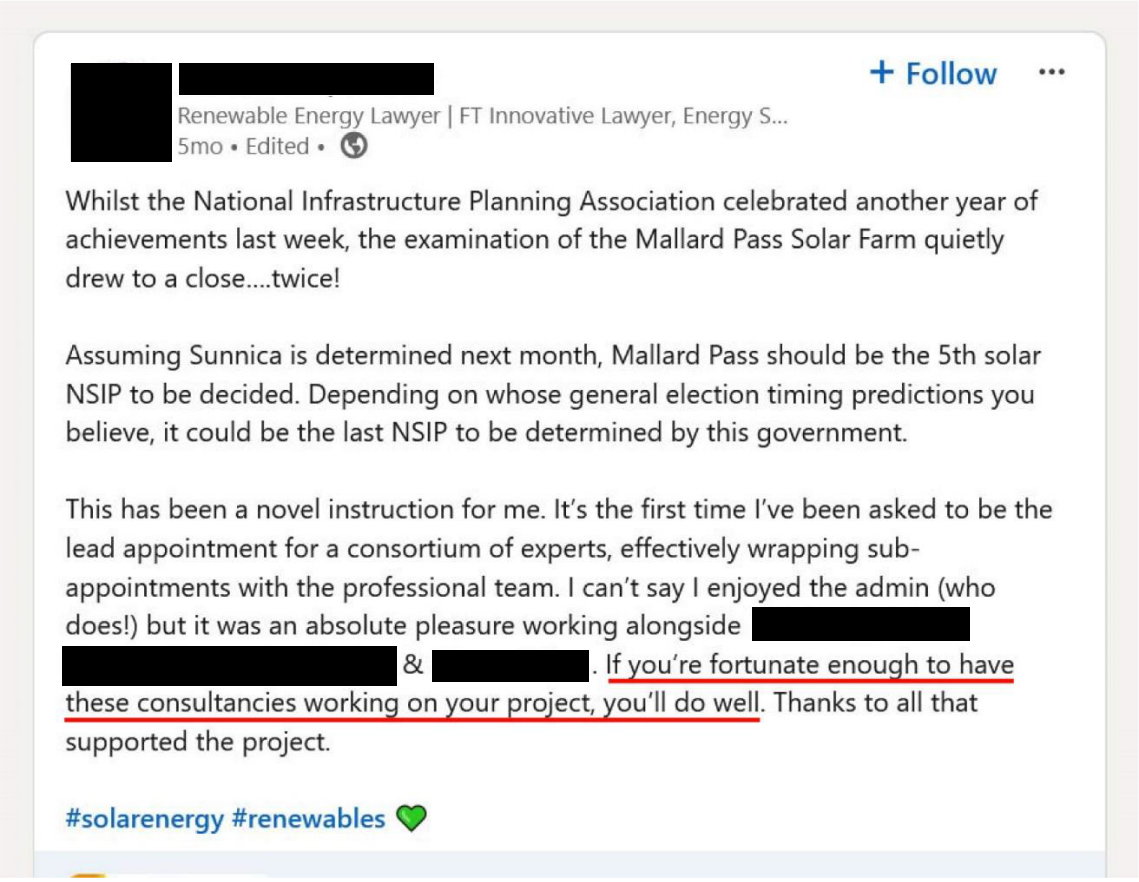
4) The DCO stipulated no minimum performance figure beyond "above 50 MW." If, in the future, the SoS queries why the farm is not producing the 350 MW that the Inspectorate was expecting,[11] the new owner – Quinbrook will have sold the farm before it is even switched on if it follows its recent strategy in Arizona – will point out that they bought the DCO in good faith; it doesn't mention anything about any 350 MW.

It can be argued that the pension fund managers have only themselves to blame if they invest in a non-existent solar farm without a performance guarantee. However, the SoS might consider potential pension fund collapse as one of *any other matters which the Secretary of State thinks are both important and relevant to the Secretary of State's decision* [PA2008 s104(2)(c) and s105(2)(c)].

[11] The projected 373 MW is almost certainly the *installed* capacity, given the land area and the most optimistic current PV efficiency. Because of the east-west configuration, a peak *output* capacity nearer 273 MW would seem more likely. But until the numbers are in, we can all remain hopeful.

Appendix 2. The Team

Solar farm DCO procurement has spawned a lucrative cottage industry of planning consultants, PR advisors, technical gurus and NPS lawyers. This dedicated group tours the country from one hearing to the next to present each NSIP Inspector with a mountain of well-rehearsed testimony in a persuasive and digestible form.



[redacted]
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Whilst the National Infrastructure Planning Association celebrated another year of achievements last week, the examination of the Mallard Pass Solar Farm quietly drew to a close....twice!

Assuming Sunnica is determined next month, Mallard Pass should be the 5th solar NSIP to be decided. Depending on whose general election timing predictions you believe, it could be the last NSIP to be determined by this government.

This has been a novel instruction for me. It's the first time I've been asked to be the lead appointment for a consortium of experts, effectively wrapping sub-appointments with the professional team. I can't say I enjoyed the admin (who does!) but it was an absolute pleasure working alongside [redacted] & [redacted]. If you're fortunate enough to have these consultancies working on your project, you'll do well. Thanks to all that supported the project.

#solarenergy #renewables 💚

Sound advice. If you aspire to owning a DCO, albeit briefly, these are the experts. They have achieved 100% success with the NPS Planning Inspectorate.

Appendix 3. Case law: Applicant, Inspectorate and HMG vs. GCSE Physics.

I don't think anyone will know – unless they were in the mind of the decision maker – why that figure was chosen. There isn't, so far as we can see, any reasoning.[12]

The 'figure' was 90MW, the 'mind' in question was that of the Secretary of State and, indeed, there was no reasoning. London barristers rarely pass comment on government ministers, but in this instance, you have to sympathise with Richard Turney.

Turney was advocating for Sunnica Ltd at an NSIP Planning Inspectorate hearing in November 2022. Sunnica had set its sights on an ambitious 500 MW solar farm set on 600 hectares of farmland near Newmarket. The *Say No To Sunnica Action Group* had mounted a spirited defence, but it was no match for Turney, the team of AECOM consultants and the solicitors of Pinsent Masons.

Hesitantly, Turney turned to the thorny issue of the Little Crow precedent. Little Crow Solar Park had been awarded a DCO in April 2022, but with a 90 MW limit on battery capacity. This had come as a surprise to everyone: neither the applicant nor the examiner had sought to impose a battery limit. Why on earth had the Secretary of State appended this? And, for the curiosity of anyone with GCSE Physics, what does it even mean?

Was it a typo? If the SoS intended a capacity limit, this would have been '90 MWh;' but this is an unrealistically low value for a solar farm battery. Alternatively, if the SoS was truly minded to impose a charge/discharge limit of 90 MW, what was the point? The grid contract was for 99.9 MW so the reduction was minimal (as well as pointless). And, anyway, there were two batteries in the Little Crow proposal, so the 99.9 MW export limit would be comfortably satisfied by a 180 MW (2 × 90 MW) discharge rate.

You can understand Turney's frustration. But a little history will illuminate the situation.

INRG Solar (Little Crow) Ltd is one of many similar-sounding UK companies[13] set up by a couple of entrepreneurs from Co Roscommon. The parent company was INRG Solar Ltd (registered in Ireland).[14] INRG first met the Planning Inspectorate in 2018, declaring itself a UK-only company responsible for 24 solar parks and several gas generation projects.

INRG were originally pitching for 150 MW of solar near Scunthorpe with a 50 MW battery. Subsequent submissions had the solar up to 200 MW with a 90 MW battery, but their draft DCO stuck with "greater than 50 MW." The ExA, in the Draft DCO Consultation Document [PD-014], proposed a ceiling of "up to 300 MW," but INRG dug its heels in. There was a brief attempt to negotiate "up to 500 MW" for solar plus battery, but Schedule 1 in the final draft

[12] The Sunnica ISH1 hearing: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010106/EN010106-003734-Sunnica%20ISH1%20Part%202%20code.html

[13] Not to be confused with a number of other similar-sounding companies (INRG Solar Parks Ltd, etc) owned by a Swiss gentleman with similar UK solar ambitions.

[14] The INGR Solar website does not appear to have been updated since early 2019. INRG Solar Ltd (Ireland) was liquidated in 2022.

DCO stuck resolutely with “greater than 50 MW” for the solar array and no specification for the battery.

In its report to the SoS the ExA recounted, over several pages, the back-and-forth over solar capacity and expressed concern over whether this project made best use of the available land (among other issues). The SoS was invited (e.g. para 4.9.77) to make a judgement.[15]

The report is detailed and meticulous but not an easy read. However, one technical parameter, repeated several times, was evidently uncontested: the 90 MW battery. The SoS exercised his executive scientific discretion and appended “up to 90 megawatts” to the two battery paragraphs in Schedule 1, and signed it off. The solar capacity specification remained as “over 50 megawatts.”

INRG must have been livid when their DCO turned up. They were expecting the customary blank page for Schedule 1. The 90 MW battery capacity was only ever intended as a topic for polite discussion at examination [and not, as it turned out, even that, given that neither the applicant nor the examiner knew the appropriate values, let alone units, for battery capacity]. They wrote directly to the SoS to plead for deletion of “up to 90 megawatts,” but to no avail. There was little prospect of the SoS overturning his one and only electrical contribution to a DCO:

The Secretary of State intended to include a capacity limit in respect of the battery energy storage system and the imposition of that limit was based on the information contained in the application for development consent as made.[16]

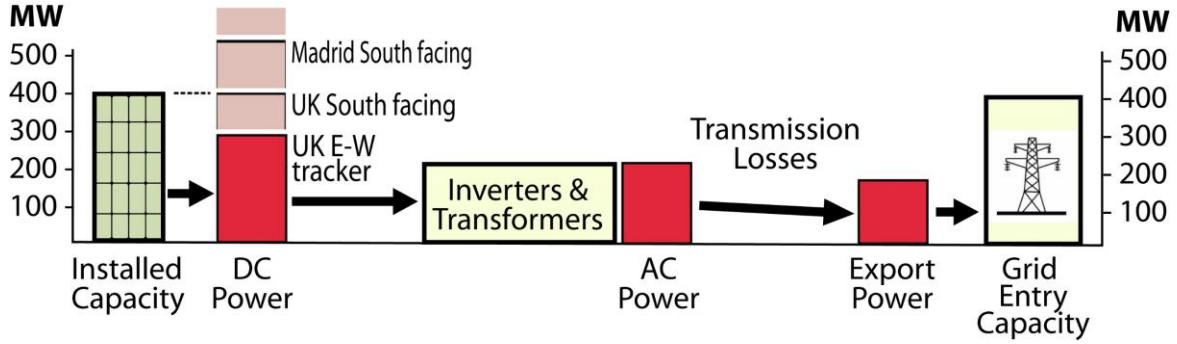
The disturbing conclusion is that none of the protagonists – [redacted] – is a promising candidate for a GCSE Physics exam.

[15] https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010101/EN010101-000875-Little%20Crow%20Rec%20Rpt%20MASTER.pdf

[16] https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010101/EN010101-000915-Little%20Crow%20NMC%20Correction%20Notice.pdf

Appendix 4. What Does an Electrical Engineer do?

Hopefully this representation of a solar farm flow diagram is similar to that of the ExA's. Obviously, all power figures refer to peak output (i.e. midday late June, no cloud cover).



Installed (Nameplate) Capacity is what's written on the label. It is the power output under standard conditions with normal (90°) irradiation at 1 kW/m^2

DC Power depends on geographical location and panel orientation. By coincidence, the output in central UK for south-facing panels is approximately the same as installed capacity. It may be two or three times higher at lower latitudes (Madrid: +66%). Non-standard configurations: East-West (Cleve Hill) and Tracker (East Yorkshire) have lower DC power output; energy may be superior.

AC Power is the output rating of the inverters (plus transformers). These are usually 'undersized' (EN-3 (2024): 'overplanting') because it is not economical to harvest the last few watts on a rare summer's day. Also, panels degrade over time and become soiled, reducing output.

Export Power is the same as AC Power for a farm adjacent to a grid entry point. Long cable runs may introduce transmission losses.

Grid Entry Capacity is in the contract with National Grid (or a DNO). It must be at least as high as Export Power.

The ExA might ask the Electrical Engineer to make two assessments:

1) What is anticipated performance of the proposed electrical system, both in terms of export power (MW)[17] and energy yield (GWh/yr)?

2) Is the design sufficiently robust to justify an anticipated life of 40 years without major repair?

For example, to a planning officer, the cable from the solar farm substation to the Drax station is a cable. To an engineer, it is an electrical circuit. It has intrinsic resistance and

[17] The Secretary of State requires solar capacity to be "measured [*sic*] in alternating current (AC)" [EN-3 (2024) 2.10.53], rather than power. Current (around 400,000A rms for East Yorkshire?) is meaningless as performance metric, of course – he probably intended "specified in megawatts (AC)". Fortunately, this requirement is solely for the purpose of PA2008 s15 (the 50MW rule), so the ExA is not bound by it for examination purposes.

inductance, and the insulation dielectric gives rise to bulk capacitance. Given the cable specification it is a relatively easy task to evaluate power loss and phase shift associated with the corridor. (A more detailed analysis might take into account the proximity of adjacent cables and shared eddy currents.)

This cable is not cheap. With three phases from each of two 132kV/200MW substations and an 8 km (?) corridor, 48 km of 145kV/500A+ (rms) screened cable will be required.

There is not a 'correct' size for this cable. A larger cable will minimise energy loss (and hence increase yield in the long term), whereas a constructor that has no long-term financial interest in the project will prefer to install a thin cable. As a 'big-ticket' item, BOOM presumably established a provisional specification for this cable when deriving their estimated project cost (£345M [APP/4.2, 2.2.1]).

The engineer could also, for example, evaluate the projected Export Power from the specifications of all the solar farm components. Based on peak sun elevation at 52°N and details of the panel layout, he will confirm that the Installed Power meets or exceeds the quoted inverter AC rating. The ExA would probably like to be made aware if the predicted Export power falls short of that presented at examination. And it is certainly not in National Grid's interest to install a mighty 400MVA transformer in their spare bay if the peak Export Power turns out to be, say, 250MW.

The engineer might identify shortcomings that could give rise to early failure, such as resonances from switching harmonics (arising in the inverters) that have not been sufficiently attenuated. These can damage expensive downstream transformers. And is there sufficient provision of reactive power to accommodate projected Power Factor excursions on the grid over the coming decades?

The solicitor's resistance at the Preliminary Hearing to electrical consultation was a surprise. The BOOM engineers will likely welcome a (free) second pair of eyes to confirm a sound design and long-term viability. And if BOOM is obliged to sell the DCO before construction, these are the sorts of details (like the architect's drawings in an LPA planning application) that will give the SoS confidence in the final outcome, regardless of who ends up designing and constructing the project – provided the details are nailed down in the DCO.

Appendix 5. In search of BOOM Power

The thousands of pages in the East Yorkshire application are curiously reticent about the projected power rating of their solar farm – beyond endlessly repeating "more than 50 MW." But there are hints.

We know for certain that the Export power will not exceed 400 MW because of the agreement with National Grid (Grid Connection Statement, [APP/7.4, 2.1.2]).

There are numerous mentions of an anticipated Export Power figure of around 400 MW (Covering Letter [APP-001], Scoping Report [ES APP/6.2/Appendix 1-1], Consultation Reports [APP/5.1, 1.3.2, 1.3.8, 2.2.2], Draft SoCC [APP/5.2, 1.3.1]). Apparently, this will power either *approximately 147,222 homes per annum* (Planning Statement [APP/7.2, 5.3.2]) or *approximately 100,000 homes* (Draft SoCC).[18]

Intriguingly, Climate Change [ES, APP/6.1] mentions a *capacity of 480MW (megawatts) oversized AC peak* [6.4.1] and *rated at 480MWp (megawatts peak) oversized AC peak* [6.4.5].[19]
It's not clear what "oversized AC peak" could mean. If this is "480MW (AC) from the undersized inverters" then this implies a lot of power (480 – 400 = 80 MW) going to heating the grid corridor. Alternatively, it might mean 840 MW (DC) going into the inverters, which could loosely be described as the oversized end of the inverters. If the latter, 480MW would be the Installed Capacity.

The only explicit mention of "installed capacity" is in the Planning Statement [APP/7.2, 5.3.2], where the declared 400 MW is based on the Indicative Layout [APP/6.3/Fig2-3]. The Indicative Site Layout drawing is certainly the definitive document for calculating installed capacity. However, it goes on to equate this to 15.9 TWh over the scheme lifetime, which is the same value equated from 480 MW in Climate Change. So, the "installed capacity" here might be a misstatement of "export capacity" or more loosely "scheme capacity."

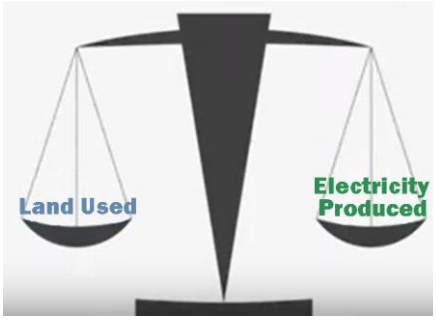
.

[18] If you know GCSE Physics, you know that this proposal will not **power** a single home. I have a single home. It is powered by EVO Energy. It is "powered" because EVO satisfies my electricity demand profile 24/7. Over a 12-month period, this proposal may (or may not) supply the **energy** consumed by 100,000 or 147,222 homes over 12 months. TV reporters and PR consultants do not need to know the difference between power and energy. [redacted].

[19] A paragraph based on the 480 MW from Climate Change is also repeated six times in statements of compliance to EN-1 in the Planning Statement [APP/7.2].

Appendix 6. Solar Farm Performance Metrics

Extensive land use is the overwhelming **Local Impact** of solar farm developments.



The government's expectation [EN-3 (2024), 2.10.17] of 2–4 acres per MW seems a little optimistic, even for Installed Capacity. Shotwick (72 MW installed, 220 acres) is one of the best at 3 acres per MW. But establishing a metric for this is certainly a step in the right direction.

An example **power density** table in kilowatts per hectare is shown below for active farms selected from the DESNZ Renewables Energy Planning Database plus three NSIPs. This is an informative but coarse comparison. It is not always easy to isolate 'solar' area (withing a scheme boundary) from land that remains in public/agricultural use. Also, this does not distinguish between contiguous developments and the impact of those that have fields spread over a wider area. (This example table was put together quickly – there are certainly mistakes. Note: because of the unusual [and ecologically harmful] East-West configuration at Cleve Hill, the effective kW/Ha value will likely be one third lower than calculated.)

A more accurate metric would use Export Power data, which would account for under-sizing (overplanting) and other losses. However, this information is rarely available.

The 'perfect' metric for solar farm comparison would be **energy density** (GWh/yr/Ha). Power is important for specifying components in the electrical chain, but what happens (or does not happen) on a summer midday gives only an indication of the farm's energy contribution to the grid. It should be easy to obtain recorded data for existing farms.

For solar farm proposals, the simulation packages used by developers do an excellent job of predicting annual energy figures based on a preliminary site layout [e.g. APP-138], considering self-shading, azimuth, latitude, meteorological records, etc. BOOM should have this information to hand.

Nevertheless, the Inspectorate may prefer **power density** based on installed capacity, as this is the government's declared metric [EN-3 (2024), 2.10.17].

active	Development	Installed Capacity	Land Used	kW/Ha
2016	Shotwick	72 MW	220 acres	808
2016	Owls Hatch Road	48 MW	212 acres	559
2021	The Grange	49.9 MW	207 acres	595
2023	Litchardon Cross	49.9 MW	63 Ha	792
2023	Larks Green	49.9 MW	106 Ha	471
2024?	Cleve Hill (NSIP)	373 MW	403 Ha	926
2025?	Longfield (NSIP)	400 MW	453 Ha	883
2027?	East Yorkshire (NSIP)	400 MW	1168 Ha	342