Submission by Mallard Pass Action Group (MPAG)
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Appendix 1
Disadvantage of MPSF not having a BESS

Disadvantages of Mallard Pass Solar Farm not having a Battery Energy Storage System (BESS)

1.1 The Applicant has made it clear that the Proposed Development could not have a BESS and that renders the proposed development sub-optimal.

1.2. It is the view of MPAG (and others) that without a co-located BESS the **value** of the Proposed Development would be **significantly reduced**. The need for a co-located BESS is supported by NPS policy, technical experts and the developers of other large solar farms all of which will have a BESS, as outlined by Sunnica's Statement of Need Table 10.1.

1.3. **NPS EN-1** para 2.2.27. *"Storage is needed to reduce the costs of the electricity system and increase reliability by storing surplus electricity in times of low demand to provide electricity when demand is higher. Storage can provide various services, locally and at the national level. These include maximising the usable output from intermittent low carbon generation (e.g. solar and wind), reducing the total amount of generation capacity needed on the system; providing a range of balancing services to the NETSO and Distribution Network Operators (DNOs) to help operate the system; and reducing constraints on the networks, helping to defer or avoid the need for costly network upgrades as demand increases."*

1.4 NPS EN-3 Para 3.10.17 states "*Where sited on agricultural land, consideration may be given as to whether the proposal allows for continued agricultural use and/or can be co-located with other functions (for example, onshore wind generation, or storage) to maximise the efficiency of land use."*

1.5 The **Ryhall sub-station** has been put forward by the Applicant as a key determinant for the location of the Proposed Development. However, it has a fundamental weakness in that it has no import connection from the Grid. Thus it is **not able to support a BESS**, impacting seriously on the viability of the Proposed Development as a fully functional supplier to the National Grid.

1.6 "*There are substantial benefits to the co-location of solar and storage generation facilities which will result in an improved contribution to **low carbon** UK electricity supplies when compared to a scheme coming forward independent of the storage*." (Statement of Need Cottam para 11.5.18)

1.7 **Co-location** is especially **beneficial for NGESO** (National Grid Electricity System Operator) where connections are to the transmission, rather than to the distribution network, because the combined asset is required to meet certain energy market operational planning, notification and service obligations. (Statement of Need Sunnica para 10.4.13)

1.8 In the Statement of Need paragraph 11.5.1 the Applicant writes "*In the absence of electricity storage facilities, the Proposed Development's overplanting strategy (see Section 7.7) seeks to maximise use of the grid connection capacity through its operational life".* This confirms that the Applicant considers there to be a link between the lack of a BESS and overplanting.
The Proposed Development needs to overplant so that in periods of low irradiance and therefore low output per panel, the grid can, at least to some extent, be supplied.

1.9 When Grid operators have to **curtail power generation**, **power is lost** without a BESS co-located on the same site to store the curtailed power. As more solar plants come into service and as maximum solar power production takes place during the summer when demand is low,

curtailment is likely to occur more frequently rendering the proposed development less efficient as the years go by..
1.10 The land take could be larger as more panels (overplanting) will be required to supply the Grid when light levels are low and, normally, when demand for power is high. This demand would normally be met by power already saved in a BESS, thus negating the need for the overplanting of solar panels for this purpose, and avoiding the need for excessive land take.

1.11 The excess number of panels would produce power during periods of high light levels exceeding inverter capacity thereby causing clipping. Without a co-located BESS the clipped power is lost thereby wasting power and the land taken up by the panels producing that power.

1.12 Including a BESS in a solar project is expensive. Given the safety concerns of lithium-ion batteries, it is also very controversial with developers having to justify the importance of a BESS against local opposition. It follows therefore that IF developers did not consider a BESS as being essential, they would not have been included in all other similar developments to that of the Proposed Development.

1.13 The benefit of having a BESS is quantified in Burton Gate ES Chapter 6 Climate Change. Note that the advisers to Gate Burton include Pinsent Masons and Mr Gillett, both acting for the Applicant and many of the other solar farm NSIPs.

1.13.1 Para 6.10.34 *"Use of the battery energy storage system provides additional carbon saving opportunities. Relatively fast response power sources such as battery storage have an important role to play in helping to balance supply and demand within the electricity grid. This grid balancing function is often performed using high-carbon intensity power sources such as open cycle gas turbines (OCGT), so the use of a battery charged from solar PV generation can deliver a direct carbon saving relative to an OCGT."*

1.13.2 Para 6.10.35 *"Should the BESS be charged from the Scheme, and discharged back into the grid once each day, at a typical round trip efficiency of 85% and an overall lifetime degradation rate of 80%, it will be able to supply 7,446,000 MWh to the electricity grid over its 60 year operational lifetime."*

"As the operational carbon intensity of the Scheme is 0.016 tCO_2e/MWh and the comparable figure for an OCGT is 0.460 tCO_2e/MWh, the use of the BESS for grid balancing purposes would deliver a saving of 3.3 million tonnes CO_2e over its operational lifetime. The ***overall carbon reduction*** *when the BESS is used for a daily charge-discharge cycle as described here is around 10.3 million tonnes CO_2e, or over* ***1.1 million tonnes CO_2e higher*** *than if the entire output of the Scheme is supplied to the grid without the use of a BESS."*

1.13.3 Para 6.10.36 *"The* ***BESS can also be used for additional grid balancing purposes*** *independent of the solar PV element of the Scheme, charging the battery from the grid overnight during periods of low demand and feeding it back when demand increases in the morning."*

1.13.4 Para 6.10.37 *"All of these figures are inevitably subject to a degree of uncertainty, but they illustrate the fact that the use of the battery system, when used for grid balancing purposes, is likely to result in significant additional carbon savings over its operational lifetime. These* ***additional carbon savings from use of the BESS*** *for grid balancing are not factored into the overall GHG assessment ….."*

1.14 The Statement of Needs for Longfield, Cleve Hill, Sunnica, Gate Burton and Cottam, all of which supported the need for a BESS, were all written by the same advisor to the Applicant, Mr Gillett. There seems an inconsistency between the Statement of Need for the Proposed Development written by Mr Gillett and all the other solar farms – the main difference being Mallard Pass Solar Farm has no BESS and his attempts to try and justify the viability of this scheme.

1.15 Table 10.1 from Sunnica's Statement of Need summarises the many benefits of co-located BESS. This table is also used in Gate Burton's, Cottam's, Longfield's, West Burton's, Cleve Hill's and other solar farm applications.

Table 10-1: The potential contributions of a storage asset within the Scheme to the GB electricity market, including ancillary service provision. [Author analysis]

Service	Explanation	Applicability
Trading	Selling energy at market prices	The backbone of renewable generation asset investment cases. Storage reduces energy market risk as output can be directed from lower-price to higher-price periods. This helps reduce curtailment of otherwise useful low-carbon generation, and provides additional revenues to the asset.
Balancing Mechanism	Being available to NGESO to balance supply and demand at delivery	Renewable generators can provide downward flexibility, but at the "cost" of carbon-free energy. Renewables plus storage both provide upward and downward flexibility, potentially without 'losing' any low-carbon energy. This can be dispatched over varying timeframes, from milliseconds to hours, depending on available technology.
Frequency Response	Changing output minute by minute to help maintain system frequency at the statutory level of 50Hz	
Reserve Operation	Changing output over minutes and hours to rebalance supply and demand following a fault or other unforeseen event on the electricity system	
Reactive Power	Locational service which allows power to "flow" from source to destination	A mandatory service for all transmission-connected assets, delivered by renewable and/or storage assets as part of the DC to AC conversion.
Inertia	A service which helps slow the rate of change of the whole electricity system in response to an unforeseen event, stopping critical faults from occurring.	Inverters installed on solar sites are able to provide synthetic inertia, storage devices are also capable of this provision. Both will be important as the traditional sources of inertia (large fossil fuelled assets) close prior to 2025.
Black Start	A locational service which would help 'turn back on the lights' if an event caused the national electricity system to fail	Solar alone is not capable of providing Black Start services, but standalone storage is. Co-located renewable generation plus storage may be able to provide a more robust Black Start service than standalone storage.
Constraint Management	Changing output in response to local energy supply, demand and transport issues, to ensure locational adequacy at all timescales.	Solar can provide important downward constraint management services, and solar plus storage can provide services in both directions. Because of its proposed connection location, The Scheme will be highly unlikely to cause constraints on the local NETS.
Infrastructure Costs	By connecting generating assets where they are needed, less electricity transmission and distribution infrastructure needs to be built out, making national savings for electricity users	Renewable generation and electricity storage can help with reducing new infrastructure requirements, although their benefits may be higher if co-located than if located separately.

1.16 In Applicant' Response to IP's Deadline 5 submissions SWQ1.1.1 the Applicant stated *"The Appendix provided by Mallard Pass Action Group, appears to suggest that because the need for BESS has been demonstrated for other projects which have the capability to co-locate with BESS, the Proposed Development is somehow "**worthless**" (their emphasis) because it is not proposed to be developed with BESS. This argument does not hold water. "*

1.17 MPAG has never maintained that the Proposed Development is *worthless* however we would describe it as distinctly *"sub-optimal"* given the limitations of the existing 400KV Ryhall substation. Given the likely relaxation of on -shore wind planning regulations recently announced, putting aside all the other in-combination effects of this scheme, an on-shore wind farm could generate the same energy at periods when it is more likely to be needed, is 3 times more efficient than solar and so would take a fraction of the space and would allow for arable farming to continue on probably 95% of the Order Limits.