

## Battery Energy Storage – Sequential Site Selection Process

The applicant is a developer of Battery Energy Storage Sites (BESS) across the UK. They follow the sequential site selection process described within this document to identify and secure sites.

There is only a limited number of sites suitable for such developments within the UK and this is primarily driven by availability of connections to the grid network at a viable cost, and secondarily by environmental, planning, technical and deliverability factors.

### Site Requirements

The technical requirements for a battery energy storage sites are the following:

- At least 2 acres in size to accommodate the batteries, ancillary equipment, substation and access;
- Ability to connect to the distribution or transmission network. This is limited to the 33kV, 66kV, 132kV and transmission level voltages. The lower voltage networks are not suitable for accommodating the connection of projects being pursued by the applicant due to capacity ratings. The volume of grid infrastructure decreases as you proceed up the voltage levels, 400v & 11kV are the most abundant supplying homes and businesses and 66Kv, 132Kv and transmission voltages the scariest. The lower volume of higher voltage networks suitable for such projects to connect to reduces the potential search areas;
- Close proximity to the substation or point of connection to ensure less electrical loss and greater efficiency (losses are a function of distance). Also, within an economically viable distance of the point of connection. It is not possible to run overhead lines or buried cables for several kilometers from the point of connection, beyond 750m to 1000m this will generally make the project unviable as the connection costs become too high.
- Not requiring significant grid network reinforcements to accommodate the connection. Any reinforcements to accommodate the connection are paid for by the applicant and significant reinforcement costs make projects financially unviable.

### Grid capacity- Primary site selection factor

The UK has two levels of electricity network. The Transmission network is operated by National Grid and operates at the highest voltages and moves electricity around the UK. The second is the distribution which provides power within regions to business and homes.

Traditionally power was generated by large fossil fuel generators connected at transmission level and electricity would be fed down to the distribution network and into businesses and homes. The network in UK was designed to operate in this manner.

Over the last decade the operation of the grid network has changed with the deployment of growing volumes of renewable energy which is connected to the distribution network. This network only has certain points where such connections can be made without the need for significant reinforcements which make a project economically unviable.

Transmission connections are only suitable for very large projects due to the cost of connection to the grid network. The projects being developed by the applicant are intermediate in scale and suitable for connection to the distribution network.

The rapid deployment of distributed generation has meant that many parts of the distribution networks and entire regions have no capacity available for further connections without significant reinforcement with long lead times and high costs.

The UK network is operated by 8 DNOs within different regions. This project is located with the UKPN Power Networks (UKPN) eastern footprint. There has been an explosion in distributed generation connecting to the grid since 2010 across all the DNO areas and they are all experiencing significant constraints to allowing new connections to their networks.

Due to its location, UK Power Networks has had a huge volume of solar and wind based projects connect in their footprint, along with large numbers of peaking generation (Gas & Diesel plants). The volume of distributed generation connected to their network has restricted the volume of new connections which can be offered without significant and costly upgrades which must be funded by the applicants.

The DNO network has a number of factors that restrict the ability to export generation to their network along with obtaining import for charging, including, but not limited to, transformer sizes, conductor size and physical location-based constraints, along with the relative rural nature of large parts of their network. The outcome of these constraints is that it is not always possible to create new Battery Energy Storage Systems (BESS) on the best land from a planning and impact perspective as the local network is often unable to facilitate additional connections.

The nature of energy storage systems means that they have additional constraints that some other generators do not have. With a solar farm, you need to be able to secure a connection that allows you to export your power to the grid. With a BESS you need not only the export connection, but also a matching import connection to allow you to charge the battery. This additional constraint heavily reduces the suitable sites that are able to support new BESS sites across this area.

To select sites, the applicant spends a huge amount of time engaging with DNOs and particularly UKPN through connection surgeries, use of mapping and other resource published by the DNOs to discover where capacity is available. Once the capacity is identified, land needs to secure land that is available for rent, but also close enough to the capacity to make the scheme financially viable.

The network is highly integrated and the acceptance of a connection offer on one part of the network can remove capacity identified within other areas. As applicants are not aware of other peoples grid connection applications, even when capacity is identified it can soon be lost due to other activity on the grid network.

As explained above the applicant will priorities grid connection possibilities as the primary driver for site selection as this is the biggest restriction in identifying new projects. In summary sites are identified by:

- Identifying the location of the existing grid network which would have the potential to allow connection of projects being pursued by the applicant. This is limited to the 33kV, 66kV, 132kV and transmission level voltages
- Identifying parts of the network with available grid connection capacity without significant reinforcement works through use of DNO mapping, DNO resources and connection surgeries with the network operators.

- Identifying a search area around the point of connection which would give a viable total grid connection cost.

### Site Selection Process – Post grid capacity identification

Once the applicant has identified areas with suitable grid connection prospects the applicant will review all land parcels within a 1km cable route of the point of connection. The identified sites will then be screened against the following criteria to determine suitability for development and potential to cause unacceptable impact to any of the following;

- In close proximity to the point of connection identified within the grid offer issued by the network operator to minimize losses;
- Outside of an area at risk of flooding;
- Not within areas of statutory and ecological importance;
- Suitable access for construction and operation;
- Available for development and a landowner willing to lease their land for the life of the development;
- Level site to limit the requirement for earthworks;
- Outside of Landscape designations (AONB, etc.) with acceptable levels of Landscape & Visual impact
- Not within areas of Heritage designations
- Not designated or promoted for competing land uses of higher value.

The final step in the process is to assess the potential grid connection cable route back to the anticipated point of connection to the grid network. This assessment looks at any obstacles for cable route (above and/or below ground). The applicant will look to avoid the following if possible:

- Railway crossings
- Motorway/dual carriage ways
- River crossings
- Requirement to cross designated area (ecology, heritage, etc.)
- Crossing utilities (gas, water, sewers, etc.)

Ideally the cable route would avoid all of the above and be within the public highway or cross land owned by the landowner the applicant is working with. The applicant will also look to engage with 3<sup>rd</sup> party land owners if required to connect a project to the grid network.

Following identification of grid capacity and screening of sites for planning, environmental and deliverability restrictions, landowners of the identified parcels are contacted to assess their desire to host a battery energy storage site.

Battery Energy Storage is competing with other land uses. The income from a battery energy storage site is significantly lower than commercial or residential development and so cannot compete with these land uses. Brownfield sites would be sought as a preference, but these have much higher value generation potential and often battery energy storage cannot compete.

Around a particular point of connection there may be several suitable sites from a technical and environmental perspective, but these are not available due to landowner interest and competing land uses.

The response rate from landowners approached is approximately 5-10% and of this, 1-2% of sites will progress.

## Site Selection – Grid Application

Once the applicant has engaged with the landowner of a suitable land parcel they will make an application to the Distribution or Transmission network operator to connect the project to the grid. The network operator will then issue a connection offer for connection. Of the issued offers received by the applicant approximately one third are suitable to progress.

The applicant has made a grid application to UKPN and has received an offer to connect 49.9MW of battery energy storage capacity to the distribution network on to the overhead line which crosses the site. The applicant has accepted and secured the connection capacity.

The applicant followed the above process in identifying and securing the site. The site secured here is the optimum site from a technical perspective as it is adjacent to the point of connection at the with no need for long and disruptive cable routes.

### Why is capacity available in Green Belt?

The applicant has made this application within the Green Belt as available capacity has been identified at this location.

Capacity is available at this location due to:

- Capacity not utilized by solar or other generators due to Green Belt designation which have a large footprint and scale.
- In a region of historic industry which required high levels of demand/import electricity connections. This means the network operator has significant infrastructure within the area.
- The network was not designed to have large demand/import connections in rural areas beyond the urban and urban fringe areas.
- Grid interfaces and substations are generally located on the fringe of urban areas where electricity demand is highest.

### Summary

As explained above there are many considerations to be considered when identifying and securing a site for development of a battery energy storage project. This is primarily driven by the ability and costs of connecting to the grid network and secondarily by the local site-specific constraints relating to environmental, technical and deliverability factors.

The site at Says Court meets all of the site selection criteria and offer great potential to connect battery energy storage to the network and further the deployment of renewable energy.

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