Staythorpe Grid Supply Point- Explanatory Note

The following brief note explains;

1. the background to the installation of an additional ie 3rd Supergrid Transformer (SGT) at Staythorpe GSP with reference to previously shared National Grid Electricity Distribution (NGED) Distribution Network Options Assessment entry;
2. why completion of these works is favourable but is by no means essential for the future operation of Longhedge Solar Farm.

Staythorpe GSP – 3rd Supergrid Transformer

NGED's DNOA sets out an overview and brief rationale for its plans for flexible operation and infrastructure reinforcement across its four distribution networks. The text from the NGED DNOA entry for Staythorpe GSP[1] is pasted in below;

> Constraint description
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> Staythorpe Grid Supply Point (has two Super Grid Transformers each rated at 240 MVA. The group demand is approaching this rating and is projected to exceed it in the near future. At this point there will be an N-1 constraint at Staythorpe GSP (loss of one of the SGTs).
>
> Justification for decision
>
> Reinforcement works are being progressed. Flexibility will be utilised as required to manage the constraint in the interim.
>
> Reinforcement description
>
> The proposed solution is to install an additional SGT at Staythorpe."

In order to properly understand the above, the term "N-1" has to be explained. "N-1" is an informal electricity network term used to describe foreseeable operating conditions in which a single circuit is temporarily removed from operation. This is usually as a result of a planned outage to temporarily take a circuit out of service for maintenance purposes or it may arise as a result of a system fault. The "N" in N-1 is an abbreviation for normal, as in normal operating conditions.

N-1 conditions is a scenario used by electricity network companies in longer term planning of their system in order to maintain network redundancy. In layman's terms they plan the network in a way that allows them to keep the lights on during periods of network outage. It does not mean that a network asset will be physically removed altogether. See footnote 1 at bottom of page 4 of the attached electricity networks association document for their brief description of N-1.

[1] https://www.nationalgrid.co.uk/downloads-view-reciteme/658613

The “N-1 constraint” above referred to by NGED above describes a scenario in which one of the two SGTs is out of operation. In this scenario they will procure “Flexibility” services from generators connected in the Staythorpe GSP group to maintain supply of electricity to customers until the SGT can be returned to service. The enduring solution to the problem is to install a new SGT at Staythorpe.

The completion of the “additional SGT” at Staythorpe will mean that there will be 3 SGTs installed and operational by the end of October 2030. At this point, the reverse power capability of the Staythorpe GSP will be significantly increased thereby significantly reducing the need to curtail the operation of currently contracted generators through the use of the Staythorpe Transmission Active Network Management (TANM) scheme.

Transmission Active Network Management Scheme

The purpose of the TANM scheme is to manage reverse power flow through the Staythorpe GSPs during periods of peak generation output across the relevant section of their distribution network such that it does not exceed limits agreed with National Grid Electricity Transmission. Such conditions usually arise during periods of very low electricity consumption and / or very high distribution connected generation and / or reduced operational availability of connected infrastructure e.g. an SGT being taken out of service for maintenance.

TANM schemes are now commonplace as a network flexibility tool that enable optimised use of existing electricity transmission infrastructure. It has become routine for developers to accept ANM schemes in new generator connections.

Developers are able to forecast the impact of ANM schemes on solar farm operation through detailed network studies taking into account local electricity demand behaviour, typical electricity generation patterns and planned electricity network reinforcement. This is necessary in order to confirm that a solar farm’s forecast electricity generation will make the project economically viable. A solar farm with forecast excessive ANM driven constraint or risk of excessive ANM driven constraint simply would not go ahead.

Longhedge Grid Connection Solution

At the time of acquisition of the Longhedge Solar Farm, it was clear a Transmission Active Network Management (TANM) scheme linked to the operation of the existing SGTs in the Staythorpe GSP would be in effect. It was also clear that, at that time, NGED had yet to commit to investing in the installation of a 3rd SGT at Staythorpe GSP. The curtailment effect of the ANM scheme in the absence of the 3rd SGT was studied and, even without the new SGT, was considered tolerable to overall project economics.

Staythorpe GSP- Key Conclusions

The key conclusion from this note are;

1. **The likely curtailment effect of a TANM scheme at Staythorpe GSP has been understood from the outset, well before plans for an additional (3rd) SGT at Staythorpe had been made by NGED;**

2. **NGED have now committed to install an additional (3rd) SGT at Staythorpe GSP. This will significantly increase the reverse powerflow capability at Staythorpe and will significantly reduce the likelihood of curtailment via the TANM scheme.**

3. **If NGED were to change its plans to install the additional (3rd) SGT at Staythorpe GSP (highly unlikely given the needs case for such investment), we would continue to deliver the Longhedge Solar Farm because we are comfortable with the likely operational curtailment that would be imposed by the TANM scheme. The additional (3rd) SGT at Staythorpe GSP is therefore not relevant to the justification for the Longhedge Solar Farm.**

P. Smart

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