



Accelerating your journey to Net Zero

Blake Clough Consulting is a specialist energy consultancy with a focus on the electricity networks. We cover a range of areas relating to power systems analysis, feasibility studies, project engineering, innovation, regulation and technical strategy, with a strong emphasis on our customer relationships.

We are passionate about the decarbonisation of the energy system and the transition to "Net Zero" and aim to support our clients to accelerate this change as effectively as possible, whether that be local authorities, large network companies, or private developers.

Our work is underpinned by solid analysis and modelling, including techno-economic assessment, cost benefit analysis, power systems analysis and network modelling.

We carry out detailed in-house studies to model the curtailment of both distribution and transmission-connected projects, covering the full range of curtailment schemes.

We conduct inhouse studies using Python and Excel tools to provide an independent assessment using realistic assumptions. Our studies provide realistic estimates for the curtailment expected across all types of curtailment schemes and technologies, including multi-site projects.

We are flexible to client needs and can further provide bespoke solutions, if requested, such as considering Future Energy Scenarios (FES), analysing the sensitivity of drop-out rates for projects connected ahead in the queue, Monte-Carlo analysis, or anything else at the request of the client.

In recent years, there has been a substantial increase in distributed Renewable Energy Sources (RES) connected to the grid, causing grid congestion and the curtailment of generators and storage systems. Traditionally, tripping has been used and still is for many projects. However, in order to achieve greater utilisation of network assets and to avoid costly and time-consuming network reinforcement, Network Operators (NOs) have been implementing Generation Management Schemes such as Active Network Management (ANM), Load Management Scheme (LMS), Generator Export Management Scheme (GEMS) or the new National Grid Electricity System Operator (NGESO) Accelerating Storage Scheme. These schemes all follow the fundamental principle of monitoring constrained network assets and curtailing generators at peak times. The scale of the subsequent curtailment has the potential to significantly impact the financial viability of a project. Therefore robust methodologies for quantifying the expected curtailment levels are required so that developers can make informed investment decisions.

The transmission system is oversubscribed with directly connecting and embedded projects, leading to high expected curtailment in many areas of the Great Britain (GB) transmission network. Yet little guidance is given within transmission offers regarding the expected level of curtailment.

From 1st April 2023, the DNOs in GB have collectively introduced a new common calculation methodology for the RIIO-ED2 price control period. This Ofgem-approved methodology introduces several new underlying assumptions which uniformly result in an overestimation of the likely future curtailment that will be seen by each new generator. Amongst others, these assumptions include a year-round 100% export from existing Battery Storage (BESS) projects. Given that most BESS systems are only capable of exporting for 4 hours a day, this assumption has a very large impact on the accuracy and usefulness of the figures calculated by the DNOs.

We conduct inhouse studies using Python and Excel tools to provide an independent assessment using realistic assumptions. These studies use our database of previously acquired historic outage data to estimate real-world outage rates, meteorological data to predict wind and solar generation profiles, linear programming to model the price arbitrage operation of BESS, as well as various other resources both public and internal. As a result, our studies provide realistic estimates for the curtailment expected across all types of curtailment schemes and technologies, including multi-site projects.

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Geocore Ltd appointed Blake Clough Consulting to conduct a full Curtailment Analysis, resulting in the successful removal of ramp rate restrictions.



This project is subject to an Active Network Management scheme, which is a scheme Distribution Network Operators (DNO) use to avoid overloading of their distribution networks. A ramp-rate limit applies as part of the ANM scheme. The project is also subject to a Load Management Scheme. According to the special conditions outlined in Appendix F, if any of the relevant circuits/transformers become unavailable due to outages, the customer will be disconnected if the remaining relevant circuits/transformers become overloaded. Half-hourly data was received to enable a detailed evaluation of the curtailment risks in the event of a planned outage.

A full curtailment analysis was provided using our inhouse Python tools, Excel tools, and DlgSILENT PowerFactory modelling. This analysis took into account the half-hourly import/export data that was received from NGENSO, enabling a more accurate calculation of the likelihood that the BESS will experience curtailment when an outage diminishes the available network capacity. Historic outage data was also provided for 2018–2022. Overlapping outages were either removed or reduced to count only non-overlapping outage times. There were also a large number of reinforcement works on the network which increased the past unavailability of the constraints and were taken into account in the analysis.

It was found that the curtailment for the project was driven primarily by the ramp rate restrictions and by the load management scheme. After extensive discussions with the network operator, we were able to convince them to remove the ramp rate restriction, thereby decreasing the expected curtailment of dynamic frequency service revenue from over 90% to almost zero.

Apatura Energy - 500MW BESS

This project was subject to an inter-trip on multiple constrained assets. These assets were not yet built, so historic outage data was not available. Using in-house and publicly available data, we assessed the outage rate for the project. However, the project was fed by two transformers, which only resulted in a partial loss of entry capacity in the event of any outages. To accurately reflect the non-linear impact of entry capacity reductions, we performed a revenue optimisation in Python comparing the constrained and un-constrained scenarios to feed into a more realistic estimate on the total revenue curtailment expected for the project.

Stark Energy - 20MW Solar

This report focussed on the potential limitations on power output imposed by the active network management (ANM) scheme, and evaluated the estimated curtailment percentage of the solar farm. We evaluated the validity of the DNO's report and curtailment value, while also using an inhouse Excel tool to offer an independent, high-level assessment of the anticipated curtailment. Based on these analyses, recommendations were provided on how to proceed with the project.

Blake Clough has provided excellent service and a very high standard of work for grif offer due diligence and curtailment analysis projects. The team provides their outputs in a timely manner and responds to our queries efficiently, which adds great value to our decision-making processes and the delivery of our projects.

They have an excellent and up to date knowledge of grid connections, grid regulation, charging, and curtailment and we look forward to continuing our relationship.

Billy Pople - Atlantic Green

BSR Energy - 50MW Solar & 100MW BESS

Outage conditions were provided in the "Alternative Connection Offer" document received by the DNO as follows:

- Planned or unplanned outage of the 132kV circuits.
- Curtailment resulting from the Category B distribution ANM (DANM) scheme.
- Running arrangements resulting in three SGTs at the GSP being connected in parallel.
- Running arrangements where all in-service SGTs at the GSP are connected to the same bar, including when either SGT is offline.
- Curtailment resulting from the transmission ANM (TANM) scheme.

This study analysed the historic data provided by NGENSO and provided an assessment taking into account transformer maintenance, transformer failure rates, circuit failure rates and new connections.

Additionally, Python tools in combination with DlgSILENT modelling were used to predict the curtailment resulting from the TANM and DANM schemes.

