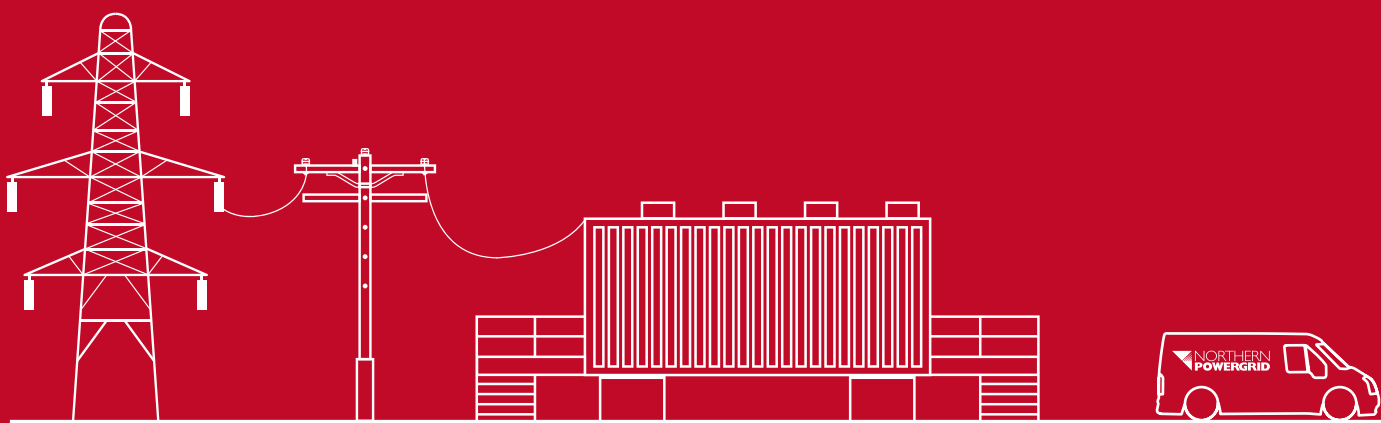


Connections Case Studies

LARGE SCALE ENERGY STORAGE CONNECTIONS



Installing a 2.5MW (5MWh) storage battery



📷 We installed a 2.5MW (5MWh) storage battery on our network in Rise Carr in Darlington.

As part of our Customer-Led Network Revolution (CLNR) smart grid innovation project we installed a 2.5MW (5MWh) battery on to the Northern Powergrid electricity distribution network at Rise Carr in Darlington.

Although this work was done on behalf of our innovation team, we followed exactly the same process that any other connection would.

The connection process for storage is similar to a generator of equal capacity. We submitted a formal application to our connections team, who performed a minimum information check on the application data submitted. One of our commercial engineers supplied some initial budget optioneering information to allow the innovation team to review the feasibility and viability of the project.

Following confirmation from the innovation team that the project was feasible, our design team set about the detailed design work. This involved a comprehensive network assessment to check that the network could accommodate both the demand and the output of a battery of this size (plus the swing from one to the other) and identifying the overall least cost technically acceptable solution.

The study activities involved assessing whether the network would be large enough:

- to transport the energy in and out (thermal rating);
- to stop energy output of the battery itself causing the voltage of the network to rise too much (voltage rise);
- to ensure the current flow in the event of a fault does not exceed existing network switchgear ratings and;
- to ensure when the battery moves from exporting energy to importing, or vice versa, it does not cause voltage quality issues (voltage step change).

In this case, the existing Northern Powergrid network at the proposed location could accommodate the battery and a connection offer was made to our innovation team on that basis. The connection was made to an existing circuit breaker on the 6kV board at Rise Carr 33/6kV primary substation. The point of connection was the 6kV metering circuit breaker.

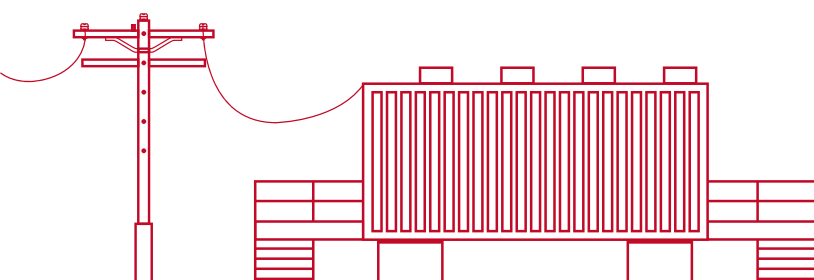
OUR ENGINEERS



Our commercial engineers will work with customers to understand the feasibility of planned connections projects. All larger HV and EHV, 33kV/66kV and 132kV connections are bespoke and individually designed. If you are considering a large storage installation, then we are happy to have upfront conversations to help you understand your connection options as early as possible.

Contact details for all our design and commercial engineers, including the areas they are responsible for are available on our website.

www.nothernpowergrid.com/get-connected



Estimated timescale and costs for delivery:

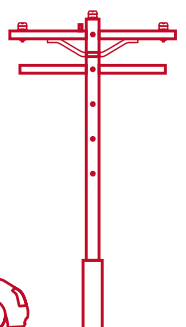
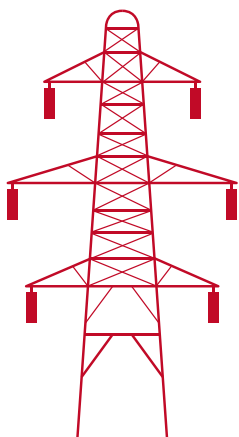
Typically connections of this size are in the region of £250k for an installation close to the network to which it will connect. This might rise to around £400k for a connection to a network one kilometre from our network and more for longer connections.

The project delivery timescales for this type of HV work are estimated to be in the region of 6-12 months. Whilst we will always work with our customers' project team to coordinate the delivery of the work activities in the timeliest manner, the overall delivery time is dependent on the following;

- plant procurement lead times;
- network outages;
- any third party interactions with National Grid and any Independent Connections Providers (ICPs) and Independent Distribution Network Operators (IDNOs);
- planning approvals and;
- wayleaves required from other landowners or authorities.

It should be noted that this was a HV connection. As the storage size goes beyond 3MW it is likely that an EHV connection would be required, which would increase the timescales for delivery to typically 18-24 months. Costs would also rise significantly, and there would be greater volatility between inexpensive and expensive locations to connect.

As a relatively simple project, the connection was substantially completed within six months, although finally commissioning was delayed until the battery installation was ready to receive supply.



The business case for installing a large-scale storage device



The business case for network connected storage relies on both technical and commercial aspects.

Technical

The 2.5MW (5MWh) energy storage battery we installed has been used to:

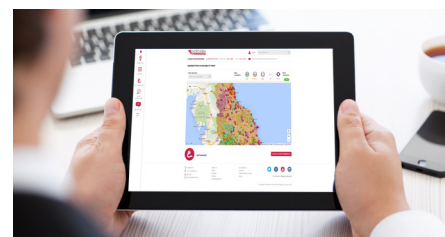
- support local load;
- support local voltage;
- offer ancillary services, specifically frequency support to NGET

It also has the potential to offer reactive power (VAr) provision or consumption to NGET though this would depend to some extent on the network to which it is connected. Energy storage of course also opens the possibility of energy price arbitrage.

Commercial

At present the only service for which there is a market in the Northern Powergrid area is the provision services to NGET. This is likely to change in future and local services are likely to be purchased by the distribution system operator.

The viability of energy price arbitrage will depend on the relative prices across a time period; the round trip efficiency of storage across that same time period and any taxes or levies paid by the storage operator. Changes in energy production and use may make electricity prices more volatile, which would make arbitrage more viable and different storage technologies may perhaps provide a different balance of response time and round trip efficiency.



Our generation availability heat map can help you identify areas of our network with the capacity to accommodate storage www.northernpowergrid.com/generation-availability-map

Useful resources

- More information is available at: www.northernpowergrid.com/energy-storage-projects
- If you are connecting energy storage to our network Northern Powergrid want to help, find out more, including how to apply at: www.northernpowergrid.com/get-connected/energy-storage-projects
- Northern Powergrid's CLNR project was one of the UK's most influential smart grid demonstration projects and generated important new learning on technology deployment and customers' energy practices. There is a wealth of information and learning on installing and operating energy storage available at: www.networkrevolution.co.uk/network-trials/electrical-energy-storage/
- Watch a video produced for the CLNR project on energy storage deployment at: www.youtube.com/watch?v=IEhJVL45Rpg
- Learn about Northern Powergrid's innovation portfolio of projects at: www.northernpowergrid.com/innovation

NORTHERN POWERGRID CONNECTIONS CASE STUDIES

CONNECTIONS ENQUIRIES

 0800 011 3433

 getconnected@northernpowergrid.com



www.northernpowergrid.com

