

# Connections Case Studies

MULTIPLE, SMALL-SCALE STORAGE CONNECTIONS

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# Installing multiple small-scale storage devices



**As part of our Network Innovation Allowance (NIA) portfolio of innovation projects, Northern Powergrid, Moxia and Energise Barnsley have teamed up for a project that demonstrates how clusters of domestic energy storage devices could increase the available capacity on the electricity network and enable more homes and businesses to install solar panels.**

Smart batteries were installed in 40 homes in Barnsley and linked together as a virtual power plant in a study to show how this solution could reduce peak solar output onto electricity networks when there is low, local demand and potentially save customers millions in the costs of running the UK's power network. Although the work was carried out on behalf of our innovation team, we followed exactly the same process that any customer would when applying for a connection of this kind.

The connection process for storage is similar to a multiple G83 generator connection scheme of equal capacity. Individually each property must have an output capability of no more than 3.68kW

for a single phase connection or 11.04kW for a three phase connection counting all storage and generation at the property. Export limiting devices may be used to keep the property within this limit. The customer (in this case the homeowner or tenant) has a right to fit a mix of generation and storage as long as they remain within the limit, and any required reinforcement is our responsibility of Northern Powergrid, however;

- the customer must inform us of their installation intentions before it is installed;
- we would expect to indicate whether the installation causes technical issues (which may take up to 45 working days for up to 50 properties and 65 days for more than 50) prior to energisation of the generation; and
- if there are any issues energisation must not take place until we have undertaken the required work to address the issues.

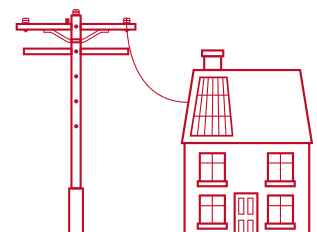
We therefore submitted a formal application to our connections team, who performed a minimum information check on the application data the customer submitted. Our design engineers undertook all the relevant studies and supplied initial information indicating whether the installation was acceptable. This involved a network assessment to check the network can accommodate both the total demand and the total output of the full proposed installation (plus the swing from one to the other) and identify any required reinforcement and the timescales to undertake this.

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Andy Heald, Director of Energise Barnsley said that they had only been able to install solar PV on two in three homes in the area planned because of existing grid constraints.

“Battery costs are falling rapidly and storage has huge potential to accelerate the national roll-out of solar and improve the lives of vulnerable people,” said Mr Heald. Some people with solar panels are saving up to 50% on their energy bills and he believes batteries could take this as high as 80%.

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The study activities involve assessing whether the network is large enough to:

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

Given that the purpose of the project was not to export energy but to produce, store and use energy within the home, the installations were acceptable. Following confirmation from that the project was feasible, our innovation team set about installing the battery and generation systems.

#### Estimated timescale and costs for delivery:

Reinforcement costs for mains cables and substation transformers for this type of connection are borne by Northern Powergrid. If the service cables to the customers properties need replaced, these costs are borne by the customer. If they are new properties then the costs for any reinforcement are apportioned in line with the normal practice for new properties, with the costs of any new dedicated assets for your development being borne in full by the customer.

If reinforcement work is required on the LV system then six to nine months may be required to arrange this. Large numbers of small scale storage units may require HV reinforcement and this could take 12 to 18 months.

Whilst we will always work with our customers 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; e.g. Independent Connections Providers (ICPs) and Independent Distribution Network Operators (IDNOs)
- planning approvals and;
- wayleaves required from other landowners or authorities.

**As a simple “connect on existing” project, no reinforcement was required in this instance. This will not be unusual for projects of this type.**



#### OUR ENGINEERS

Our engineers will work with our customers to understand the upfront feasibility of a project of this type. If you are planning on installing multiple storage units the project would be bespoke and individually designed. We are happy to get involved and 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](http://www.nothernpowergrid.com/get-connected)

# The business case for installing multiple small scale storage devices

**The business case for domestic storage relies on both technical and commercial aspects.**

## Technical

Small scale batteries can be used to:

- support local load or minimise the export of local generation;
- support local voltage, either by raising or lowering the voltage;
- offer ancillary services, specifically frequency support, to National Grid Electricity Transmission (NGET)
- capture domestic generation, typically solar/PV, within the home until it can be used.

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. Because the battery exists on the customer's side of the meter, any generation, such as roof top solar, that also exists on the customer's side of the meter can be captured and used without incurring costs as it passes through the meter.

## 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.

Where domestic storage is used in conjunction with domestic generation at the same property, then there will be no taxes or levies paid as these are applied at the meter. This can make self-storage of domestic generation attractive to consumers.

Minimising the export of generation may also be attractive to owners of multiple properties as it allows additional generation to be installed in an area without reinforcement. Combined with an export limiting device, it may allow more than 3.68kW per phase to be installed while remaining within the rules for connection (and allocation of cost) that apply at this level of generation.

## Useful resources

- 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](http://www.northernpowergrid.com/get-connected/energy-storage-projects)
- Learn more about the study we have undertaken at: [www.northernpowergrid.com/innovation/projects/distributed-storage-solar-study-nia-npg-011](http://www.northernpowergrid.com/innovation/projects/distributed-storage-solar-study-nia-npg-011)
- Read our news release at: [www.northernpowergrid.com/news/home-battery-trial-aims-to-increase-electricity-network-capacity-to-enable-more-solar-homes-and-save-millions-for-customers](http://www.northernpowergrid.com/news/home-battery-trial-aims-to-increase-electricity-network-capacity-to-enable-more-solar-homes-and-save-millions-for-customers)



Smart battery installed in a domestic property in Barnsley.



## NORTHERN POWERGRID CONNECTIONS CASE STUDIES

### CONNECTIONS ENQUIRIES

 0800 011 3433

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[www.northernpowergrid.com](http://www.northernpowergrid.com)

