

**electricity**  
**north west**

Bringing energy to your door



**RESPOND**



# Active fault level management

The Department of Trade and Industry wrote in 2005 that active fault level management will help distribution network operators to quickly connect customers' low carbon demand and generation, and at a lower cost than traditional reinforcement. By combining innovative technical and commercial solutions with existing assets, the Respond project will make that vision a reality.

## Why do we need Respond?

To meet the decarbonisation challenge laid down by the Government, our customers are being encouraged to adopt new low carbon technologies such as electric vehicles and heat pumps. Government forecasts suggest that there may be up to a 60% increase in total electricity demand in Great Britain by 2050.

Increased demand and the connection of more embedded generation will create pressure on the electricity network and cause an increase in 'fault current', which is the instantaneous surge of energy that occurs during a fault. Distribution network operators (DNOs) like Electricity North West install protection equipment to safeguard their networks from damage that could be caused by fault current. However, if 'fault level' (the potential maximum amount of fault current that will flow when a fault occurs) rises above the rating of our protection equipment, we have to replace it with higher rated equipment.

As it stands, we will need to spend millions of pounds reinforcing our network because of the increased fault current we expect to see, as demand for electricity grows.

## What is Respond?

Respond is trialling an intelligent Fault Level Assessment Tool coupled with two novel technical solutions and a revolutionary commercial concept. This intelligent software, which interacts with our network management system, is installed in our control room and uses network data to predict fault level in near



real time. When fault level approaches or rises above our equipment ratings, the tool will 'enable' one of three innovative techniques designed to manage fault current safely. The techniques are: Adaptive Protection, the  $I_s$ -limiter and the Fault Current Limiting service.

Respond will benefit all electricity customers in the long term by helping us to avoid or defer traditional, expensive and disruptive reinforcement solutions. This will keep costs down for customers, reduce carbon emissions and allow us to manage our existing network assets more efficiently.

The Respond method will release the same capacity as traditional reinforcement but up to 18 times faster and at much lower cost – up to 80% cheaper – potentially saving Great Britain £2.3 billion by 2050. The project started in January 2015 and will run until October 2018.





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### Adaptive Protection

Also known as sequential tripping, this technique re-sequences the operation of circuit breakers – the electrical switches on our network which operate automatically to protect an electrical circuit from damage. Adaptive protection has been retrofitted at five high voltage substations operating at 11kV or 6.6kV, and at two 33kV extra high voltage substations.

### I<sub>s</sub>-limiter

The I<sub>s</sub>-limiter is a current-limiting fuse which detects the rapid rise in current when a fault occurs and responds within 1/200th of a second to break the current. This existing technology is used on private networks in the UK and extensively on public distribution networks in Europe, USA and Australia as a fault current mitigation technique. This will be the first installation of an I<sub>s</sub>-limiter on a British DNO network. As part of the Respond project we are aiming to demonstrate how these devices can be deployed safely and legally to unlock the benefits they can provide for customers. I<sub>s</sub>-limiters are installed at two high voltage substations. I<sub>s</sub>-limiter sensing equipment has been installed at a further five sites to gather additional operation and maintenance data.

### Respond trials

During the project trials we need to validate every fault that occurs and ensure that the Respond installations have operated correctly.

Both technical solutions, Adaptive Protection and the I<sub>s</sub>-limiter, have operated successfully a number of times as part of the trials.

Reports on each operation can be found on our project website.

### Fault Current Limiting service (FCL service)

The FCL service is a unique opportunity for large demand and generation customers to financially benefit from providing us with a fault current limiting response, through a managed service agreement.

When a fault occurs, all sources of generation connected to the electricity network contribute to fault current. Under fault conditions, inertia in large synchronous motors can have the same effect as generators.

The FCL service trial will allow us to test new technologies that can switch off a customer's generator or motor, remotely and instantaneously, when a network fault occurs and when fault level is high. If the customer's equipment is switched off for just a few minutes, it will no longer contribute to fault current. We can then safely isolate the network fault, without excess fault current causing damage to our protection equipment.

An extensive customer survey, conducted across a range of industrial and commercial market sectors, has shown that a theoretical appetite exists among certain customers, primarily in the non-manufacturing sector, to provide this kind of service. We are now seeking up to five large industrial business customers in the North West to trial the FCL service as part of the Respond project.

### Who's involved?

Throughout the Respond project we will work with a number of partners and key suppliers who are leading experts in their respective fields of research, technology and customer engagement. Our project partners are listed below and you can find out more about how they are supporting the Respond project on our website.

- ABB
- The Association for Decentralised Energy
- ENER-G
- Impact Research
- Kelvatek
- Parsons Brinckerhoff (PB) Power
- Schneider Electric
- United Utilities

TO FIND OUT MORE ABOUT OUR  
**RESPOND PROJECT**, VISIT:  
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