



Problem statement



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Problem statement



- 1** The Climate Change Act 2008 has set targets for the UK to reduce greenhouse gas emissions by 80% by 2050. This will mean that we have to **burn fewer fossil fuels.**

- 2** Therefore, the **demand** on electricity networks is likely to double because:
 - Homes and businesses are likely to be heated by electricity instead of gas; and
 - Cars will be electric rather than petrol fuelled.
 - Other forms of electricity generation will be connected to help customers reduce their bills and large power stations meet the UK's demand.

- 3** If we (Electricity North West) continue to use our electricity network in the same way as we do now, in order to cope with the extra demand, we would need to invest nearly £9 billion in the North West to **expand the network.** The cost of expanding the network would have to be passed on to customers through increasing their bills.



The **Department of 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.



In Electricity North West's **Fault Current Limiting service (FCL service)**, Industrial, commercial and generation customers can operate their equipment so they can offer fault level management services to DNOs using new technology which will be trialled under Respond.

Possible options



A

Invest heavily in new overhead lines, underground cables and substations to meet the increase in demand.

This option will be costly, disruptive to society and carbon intensive. These extra costs would be passed onto customers.

B

Roll out the **RESPOND** FCL service concept.

This commercial solution will enable customers to earn rewards and will benefit all distribution customers through reduced reinforcement costs.

C

Invest in **other** alternative low carbon technologies and strategies designed to use existing capacity more effectively. Other electricity companies are trialling their own initiatives.

D

Do a **combination** of the above options.

Analogy



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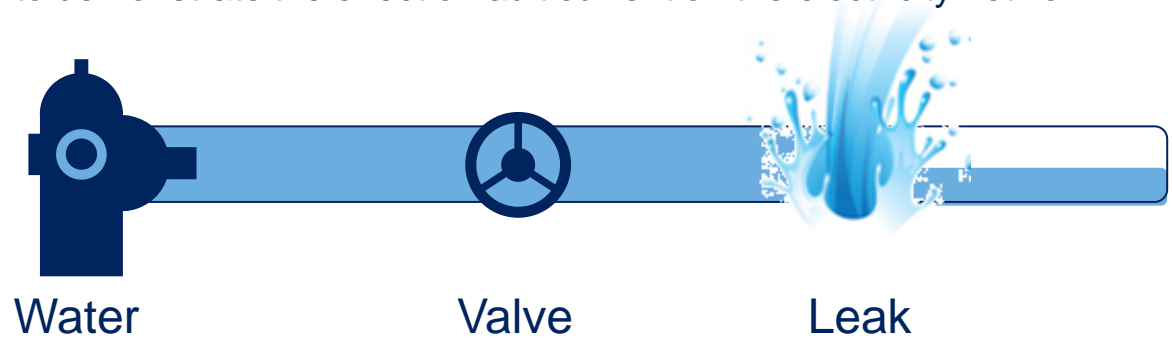
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What is fault current?

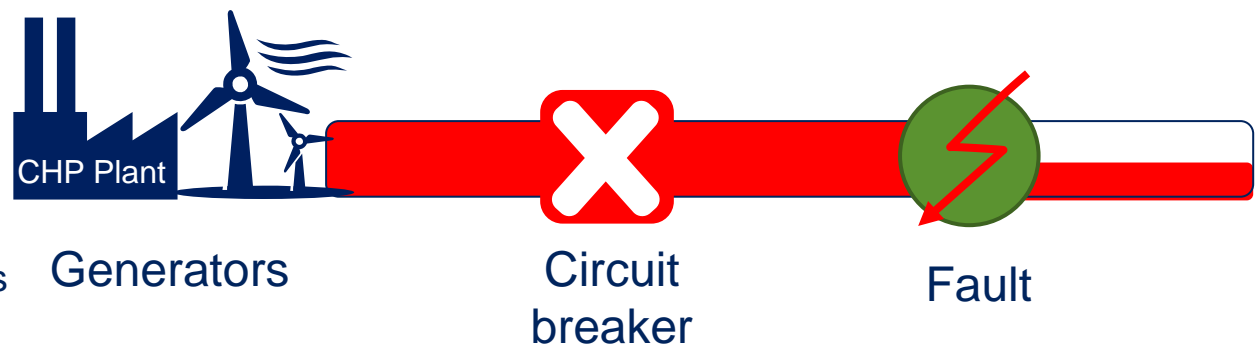


The electricity network can be likened to the water network in that both electricity and water are pumped around a circuit, under pressure, to provide customers with a supply. Generators act as electricity 'pumps' and create the pressure to move energy around the system. The following water analogy, whilst not completely accurate, helps to demonstrate the effect of fault current on the electricity network.

If a pipe bursts, water will gush from the fractured pipe. To stem the leak, a valve can be closed but unless the pump is switched off, water pressure will build in the pipe and damage the valve.



Similarly, electrons will rush to escape at the point of a fault with explosive force. We can stem the leakage of electrons by operating circuit breakers, but unless the total pressure flowing through electricity cables from generation sources is reduced, the circuit breaker may be damaged.



Turning off some of the flow of electricity from generation sources, for just a few minutes when a fault occurs will prevent damage to the electricity network.

Concept board



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RESPOND Fault Current Limiting service



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Background

The UK's electricity demand is expected to increase significantly in forthcoming years as we move towards a low carbon future and reduce our reliance on fossil fuels.

Problem

- Higher demand for electricity will increase faults on the distribution network and this will raise **fault current**. Normal current is the steady flow of electricity through the network. Fault current is the instantaneous surge of electrical energy, which occurs only when there is a fault.
- **Fault level is the potential maximum** amount of fault current that will flow during a fault.
- Additional demand and generation will inevitably increase fault level and if the safety rating of network equipment is exceeded, it must be replaced. This can be disruptive, lengthy and expensive.

Solution

Respond provides a range innovative techniques to manage fault level at much lower cost than traditional reinforcement by optimising existing assets and offering a new commercial solution - the Fault Current Limiting service (FCL service).

Respond will ensure that customers continue to get the power they need and the network operator has the flexibility to connect demand and generation to the network.

How?

Electricity North West will buy a managed service from some industrial and commercial customers which will allow them to remotely switch off large electrical motors and generators, for just a few minutes, when a network fault occurs. This will stop the customer's equipment from contributing to the fault current. The fault level response is expected to occur only a few times each year.

What's in it for me?

Respond offers significant financial benefits to industrial and customers who are willing and able to sell a FCL service to Electricity North West through a managed service agreement.

Faster & cheaper adoption of low carbon technology | less disruption | lower bills