

Celsius

Cooling down electricity substations could cut fuel bills



The first solution of its kind in Great Britain, the pioneering Celsius project is trialling a range of cooling techniques at 100 substations across the North West. The £5.3 million project will release additional capacity, reduce long-term costs for customers and avoid early asset replacement.

Electricity North West is leading the way in developing smart solutions to meet our future energy demands. As the regional electricity operator, the company is responsible for powering 2.3 million homes and businesses in the North West of England. It's also their job to plan for the future and look at smarter ways of meeting the expected increase in electricity demand as we start to reduce our reliance on fossil fuels.

Why do we need Celsius?

To meet the decarbonisation challenge laid down by the Government, 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.

This increase in load means an increase in the current flowing on the electricity network. The greater the amount of current flowing, the greater the heat generated and the hotter an asset becomes.

The expected increase in electrical load from low carbon technologies will lead to thermal 'pinch points' at distribution substations, where load causes equipment to operate close to its maximum operating temperature.

What is Celsius?

Celsius is a four year trial of a co-ordinated approach to managing the temperature of electrical assets in distribution substations. A two-step structured approach will gather data to increase understanding of thermal behaviour and release capacity to customers.

With greater knowledge of the behaviour of these assets, network operators will be able to support the connection of increasing numbers of low carbon technologies more quickly and at lower cost than deploying traditional solutions.

Celsius will enable the release of capacity at a fraction of the cost of traditional reinforcement,

Stage 1 - Thermal monitoring

The first stage of the project is now complete. Monitoring equipment has been installed at 520 substations to record temperature and load measurements. The sites were selected to be representative of 80% of the national substation population.

Data from the monitoring equipment is being analysed by project partner Ricardo-AEA to develop a simple 'thermal ratings tool' which will enable network operators to understand what additional capacity can be released from their substations.

The project team is also working with the National Physical Laboratory on a 'thermal flow study' to analyse the heat and air flows in substations. This will influence the design of future substations and potentially show how air flow in existing substations can be improved.

reducing costs for British customers by around £0.6 billion by 2050 and releasing 13GW of thermal capacity.

Engaging with customers

As the cooling techniques are being deployed at substations close to where customers live and work, a programme of engagement is being carried out to understand if customers find them as acceptable as traditional solutions.

A series of customer focus group meetings were held in June 2017 to test engagement materials that will be used in customer surveys.

The survey is taking place in two phases – one was completed before the cooling techniques were installed, and one will be completed after the 12-month trial to understand any audible or visual impact on customers.

The research has been carefully designed to assess if customers who have been educated about the need for, and benefits of, Celsius are more or less accepting of the cooling techniques, than customers who have not received any information.

Stage 2 - Retrofit cooling techniques

Working in collaboration with other network operators, Electricity North West has evaluated a number of retrofit cooling techniques for cables and transformers, some of which are now deployed at 100 of the original 520 trial sites.

The benefits of the cooling techniques will be quantified via an extended period of monitoring for a minimum period of 12 months. These include passive techniques such as additional vents, painting transformers with reflective paint, new backfill material for cables; and active techniques such as fans on transformers. The learning from this work will be captured as an enhancement to the thermal ratings tool.



Celsius is funded by Ofgem's Network Innovation Competition. The project started in January 2016 and runs until March 2020.

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To find out more about the Celsius project, visit: www.enwl.co.uk/celsius