

Celsius Thermal Rating Tool

The Thermal Rating tool is an output of the Celsius project. It predicts more informed ratings for Low Voltage transformers by using data or information about the asset and its environment.

Introduction

The aim of the Celsius project is to increase the capacity of distribution substations by investigating the thermal behaviour of the substation assets, developing methods to estimate improved thermal ratings, and investigating retrofit asset cooling technologies. This will allow the uptake of low carbon technologies and avoid the costly alternative of network reinforcement.

The methods included in this tool were developed as part of the Temperature Factors Study, which is described in detail in a separate document. This study developed three methods to calculate a more informed thermal rating for low voltage distribution transformers:

The simplified Celsius rating, which is a simplified way of estimating the daily rating from only nominal rating. This should be used as a first estimate only.

The full Celsius rating, which takes into account more temperature factor variables, including transformer characteristics and environment, but no measurement data. It is closer to the full estimated rating, but should not be used as the final estimate to make decisions.

The Celsius daily rating, which is based on temperature and load data from site, is a more accurate predictor of ratings. It will vary from day to day, so should be calculated over a number of days to understand thermal behaviour over an extended period.

This Model

This model includes four tabs; one for each of the three ratings methods, and an admin tab.

The model tabs: this is where a user can enter the information into the tool, and gain the result. Note that:

These tabs do not interact, meaning that information entered into one tab does not copy into other tabs.

The Daily Ratings tab receives data for one day only, in 30 minute timesteps. To gain ratings for multiple days, data from those days must be entered separately.

The Daily Rating tab will only produce results with valid input data, including for data where a peak load is greater than 60% of nominal rating. Error messages will appear if this is not achieved.

The admin tab: This sheet includes the key settings and coefficients to drive the tool. These should be changed with care, for example, where significant additional evidence has been developed to update the embedded equations.

Model Version

Version Number	Approver	Date	Notes
1.0	Mate Antosik	10/09/2018	First version of the tool that includes the three Celsius rating methods. Celsius Daily Rating tool is capable of producing results from 1 day of data at 30 minute intervals. This tool was developed by Olivia Carpenter and Michael Kelly.
1.1		09/10/2018	Updated calculations to reflect the updated version of the Temperature Factors Report; v3.0, issued on 28/09/2018