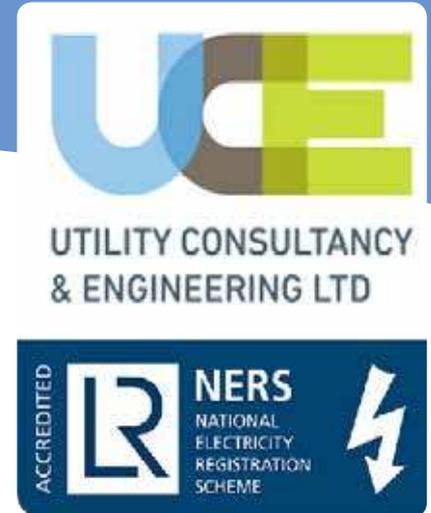


## UCE use CRATER to provide evidence of cable configuration

UCE provide Power Systems Consultation, Design and Analysis to a wide range of sectors and have been awarded Lloyds (NERS) Full Accreditation for design from LV to 132kV



### Background

- UCE was appointed to design the contestable works associated with the connection of two 5MW Solar Farms to a common Northern Powergrid 33kV connection. Two points of connection were provided by Northern Powergrid on their overhead line circuit passing the site requiring the installation of two 33kV underground cables which over the majority of the cable route shared a common trench.
- As part of the design submission Northern Powergrid requested evidence that the configuration of the cable trench would maintain the circuit rating of 37MVA.

### Challenge

- Identify a suitable rated XPLE cable and bonding system.
- Identify a suitable design of duct, installation system and laying conditions.
- Ensure duct depth and spacing are suitable for the cable circuits.
- Consideration of ground temperature, soil resistivity and load cycling conditions of the agricultural land.
- Using CRATER, obtain verification for the local DNO that the cable network design was within the thermal rating constraints for the cables selected.

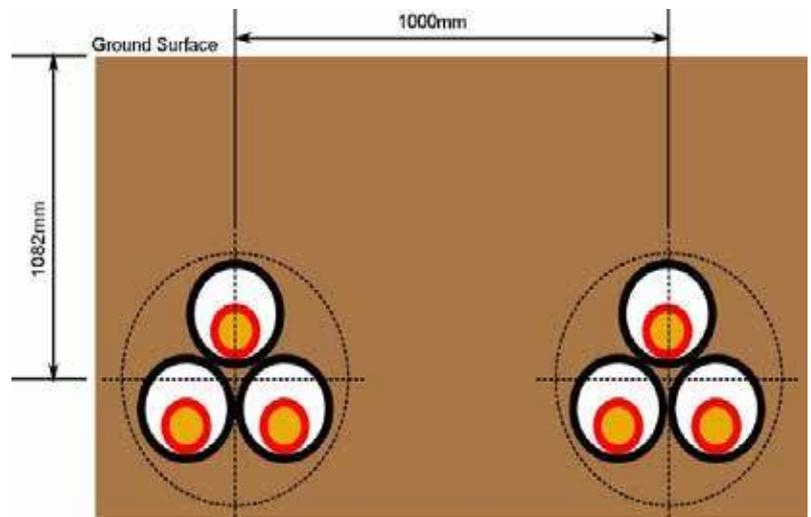


Figure 1: Duct Laying Centres: Trench Profile

### Solution

- EA Technology, with the support of the GB Distribution Network Operators (DNOs), has designed a sophisticated Cable Ratings tool (CRATER), which is the approved cable rating tool of the GB DNOs. EA Technology's cable rating service utilises CRATER enabling current ratings of a wide range of thermally interdependent circuits to be calculated, providing GB DNOs with reassurance that the thermal cable rating study is from a recognised and approved source.

*"UCE was very pleased with the service provided by EA Technology which assisted in UCE completing the project to the clients very tight timescales"*

Paul Leeuwerke, Managing Director, UCE

# Cable Rating Study

Applying the following information to CRATER enabled the cable circuits to be modelled:

- 630mm<sup>2</sup> copper 33kV MV Polymeric single core XLPE cables, 35mm<sup>2</sup> copper wire screen, BS7870-4.10
- Cable earths solidly bonded at both ends.
- Temperature and thermal resistivity of ground: 1.2W.m K-1 at 15°C. Note: These parameters are referenced as Summer Load conditions in ENA ER P17.
- Continuous rating of 37.0 MVA
- uPVC ducts are single walled; 150mm internal diameter, 160 external diameter; Three ducts in trefoil, one cable per duct - each duct air-filled.
- Duct depth requirement 910mm to the top of the upper duct, with spacing between duct centres of 1000mm. Centre of the group of ducts is 1082mm - calculated by EA Technology.

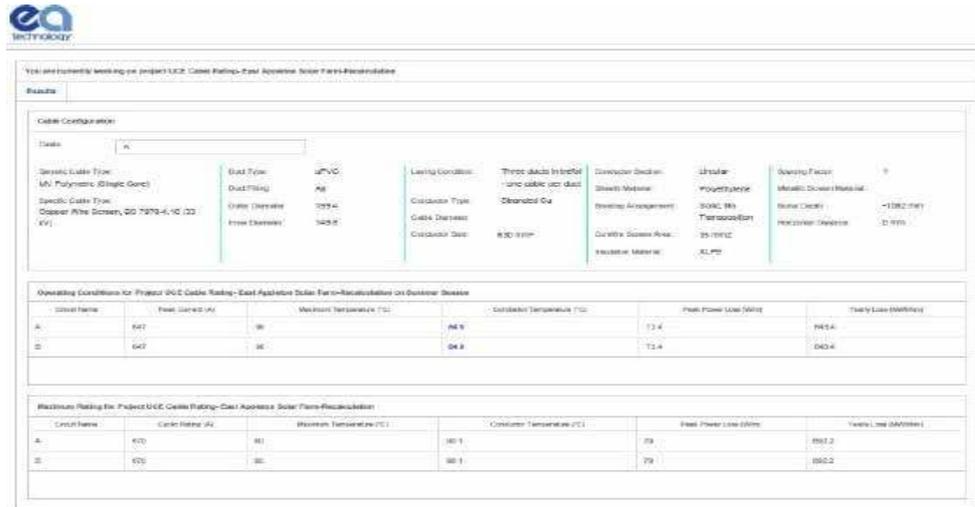


Figure 2: Cable Rating Results Page from CRATER - also showing circuit configuration

## Results

- The conductor temperature calculated for both cable circuits were 84.9°C for a steady continuous circuit operating current of 647A, which is within the maximum conductor temperature of 90°C for XLPE cables. Providing verification to the GB DNOs that the thermal rating of both cable circuits based upon the circuit design network parameters was acceptable.

Operating Conditions for Project UCE Cable Rating-East Appleton Solar Farm-Recalculation on Summer Season					
Circuit Name	Peak Current (A)	Maximum Temperature (°C)	Conductor Temperature (°C)	Peak Power Loss (W/m)	Yearly Loss (MWh/km)
A	647	90	84.9	73.4	543.4
B	647	90	84.9	73.4	543.4

Figure 3: Temperature of each Cable Circuit for a circuit rating of 37MVA

Maximum Rating for Project UCE Cable Rating-East Appleton Solar Farm-Recalculation					
Circuit Name	Cyclic Rating (A)	Maximum Temperature (°C)	Conductor Temperature (°C)	Peak Power Loss (W/m)	Yearly Loss (MWh/km)
A	670	90	90.1	79	692.2
B	670	90	90.1	79	692.2

Figure 4: Maximum permissible Cable Circuit Load when operating at Maximum Temperature Rating of Conductors

## Benefits

- Having the thermal rating of cables circuits calculated using CRATER provided UCE with the reassurance that the GB DNO would accept the results of the study for integration into the GB DNO owned and operated cable network system.

For more information call +44 (0)151 347 2313 or email [sales@eatechnology.com](mailto:sales@eatechnology.com)

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