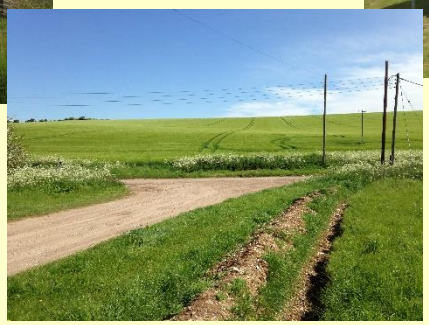
Scenario:

Farmer Brown has been granted permission to add to her existing ground mount solar PV system.
She currently has a 50kW 3-phase system and is looking to have an *additional* 50kW system in the same field.



2x new AC circuits are to be installed to feed each of the 2x *new* solar PV inverters, of which will be mounted on the array via Unistrut as shown below:

The earthing system at the origin is TT and is supplied via a public low-voltage distribution system.

TT

400V

R_a = 33Ω

There are spare ways/capacity available in the existing 6-way 250A 3-phase TP&N board - on the existing array – **the 3-phase volt drop at this DB (PV DB1) 6-volts.**

The circuit(s) are to be wired using DRAKA 4-core steel wired armoured 90 °C thermosetting insulated cable with copper conductors: BS5467 Low Voltage Armoured Cable (drakauk.com)

The SWA of the cable is to be utilised as the CPC.

The cable(s) are to be run through the array from the existing DB position via a catenary wire **(similar to the DC cable method of installation opposite & below)** - in order to save time and labour costs - as opposed to being buried direct in the ground.

The ambient temperature is 20 degrees C.

The 2x new inverters are ABB – 1x rated at 20kW 3-phase and the other at 27.6kW: TRIO-20.0/27.6-TL-OUTD NA data sheet (abb.com)

The length of run for inverter 3 (27.6kW) is 83m from PV DB1

The length of run for inverter 4 (20kW) is 85m from PV DB1

1. For Inverter 3 (27.6kW) determine the:

a) design current (I_b)

b) **minimum** nominal rating of protective device (I_n).

2. Determine the:

d) reference method used to calculate the current capacity of the circuit live conductors

e) appropriate rating factors and their values.

f) minimum current carrying capacity, in amperes, that the cable must be capable of carrying.

3. Select a suitable cable for current-carrying capacity including the:

vii. appropriate table and column number

viii. tabulated value of current carrying capacity I_t

ix. **minimum** cross-sectional area.

4. Determine the:

c) volt-drop for the circuit.

d) **maximum** permissible volt-drop, to the PV inverter terminals.

5. Determine the R_1+R_2 for this circuit at full operating temperature.

6. Determine for this circuit the:

a) total earth fault loop impedance

b) maximum permissible earth fault loop impedance (Z_s)

c) Ipf **(be careful here!)**

d) required CPC size – does the SWA comply?

7. Explain if the new circuit complies with the requirements of the current edition of BS 7671.

8. State what *additional* considerations need to be made with regards to the installation being on a farm.

9. State any other design considerations to be made to the solar PV system (AC only).

10. If the installation method was changed to the new circuits being buried direct in the ground (instead of on a catenary wire), what would the requirements be?

11. BONUS QUESTION: Investigate/determine if separate DC isolators are required for each of the DC strings (6x strings on Inverter 3 and 4x on Inverter 4).