MCS Shade Procedure & the SolarEdge Advantage

The MCS Shade Evaluation Procedure[1] is a method for installers to present decent evaluation of the shading effect on the performance of solar systems and prevent misleading of system owners. This method is based on sunpath charts and provides estimates of the shading effect with approximately 10% accuracy for most systems in the UK.

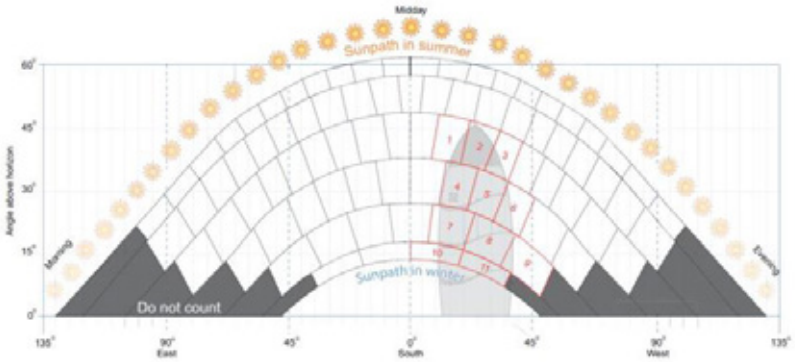
The MCS Shading Procedure

There are many ways to perform the MCS shade procedure[2] but the general idea is to color the segments affected by the shading obstacle. Each segment on the sunpath diagram accounts for -0.01 of the systems' shade factor (SF). In a system with no shade at all SF = 1. In systems with shade SF = 1- (0.01 x number of affected segments).

EXAMPLE:

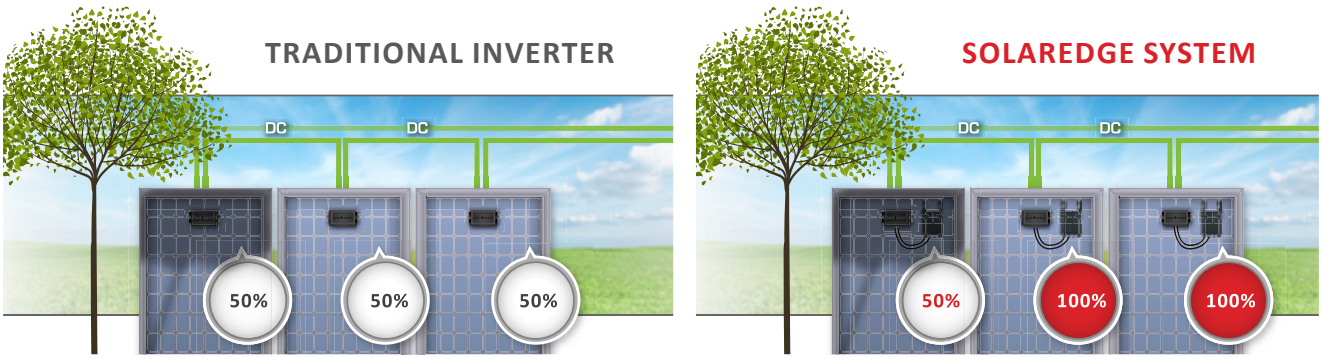
In the example, 11 blocks are affected, resulting in a ~11% reduction in system output due to the shading object:

SF = 1 - (11*0.01) = 1 – 0.11 = 0.89



SolarEdge Module Level Power Optimisers:

SolarEdge power optimizers perform Maximum Power Point (MPP) tracking for each module individually and therefore minimize the effect of partial shading. Power optimisers extract the maximum energy from each module, regardless of other modules in the string.



Shade Procedure when using Module Level MPP Trackers

The MCS guide[2] states that using multi-MPPT systems, such as SolarEdge power optimisers, minimises the effect of shade. In these cases, a separate shade analysis should be done for each MPP tracker.

Performing a separate shade procedure for each module will dramatically reduce the effect of the shading obstacles, but will be very tedious and time consuming for the installer.

We therefore present four typical examples for shading analysis with module level MPPT.

[1] www.microgenerationcertification.org/mcs-standards/reference-materials/solar-pv-reference-materials

[2] www.microgenerationcertification.org/images/MCS%20Shading%201%20FINAL.pdf

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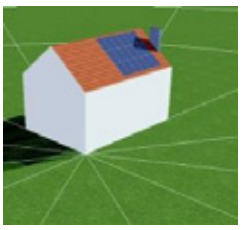
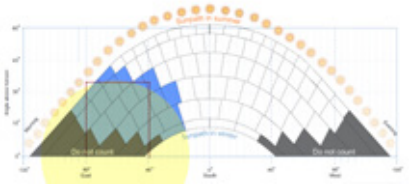
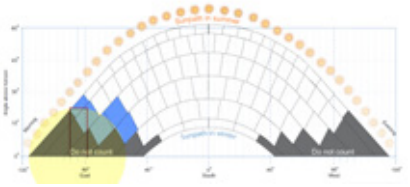
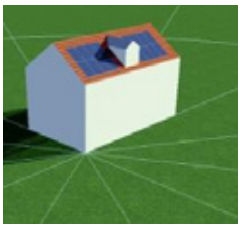
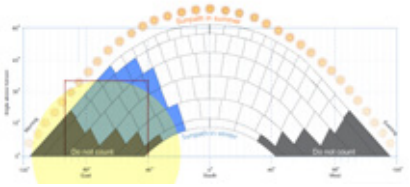
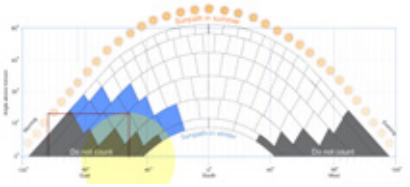
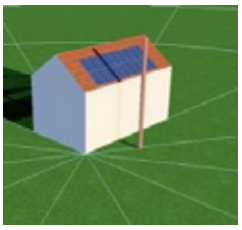
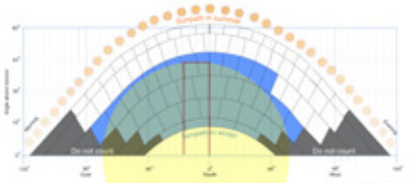
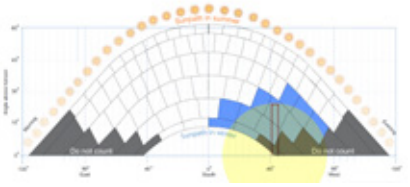
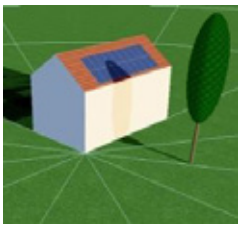
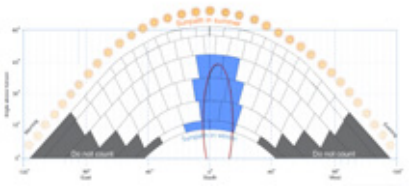
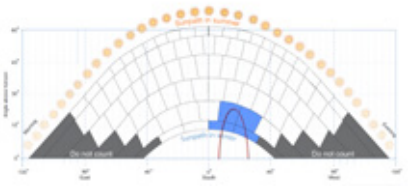
EXAMPLES:

The table below demonstrates the annual energy gain with SolarEdge in various shading scenarios as calculated by the MCS shading analysis charts. In the analysis one chart per system was used for a traditional inverter and one chart per module was used for a SolarEdge system:

Case		Traditional system	SolarEdge system with module-level MPPT
CASE 1: 4.5kW DC Near shading from Chimney 	MCS Sun Chart	1/1 	1/18 
	Shading Factor	SF = 0.81	SF* = 0.91
	Annual Energy Estimation	3,415.4kWh	3,837kWh SolarEdge Advantage: 12.3%
CASE 2: 4.0kW DC Near shading from dormer 	MCS Sun Chart	1/1 	1/16 
	Shading Factor	SF = 0.81	SF* = 0.90
	Annual Energy Estimation	3,032.7kWh	3,369.6kWh SolarEdge Advantage: 11.1%
CASE 3: 4.5kW DC Near shading from electrical pole 	MCS Sun Chart	1/1 	1/18 
	Shading Factor	SF = 0.63	SF* = 0.76
	Annual Energy Estimation	2,653.6kWh	3,201.1kWh SolarEdge Advantage: 20.6%
CASE 4: 4.5kW DC Far shading from tree (>10m) 	MCS Sun Chart	1/1 	1/18 
	Shading Factor	SF = 0.90	SF* = 0.94
	Annual Energy Estimation	3,790.8kWh	3,959.3kWh SolarEdge Advantage: 4.5%

* Average sum of colored segments in each of the module charts