amberroot

Distributed Chargers

A novel approach for ideal solar charging in telecom applications

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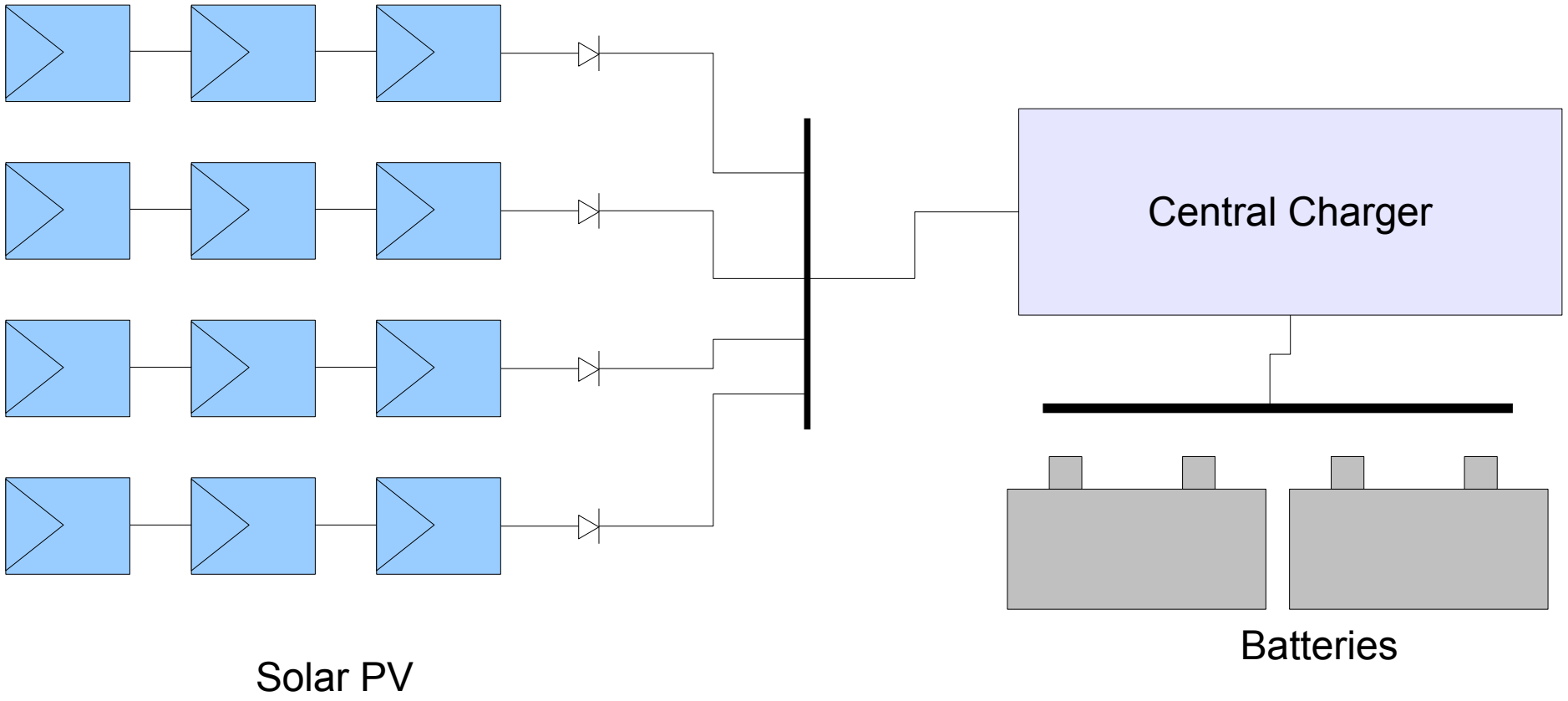
We are a power electronics products company

“Innovation has nothing to do with how many R&D dollars you have... It’s not about money. It’s about the people you have, how you’re led, and how much you get it.”
- Steve Jobs

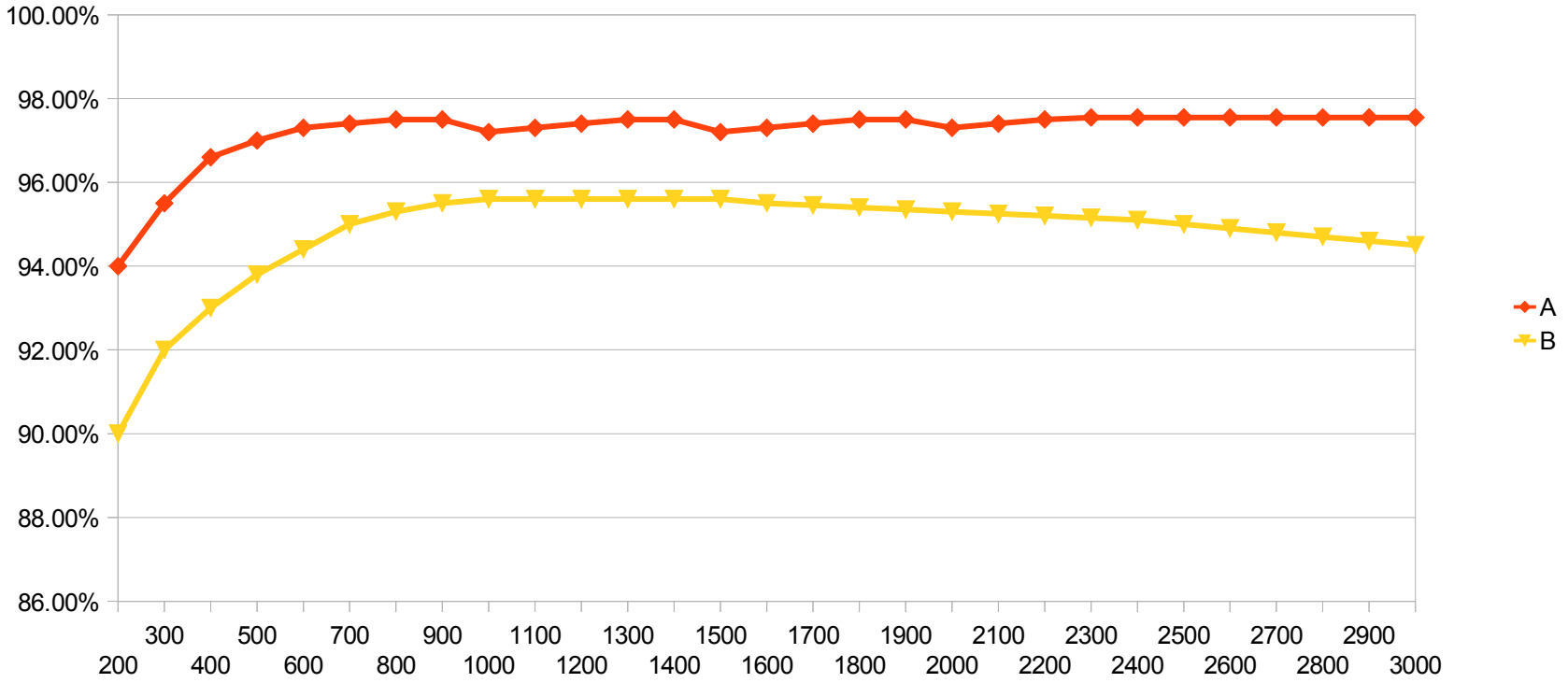


Existing Central chargers are just not right for Solar Telecom applications. Distributed chargers are the way to go





Central Chargers extract power from the combined Solar array to charge the batteries



Good chargers deliver UNIT efficiencies between 94-98% under standard conditions

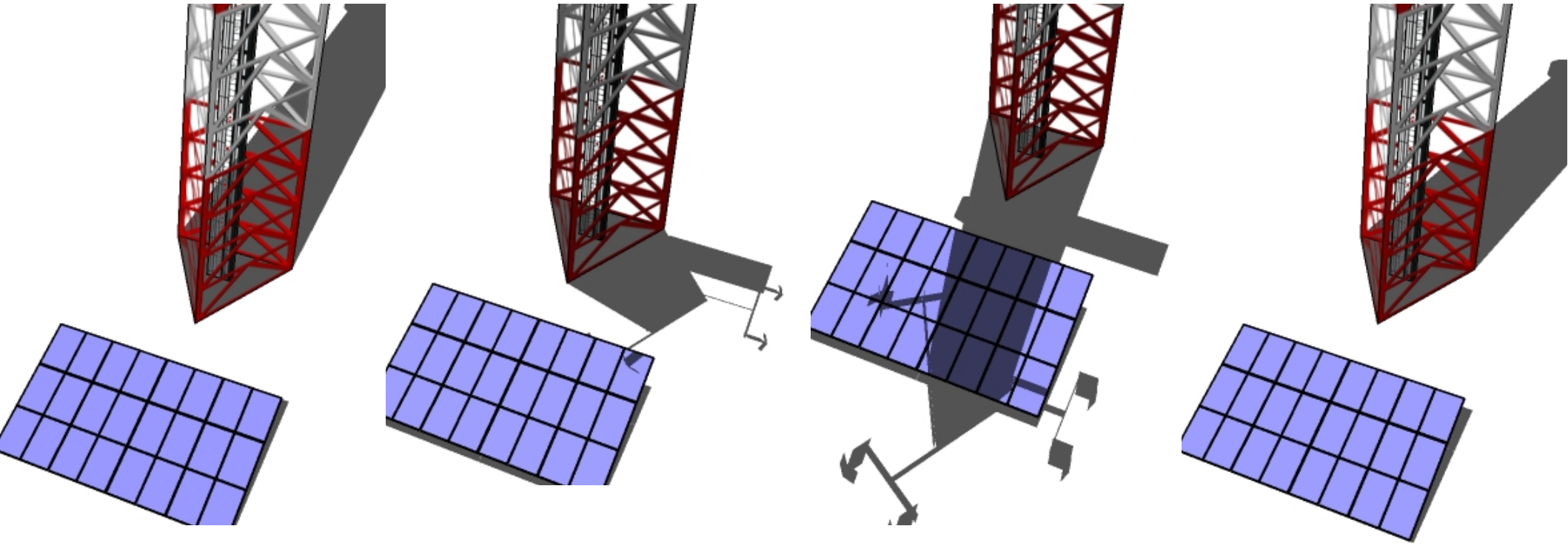
However, Central chargers are not designed for Telecom solar applications.



PROBLEM # 1
Shading is practically inevitable due to realities of a telecom installation

* image: MoserBaer Limited

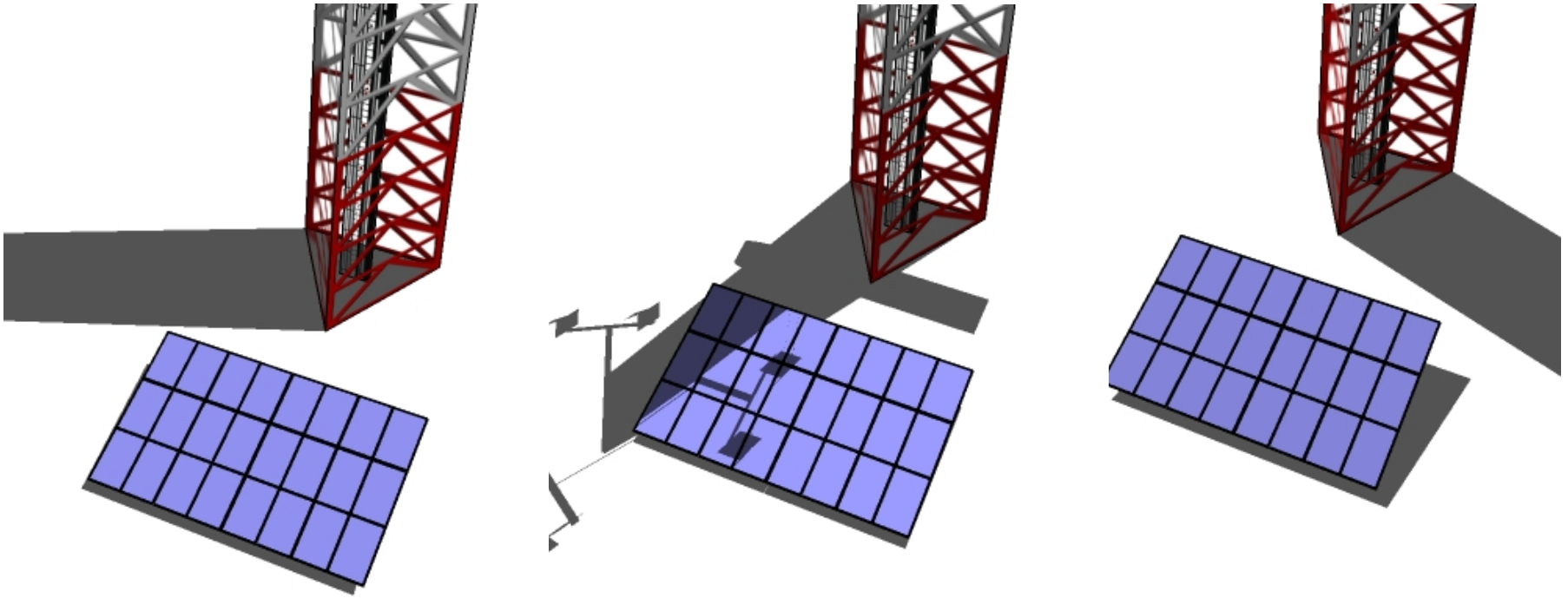
Shadow on a Solar array in Bangalore



January May July November

Sun movement in our latitudes & area constraints in a telecom site result in shadow on PV panels

Movement of Shadow on June 1



10:30 AM

12:30 PM

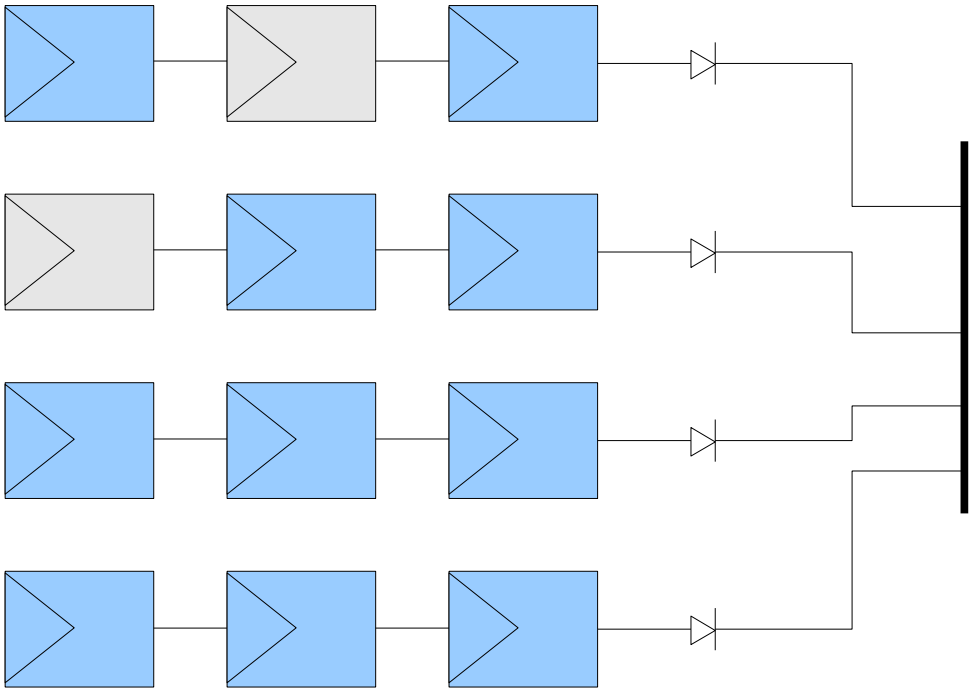
3:00 PM

Sun movement causes moving partial shade through the day



Telecom towers in this region can have shadow due to presence of obstructions in South of the installation **in Winter**

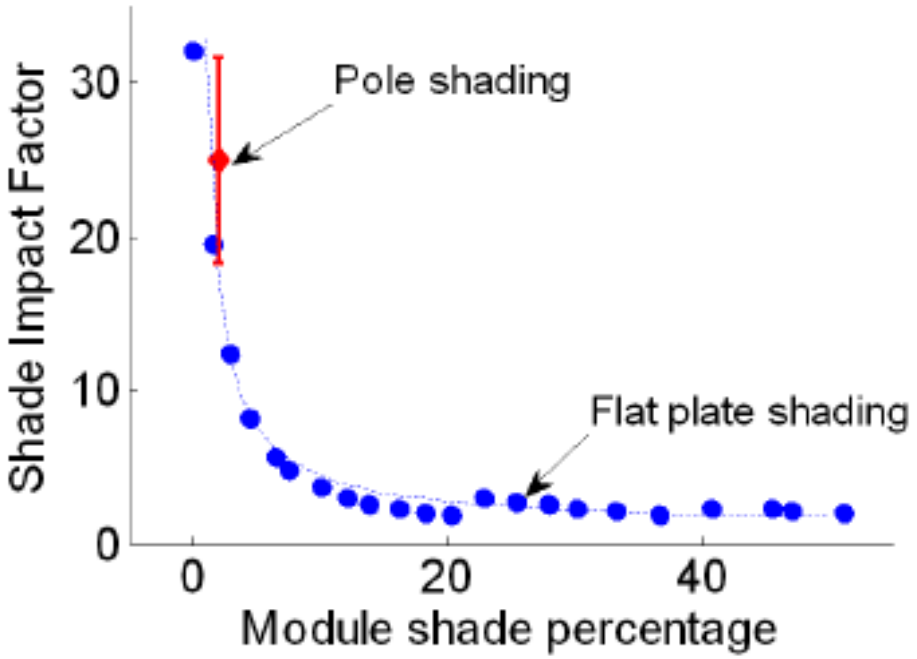
Telecom towers in this region will be affected by **Summer Shadow** Between April and September from the tower



3 Series X 4 Parallel

Voltage - ~ 90V DC

Central chargers exacerbate the effect of shade by forcing a series – parallel arrangement of PV



'Shade Impact Factor' (ratio of power lost to area of shade) for a single module in a single string PV system [1]

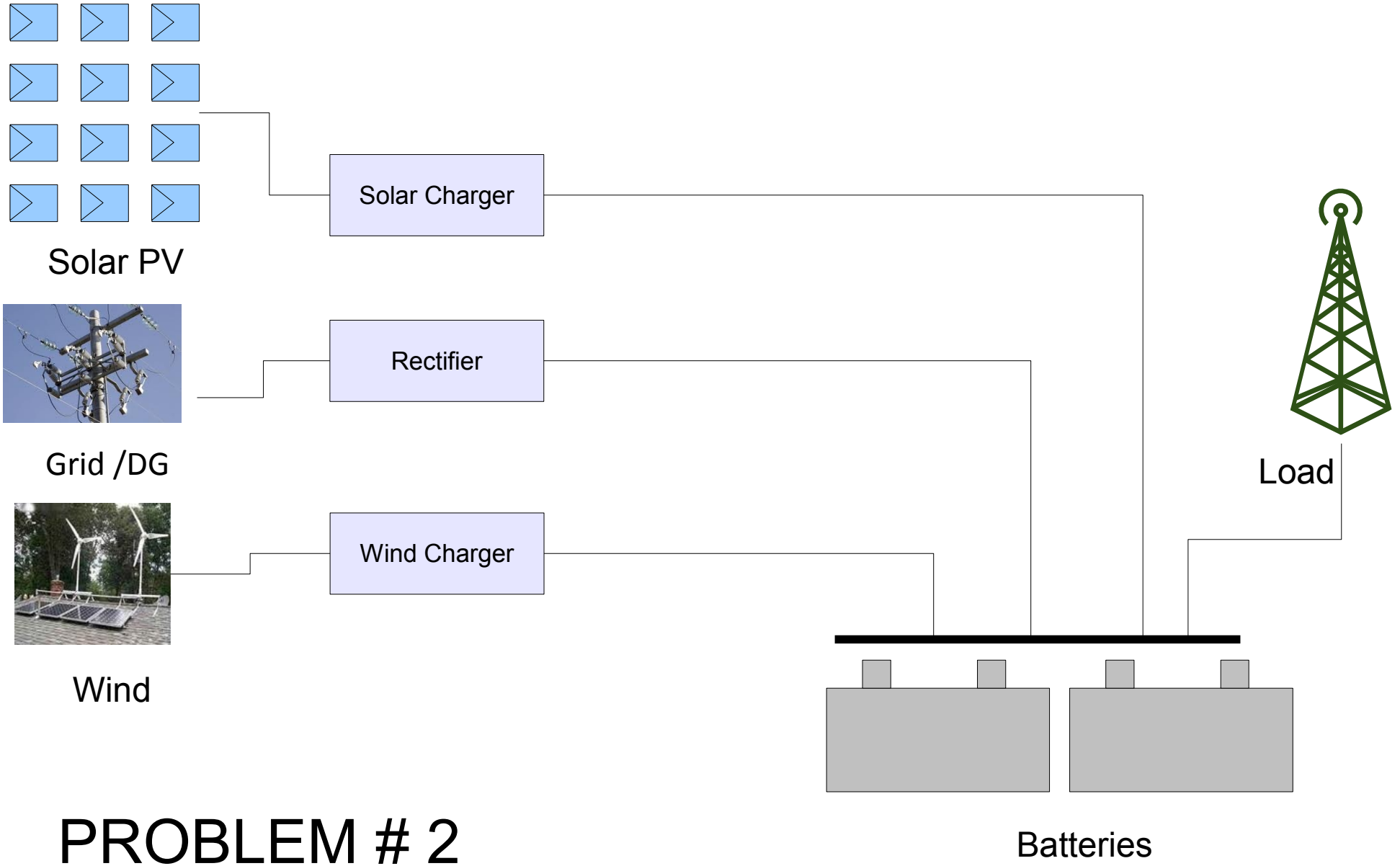
Shade Impact is much higher than actual percentage of shade

Source:NREL Paper on Partial shading – Chris Deline

Net Yearly Loss : Estimated 25% of Wp

1. Loss due to shading – Not recoverable
2. Loss due to shade Impact – Partially recoverable
3. Loss due to lower efficiency during cloudy days - Recoverable
4. Loss due to blocking diodes etc- Recoverable

The Problem is BIG !



PROBLEM # 2

Solar is not the only source of energy in the system

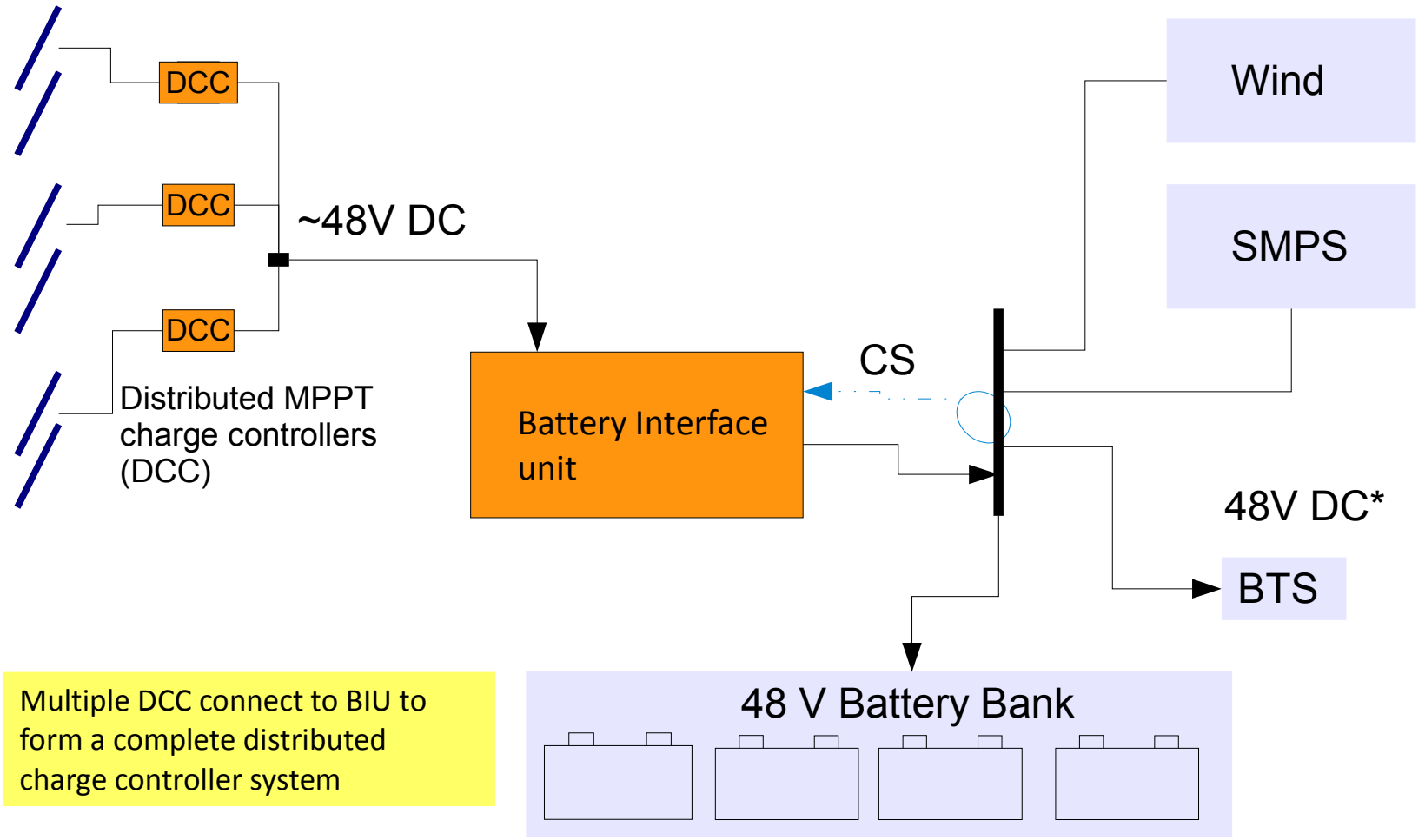


Multiple independent chargers can overcharge batteries (high charge rate)– thereby reducing its life= Increased System Cost

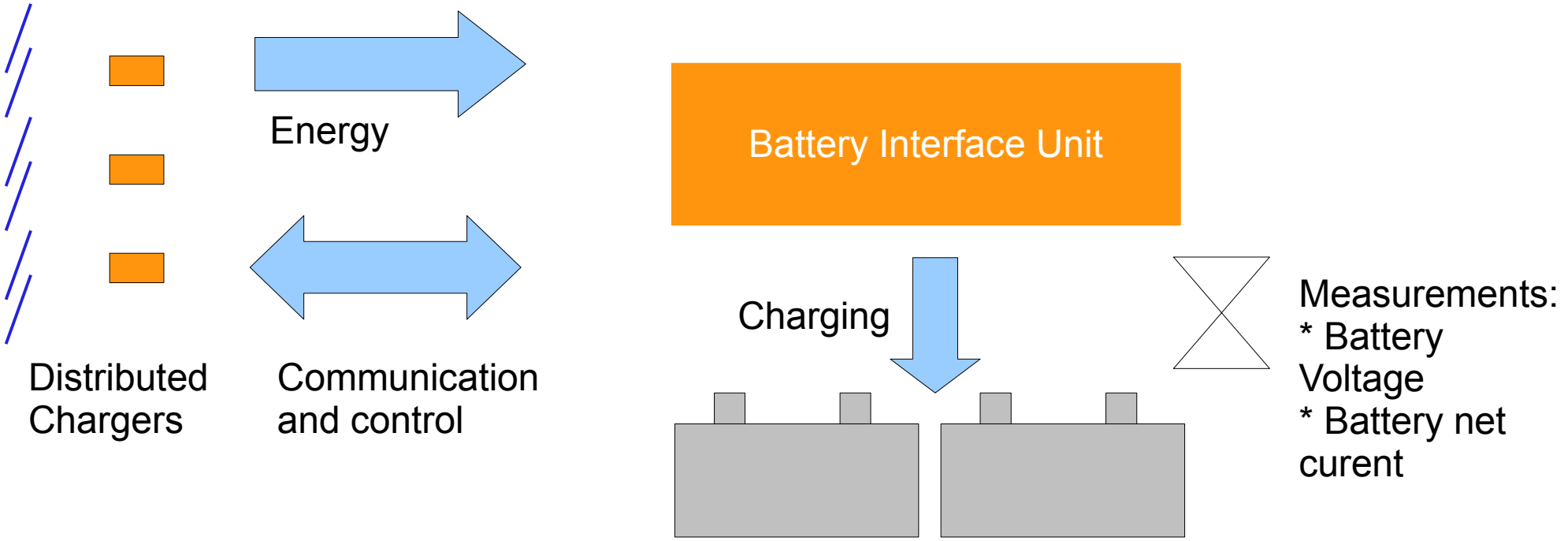
The solution must

1. Must address the issue of shading
2. Must do accurate charging of the batteries
3. Must not add to the net system cost

Amberroot Distributed Charger

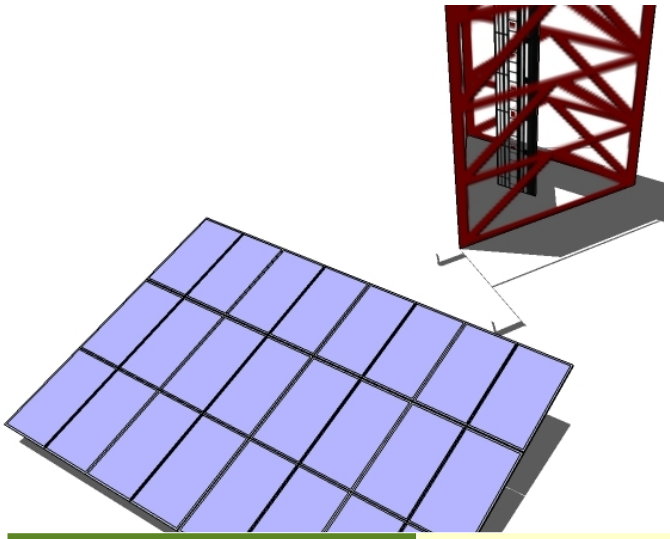


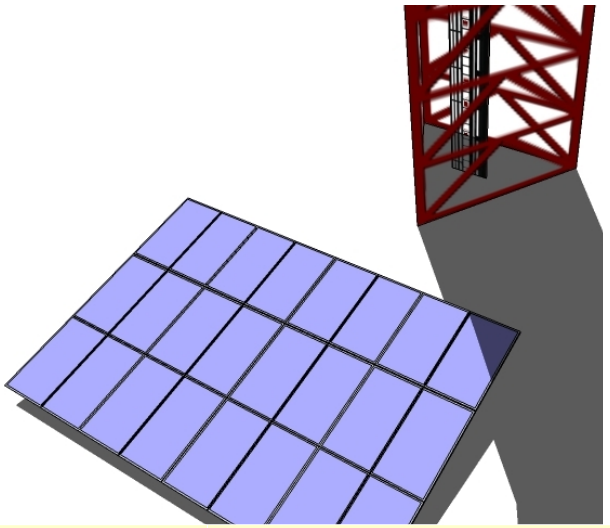
- High efficiency MPPT charger
- Multi-stage accurate battery charging
- Communicates to a Battery Interface Unit

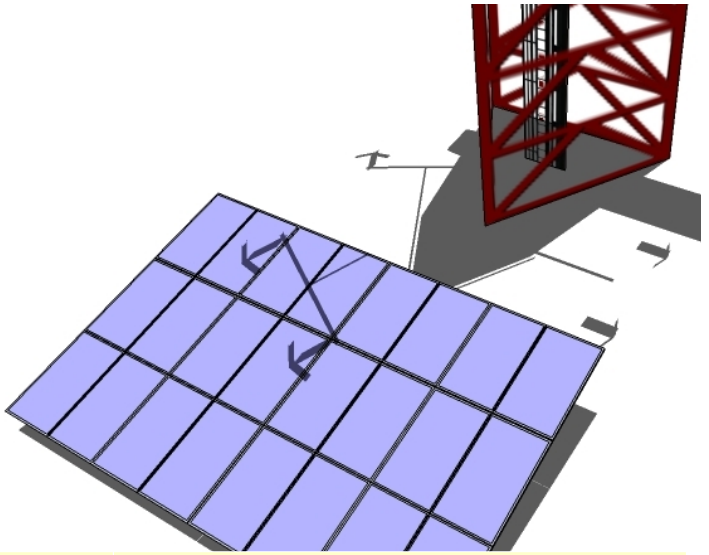


- Battery Interface Unit ensures accurate charging
- The system is 'other chargers aware'

Actual Site Results Show Improved Performance

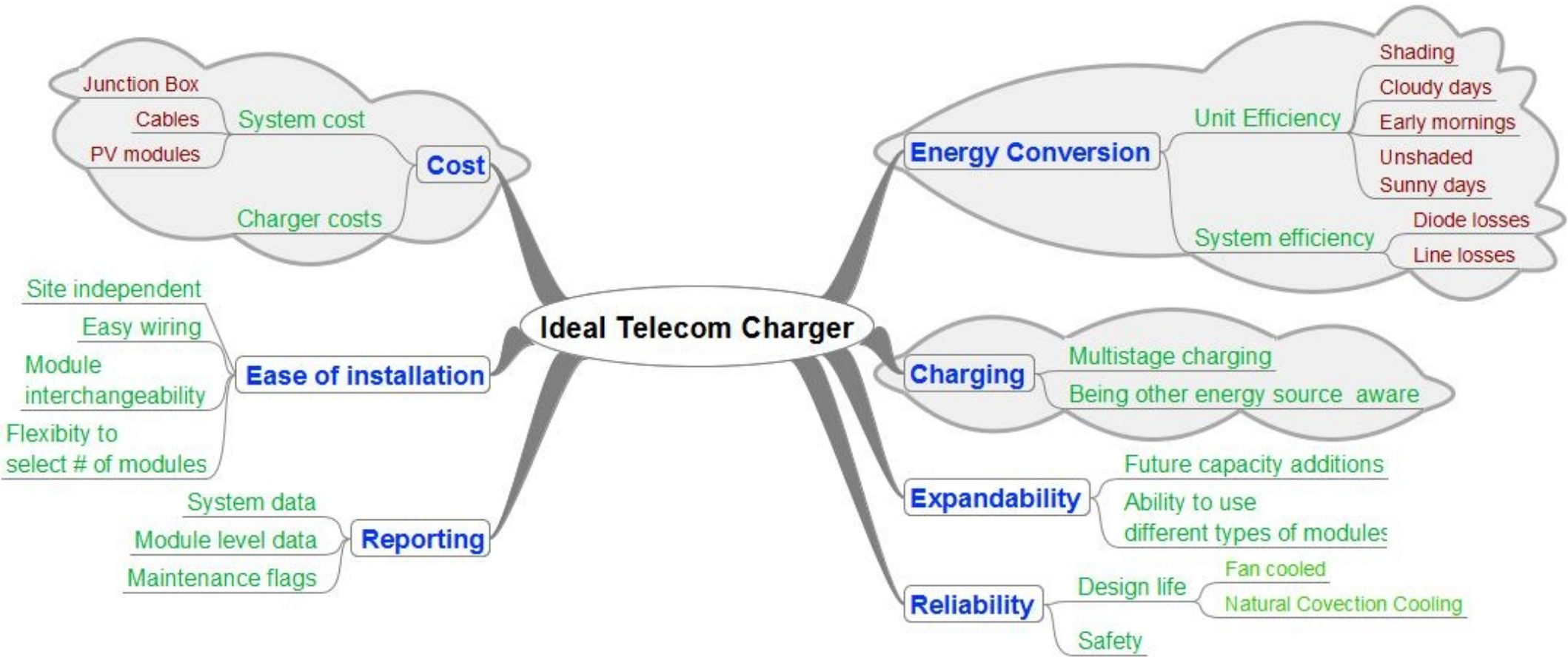




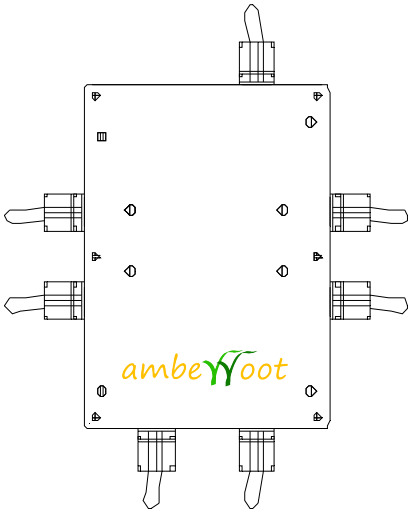


Type of Test	No Shade	One PV panel fully shaded	Partial (25%) shade across multiple panels
% more energy delivered by ModuleMax	12.5% (Typ expected > 5%)	83% in a two series string	26%

An increase of 10% more power extracted per year compared to central chargers !



Distributed Charging approach improves on practically every aspect of an Ideal Telecom charger



ModuleMax Distributed Chargers are available TODAY.

Contact us at karthik@amberroot.com