

INTRODUCTION

Grid scale solar power plants (>50MW) can be expensive to provide enough ground conductor to safely mitigate ground faults. Additionally, design complexity can lead to non-optimized grounding systems—large quantities of ground conductor is an unnecessary cost, but insufficient ground conductor exposes site personnel to hazardous voltages during ground faults. By establishing a standard for design, construction, and commissioning—solar power plants can balance these objectives.

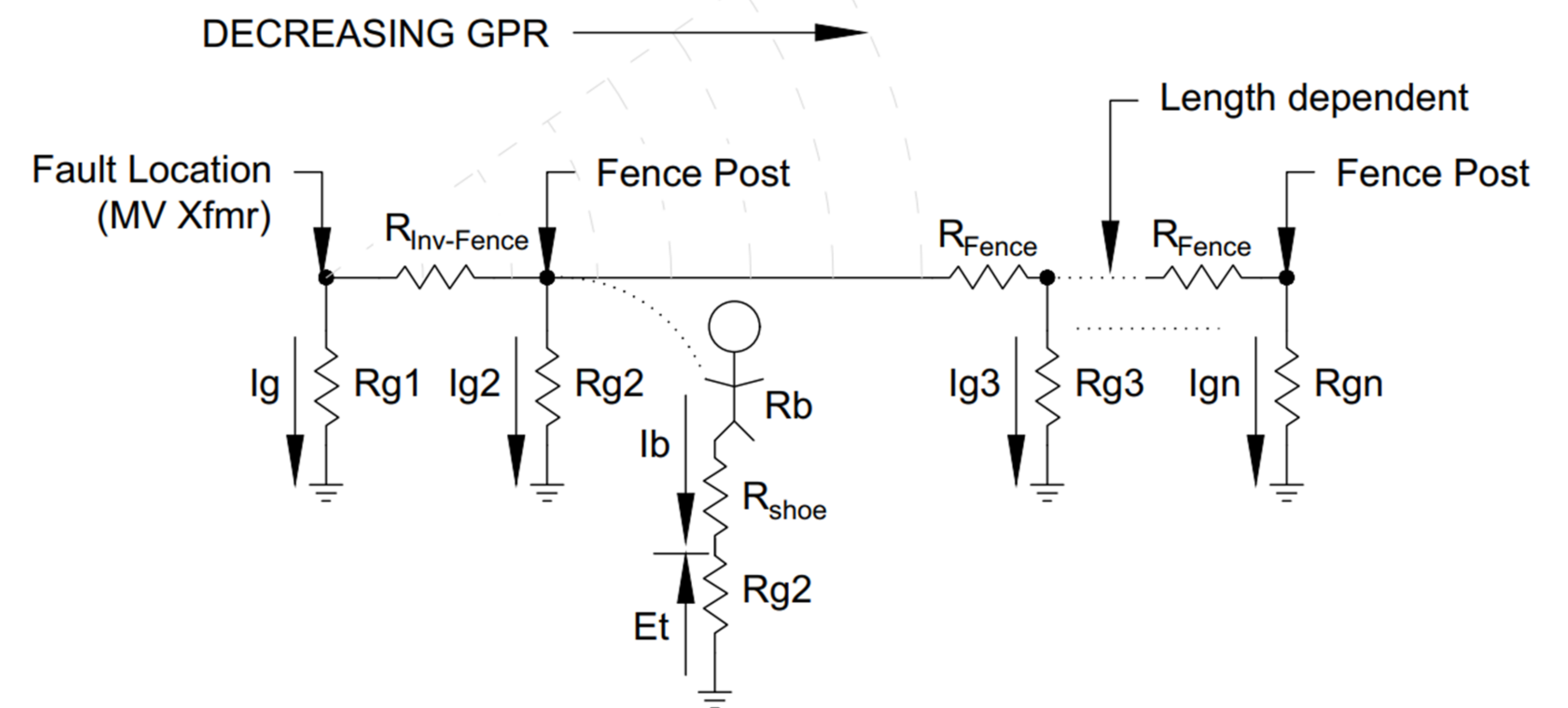
ISSUES

1. Inconsistent inputs for grounding analysis—Electrical resistivity (Wenner or Schlumberger method) should be:
 - a) Measured during the driest month and test results should indicate any recent rainfall
 - b) Probe distance >100 ft across site and one test ~1000 ft
 - c) Test across the site at ~1650 ft spacing per IEEE Std 2778
2. Inconsistent analysis method
 - a) IEEE Std 2778 provides guidance for method
 - b) Analysis should include select PV Blocks at corners, islanded, or shaped as a peninsula
 - c) Analysis should include fence adjacent to analyzed PV Blocks
 - d) Split factor should be considered—reference "Wind Power Plant Split Factor for Safety Design", R. Schaerer, 2014 IEEE PES T&D
3. Varying commissioning tests
 - a) Should be measured at inverter after installation is complete (ground ring, piles, DC trench grounds, etc.), with documented weather and testing photos
 - b) Test methods may include fall of potential or step & touch potential. Both are difficult to implement for grid scale facilities

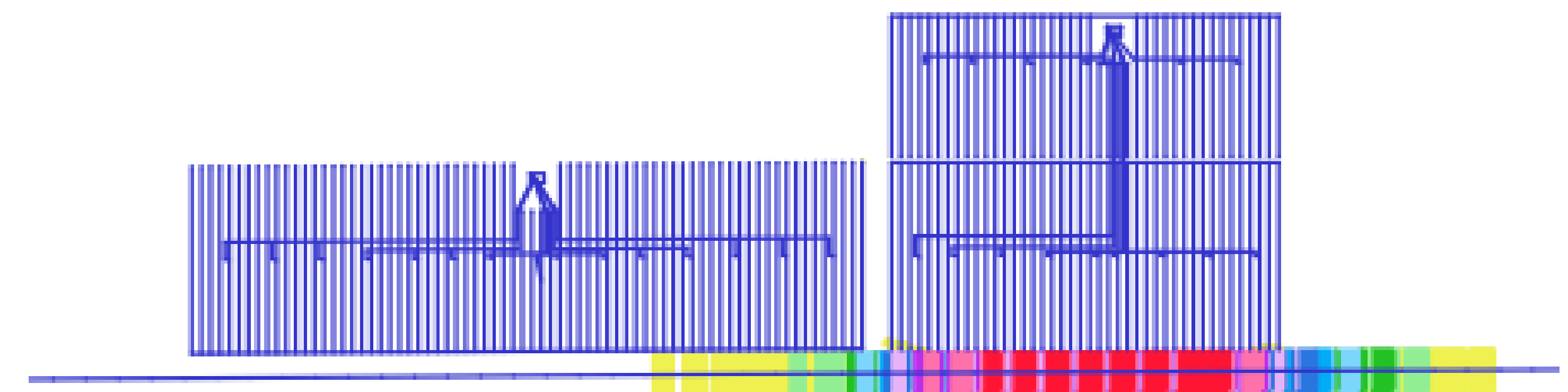
FIELD EXPERIENCE

1. Fall of potential may only provide value along perimeter blocks
 - a) Outer probe must be > 300 ft
 - b) Interior blocks are too closely coupled with adjacent blocks
2. Step and touch potential measurements are difficult to compare against the software grounding system model
 - a) Heavily depends on split factor calculation
 - b) Requires significant testing coordination
3. Must coordinate analysis methodology with field testing expectations and available test equipment

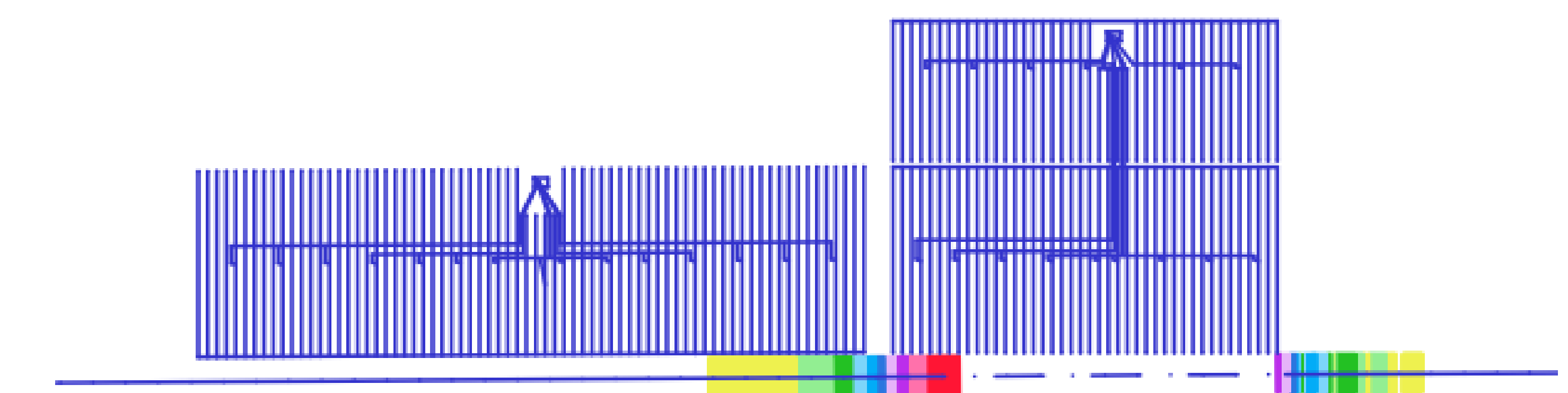
Fence Analysis Schematic



Touch Results with Contiguous Fence



Touch Results with Isolation Panels



Overall Grid Resistance (Rg) Test Results and Model Comparison

