

Smart Inverter Interoperability Standards and Open Testing Framework to Support High-Penetration Distributed Photovoltaics and Storage

Summary of EPC 14-303

February 19, 2019

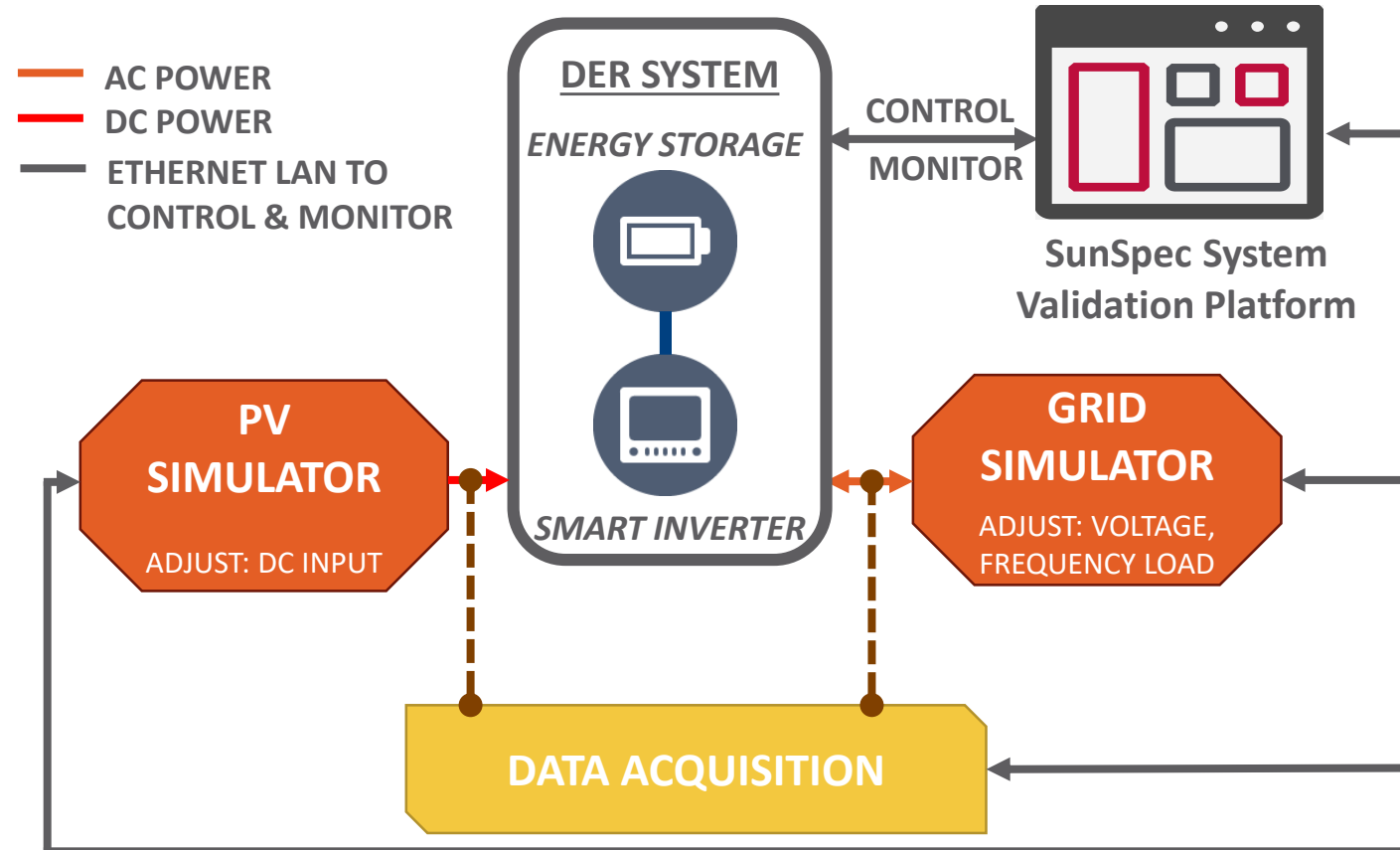
Program Objectives

- Deliver a test & certification framework for CA Rule 21 compliance
- Reduce DER system engineering costs by 10%
- Demonstrate safe DER penetration on feeder circuits above the IEEE-mandated 15% limit using communication and smart inverters
- Demonstrate the ability of smart inverters to support the power grid during system disturbances and increase power grid reliability
- Identify new revenue models for DER investors and operators

SunSpec Open Source Reference Test Platform

Test Capability

- Advanced inverter and storage
- SunSpec Modbus
- IEEE 2030.5*



* Available Q1 2019

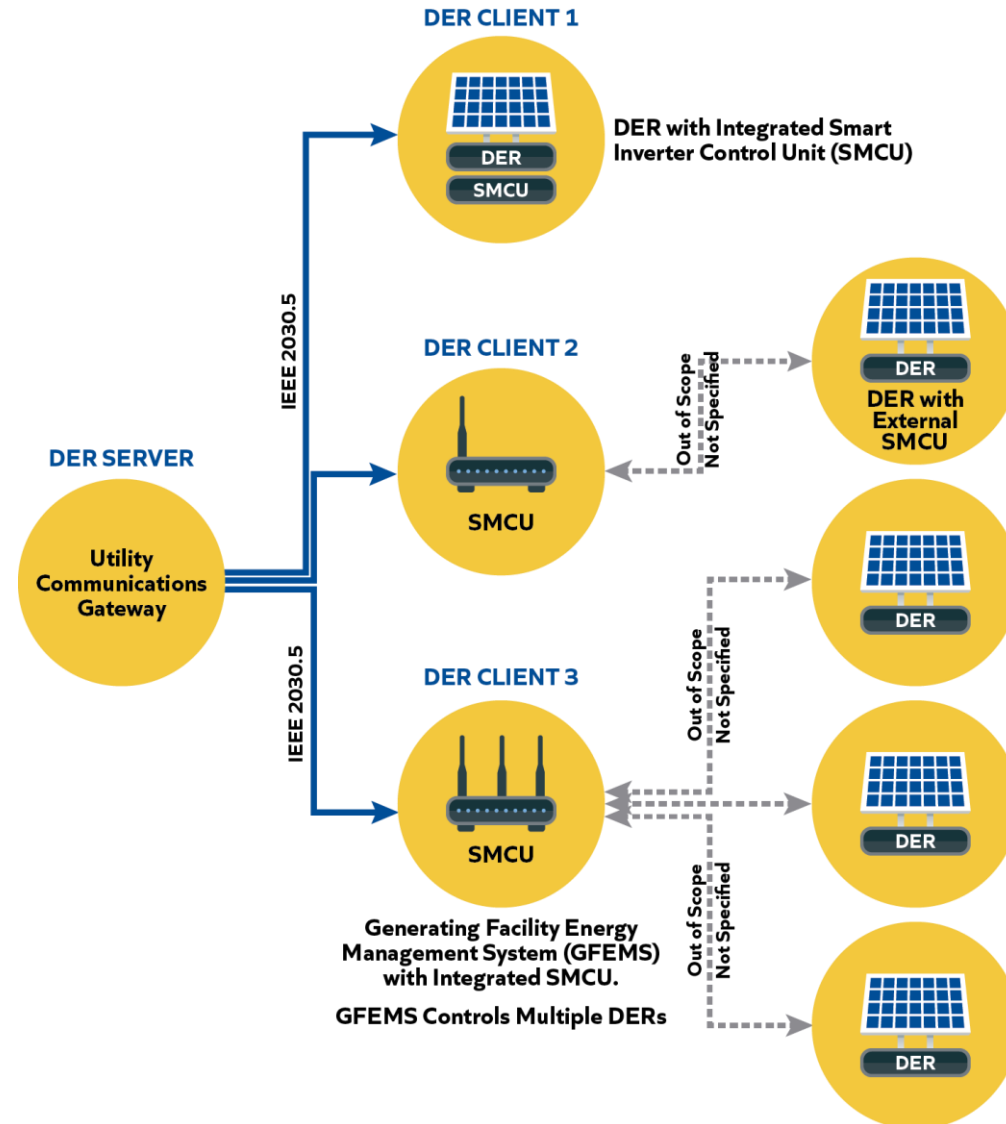
SunSpec Open Source Reference Test Platform At UCSD

- Five manufacturers proven CA Rule 21 compliant
- Standard communication interface enables CA Rule 21 Phase 1 remote settings

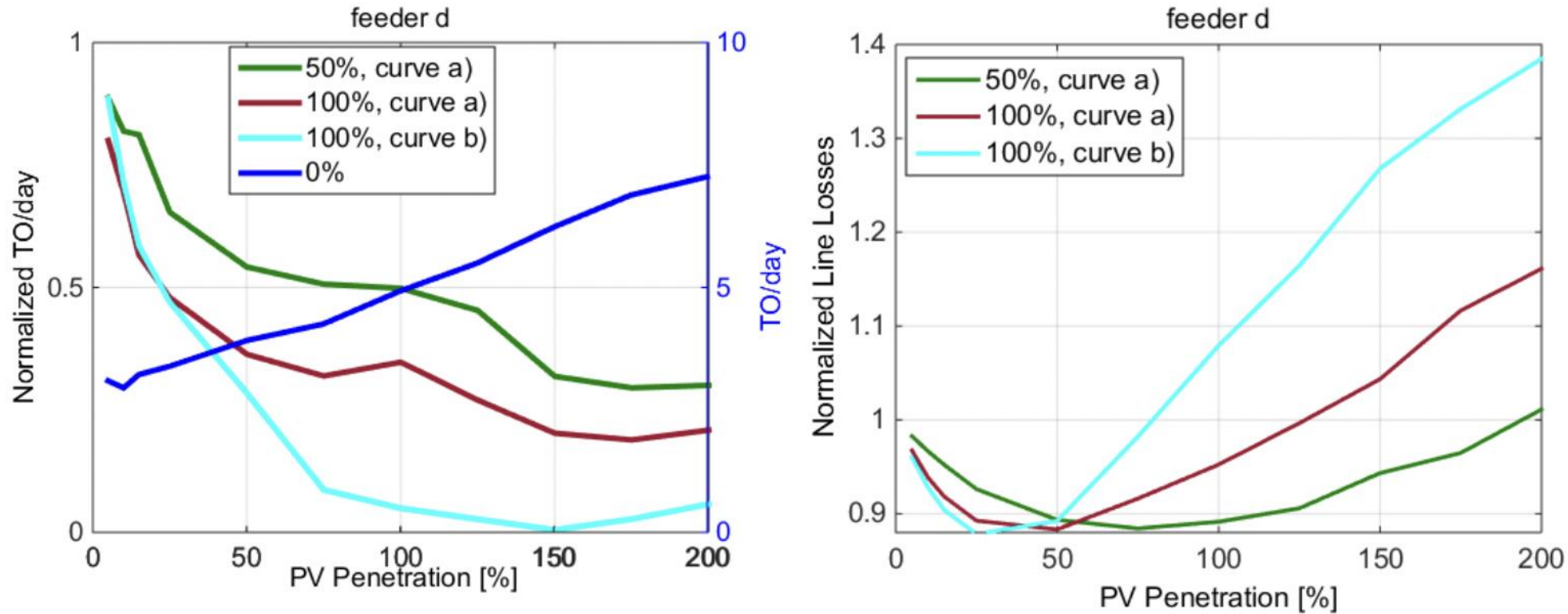


IEEE 2030.5/CSIP Enhances Grid Stability

- 15 PV+storage systems networked with IEEE 2030.5/CSIP
- Demonstrated CA Rule 21 Phase 1 settings changes alleviate grid issues

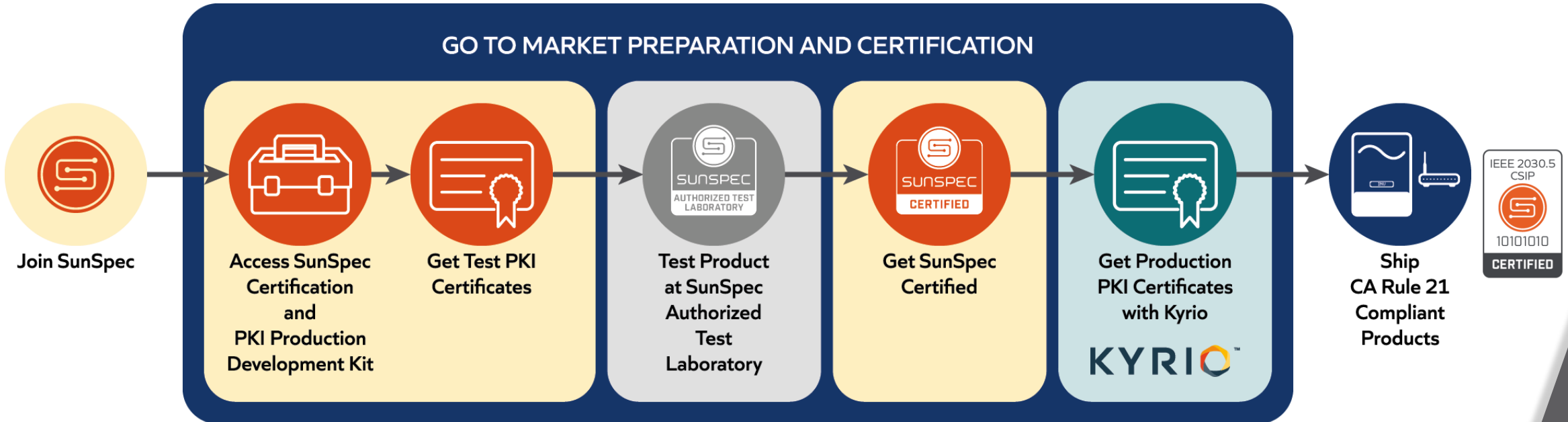


DER Circuit Penetration: Safe At 100%+



ES 2: Normalized tap operation (left) and line losses (right) as a function of increasing PV penetration. The left image has two y axis. The right axis represents the average tap operations per day of the feeder with increasing PV penetrations. The left axis represents normalized tap operations of the feeder in the presence of SI.

Cost Efficiency From Standardization



- Standard communication interface eliminates network integration cost
- Standard PKI ensures uniform, low-cost cybersecurity solutions

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