IEA TCP ISGAN - SIRFN
International Development of Evaluation Platforms for Electrical and Interoperability DER Certifications

The Smart Grid International Research Facility Network (SIRFN) *DER Testing Protocols* Task accelerates interoperable DER integration by improving certification procedures using automated test platforms

INTERCONNECTION STANDARDS FOR POWER SYSTEMS CONTROL AND STABILITY

Countries around the world are grappling with the challenges of increased renewable energy on their power systems. To address these challenges, updated national grid codes require distributed energy resource interoperable grid-support functions. SIRFN is collaborating to develop a common certification software platform for device testing.

THE SYSTEM VALIDATION PLATFORM (SVP)

The SVP is a highly versatile software tool that orchestrates the operations of laboratory equipment, data acquisition systems, and the equipment under test (PV inverters, storage systems, or other distributed energy resources).
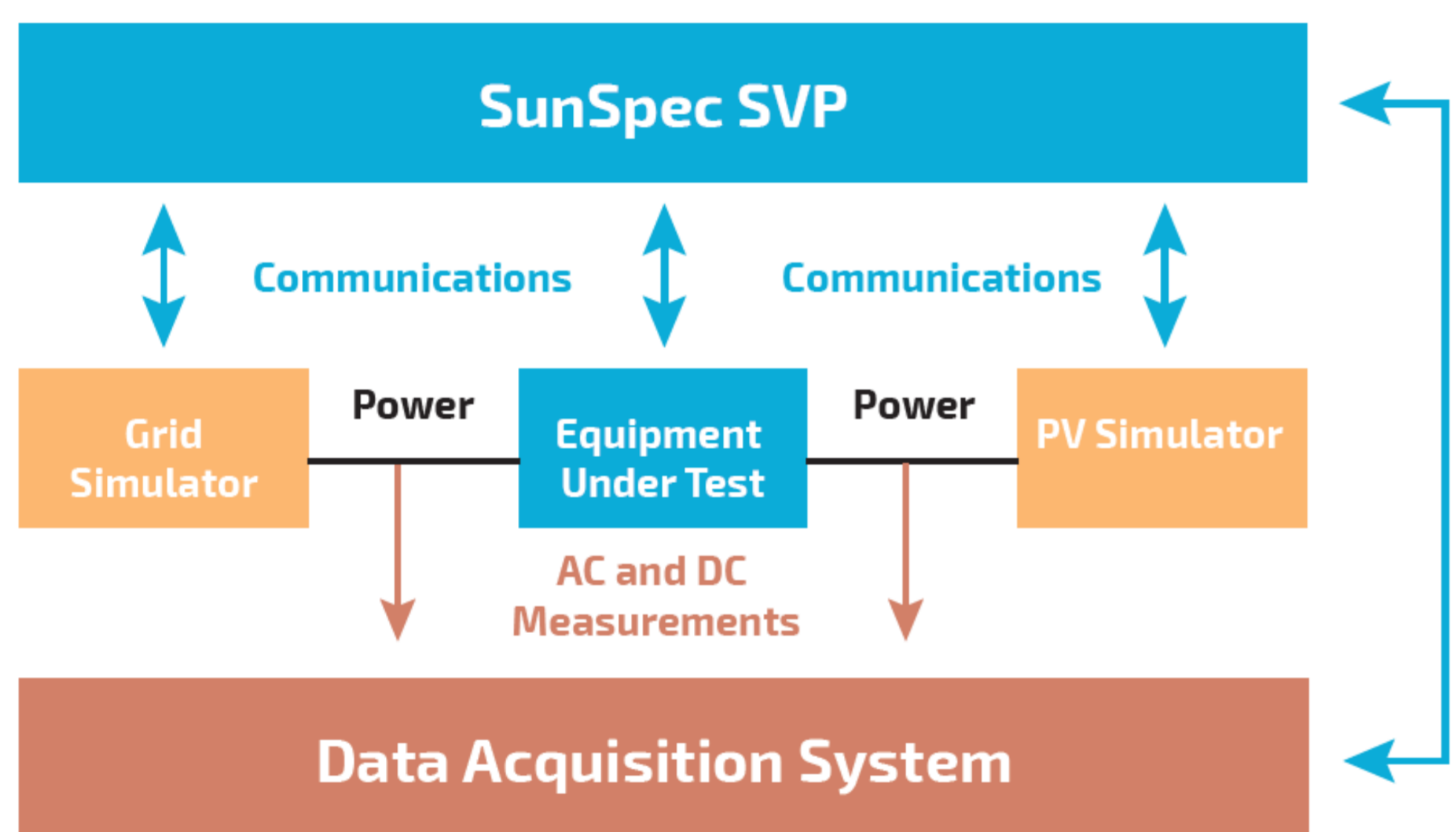
TEST PROTOCOL DEVELOPMENT

The SIRFN team has developed open-source automated test scripts for several DER certification protocols including:

- UL 1741 SA
  - Normal ramp rate, soft start ramp rate
  - Specified power factor, volt-var, and frequency-watt
- IEEE 1547.1-2020
  - Constant power factor, volt-var, frequency-droop, and volt-watt
  - Limit active power, constant reactive power, active power-reactive power (watt-var), and prioritization of grid-support functions
  - Voltage ride-through, frequency ride-through, and rate of change of frequency (ROCOF) ride-through, and voltage phase-angle change ride-though
  - Interoperability for SunSpec Modbus, IEEE 2030.5, and IEEE 1815
- AS/NZS 4777.2
  - Constant power factor, constant reactive power, and volt-watt

To run the experiments the team has created drivers for many common laboratory devices:

- DER protocols – SunSpec, IEEE 2030.5, IEEE 1815, Modbus
- HIL systems – Opal-RT, Hyphoon HIL
- Data Acquisition – LabVIEW, Tektronix, Yokagawa, DEWETRON
- DC Simulators – Ametek TerraSAS, Chroma, Keysight, NHR
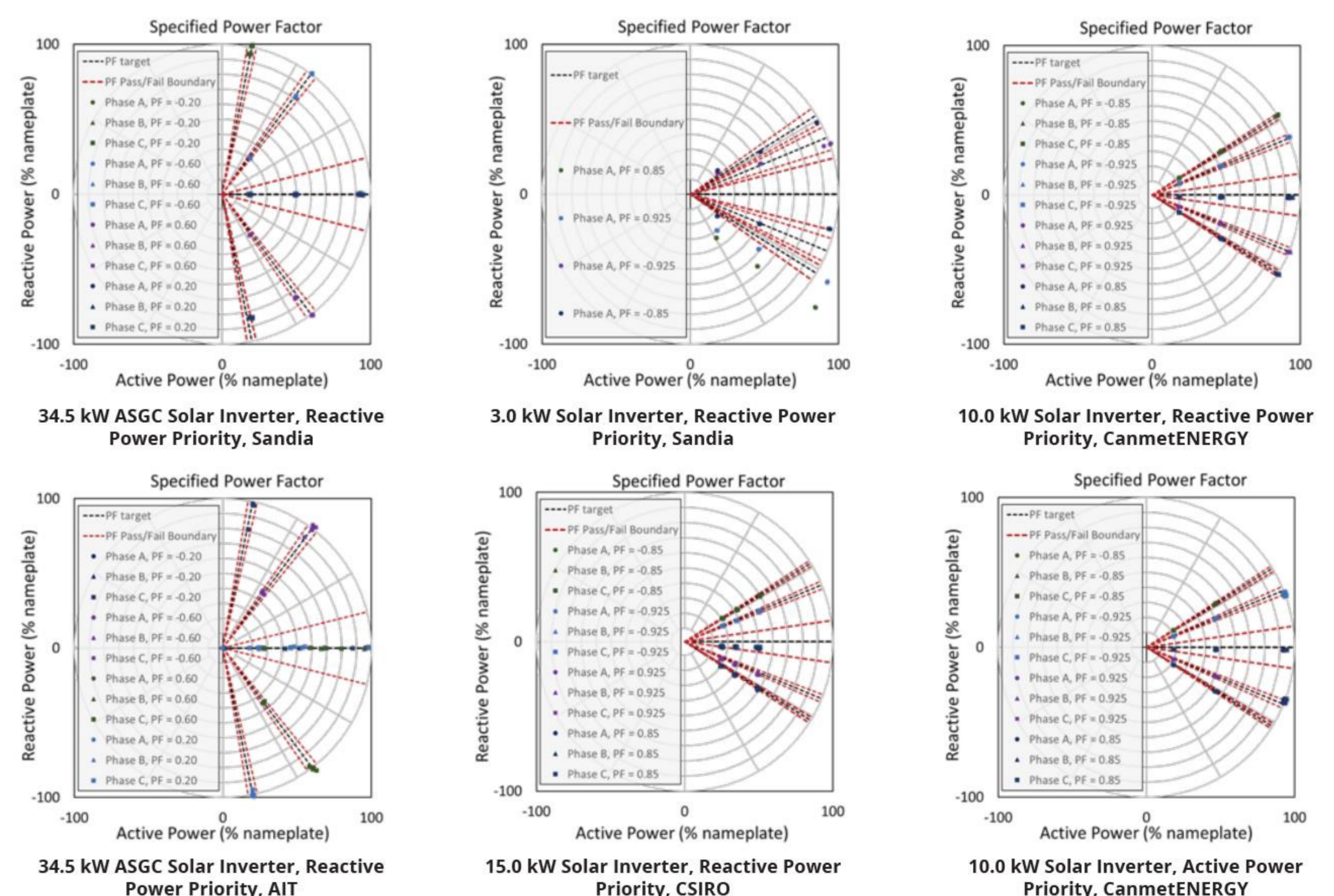- Grid Simulators – Ametek, Chroma, Pacific, Spitzenberger Spiess, SunRex

SMART GRID INTERNATIONAL RESEARCH FACILITY NETWORK (SIRFN) DER TESTING PROTOCOL WORK GROUP

Researchers from world-class research institutions on three continents are creating a common certification platform (the System Validation Platform) to accelerate the adoption of renewable energy technologies.

EXAMPLE RESULTS

To demonstrate the use of the SVP, Underwriters Laboratories 1741 Supplement A (SA) volt-var (VV) and specified power factor (PF) test results from multiple laboratories were compared. The same testing logic was used at multiple laboratories to generate PF results per the UL 1741 SA test procedure.

34.5 kW ASGC Solar Inverter, Reactive Power Priority, Sandia

3.0 kW Solar Inverter, Reactive Power Priority, Sandia

10.0 kW Solar Inverter, Reactive Power Priority, CanmetENERGY

34.5 kW ASGC Solar Inverter, Reactive Power Priority, AIT

15.0 kW Solar Inverter, Reactive Power Priority, CSIRO

10.0 kW Solar Inverter, Active Power Priority, CanmetENERGY

OPEN-SOURCE SOFTWARE

- SunSpec System Validation Platform, https://sunspec.org/sunspec-svp
- SVP equipment drivers, https://github.com/jayatsandia/svp_energy_lab
- IEEE 1547.1 test scripts, https://github.com/jayatsandia/svp_1547.1
- UL 1741 SA test scripts, https://github.com/jayatsandia/svp_UL1741SA
- AS/NZS 4777.2 scripts, https://github.com/BuiMCanmet/DR_AS-NZS-Scripts