



Overview

The DERSec DER Simulator (DERSim) is a powerful tool for emulating interoperable Distributed Energy Resource (DER) devices. It provides a comprehensive environment for simulating **real-time DER interoperability and electrical behavior** scenarios, enabling users to load test head-end systems, validate compliance with industry standards, and train security teams on DER protocol interactions. The simulator demonstrates steady-state IEEE 1547-2018 compliance and can reproduce behaviors associated with IEEE 1547.1-2020 and UL 1741 SB test conditions.

Supported Device Types

- ▶ **Single-Phase, Split-Phase, and Three-Phase PV Inverters**
- ▶ **Single-Phase, Split-Phase, and Three-Phase Energy Storage Systems (Batteries)**
- ▶ **Three-Phase Natural Gas and Diesel Gensets and other Synchronous DER**

Hybrid PV+battery systems, site/microgrid equipment, and load profile simulations are also supported.

Interoperability & Communication Protocols

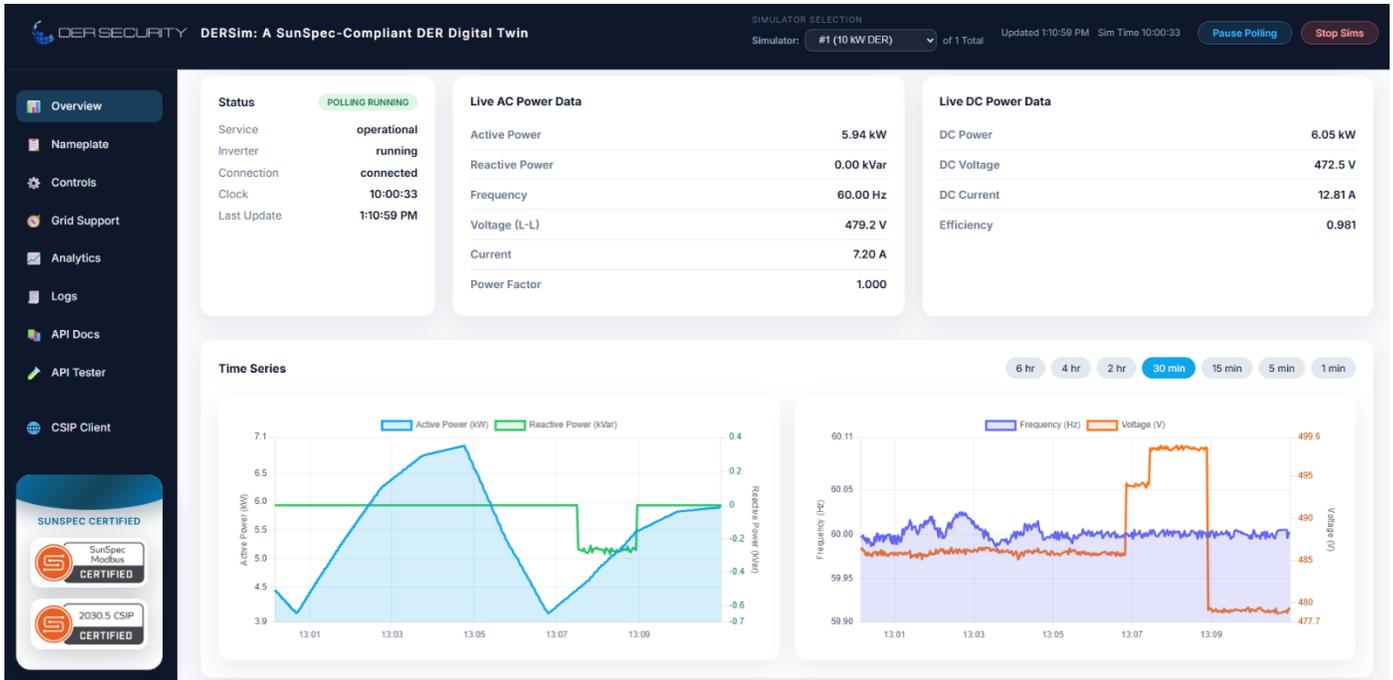
DERSim implements a **SunSpec Modbus server, DNP3 outstation**, and/or an **IEEE 2030.5 CSIP client** to provide standardized communication interfaces. The equipment nameplate parameters and functionality can be customized by loading a JSON file representing the device interface. AC and DC measurement values update in real-time, nameplate and settings information are served, and the SunSpec 700-series models with associated IEEE 1547-2018 grid-support functions are fully respected. TLS encryption is supported for both Modbus and IEEE 2030.5 sessions.

IEEE 1547 Grid-Support Functions

- ▶ **Volt-Var Control** — Configurable curves + VRefAuto
- ▶ **Volt-Watt Control** — Adjustable voltage-watt response
- ▶ **Frequency Droop** — Frequency-watt droop response
- ▶ **Watt-Var Control** — Configurable watt-var curves
- ▶ **Trips and Ride-Throughs** — Voltage and frequency
- ▶ **Power Factor** — Adjustable power factor targets
- ▶ **WSet / WMaxLimPct** — Active power limit controls
- ▶ **Reactive Power Settings** — QSet controls
- ▶ **Nameplate & Settings** — Full nameplate and settings
- ▶ **Live Measurements** — Complete power telemetry

Why DERSec DER Simulator

<p>⚡ Standards Compliant IEEE 1547-2018, IEEE 1547.1-2020, and UL 1741 SB compliant simulation behaviors.</p>	<p>🔌 Multi-Protocol SunSpec Modbus (including Secure SunSpec with TLS), IEEE 2030.5 CSIP, and DNP3 protocol support.</p>
<p>🛡️ Security Training Built-in compromised behavior engine for realistic DER cyberattack simulation and SOC training.</p>	<p>🚀 Scalable Deployment GUI, REST API, or standalone binary. Can simulate multiple concurrent DER devices with auto-incrementing ports.</p>



DERSec DER Simulator provides real-time visualization of power measurements, grid-support functions, and protocol traffic.

Deployment Options

The DER Simulator offers flexible deployment methods to suit different workflows. Run it directly from the [DERSec LabTest GUI](#) for interactive testing or deploy as a [standalone Docker container or Linux binary](#) for embedded and production environments. In either case, users can automate test cases via [REST API](#) for scripted and CI/CD workflows. Multiple simulated devices can be launched with a single instance of the software to accelerate data collection and test coverage.

Cybersecurity Testing

The simulator includes a [compromised behavior engine](#) that can simulate various attack scenarios against DER devices. Operators can trigger SunSpec Modbus readback modifications to emulate data falsification, measurement tampering, settings manipulation, and identity spoofing. This capability enables security teams to validate detection systems, train SOC analysts, and test incident response playbooks against realistic DER attack scenarios.

Target Use Cases

Load Testing	Compliance	Security Testing	Integration
Stress test DERMS and head-end systems	Validate IEEE 1547 and UL 1741 SB behaviors	Red team and SOC training with attack simulation	Validate SCADA, DERMS, and IDS integrations

Proven Technology

Built on years of extensive certification tests, DERSec DER Simulator provides a physics-informed, standards-compliant emulation environment trusted by utilities, national laboratories, and DER equipment manufacturers. The simulator integrates seamlessly with the DERSec product suite including DERSec LabTest and DERSec Sentry for end-to-end DER interoperability testing, compliance validation, and cybersecurity assessment.

Ready to simulate your DER fleet? Contact us at info@dersec.io | dersec.io