

Grid Modernization Solutions

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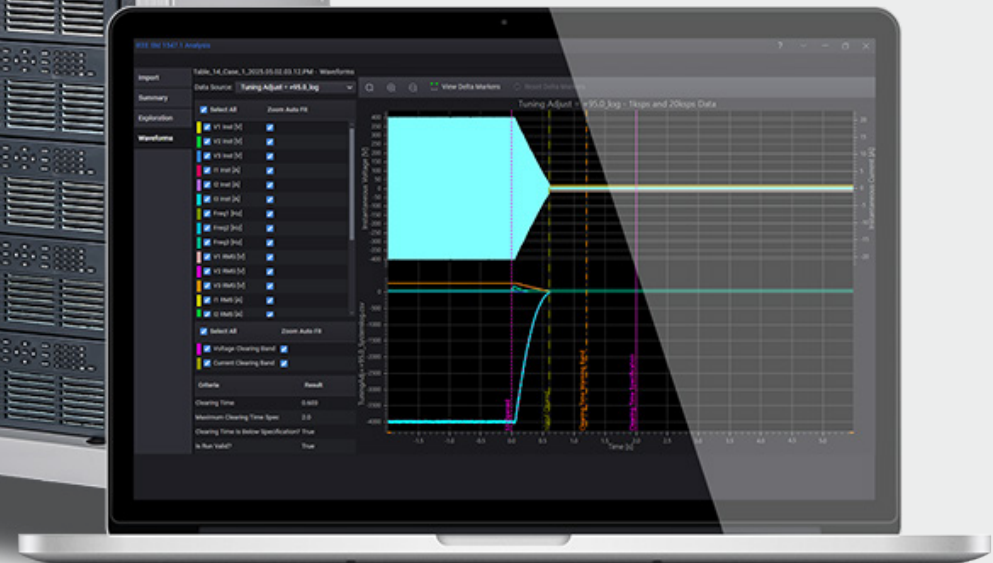


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Introduction

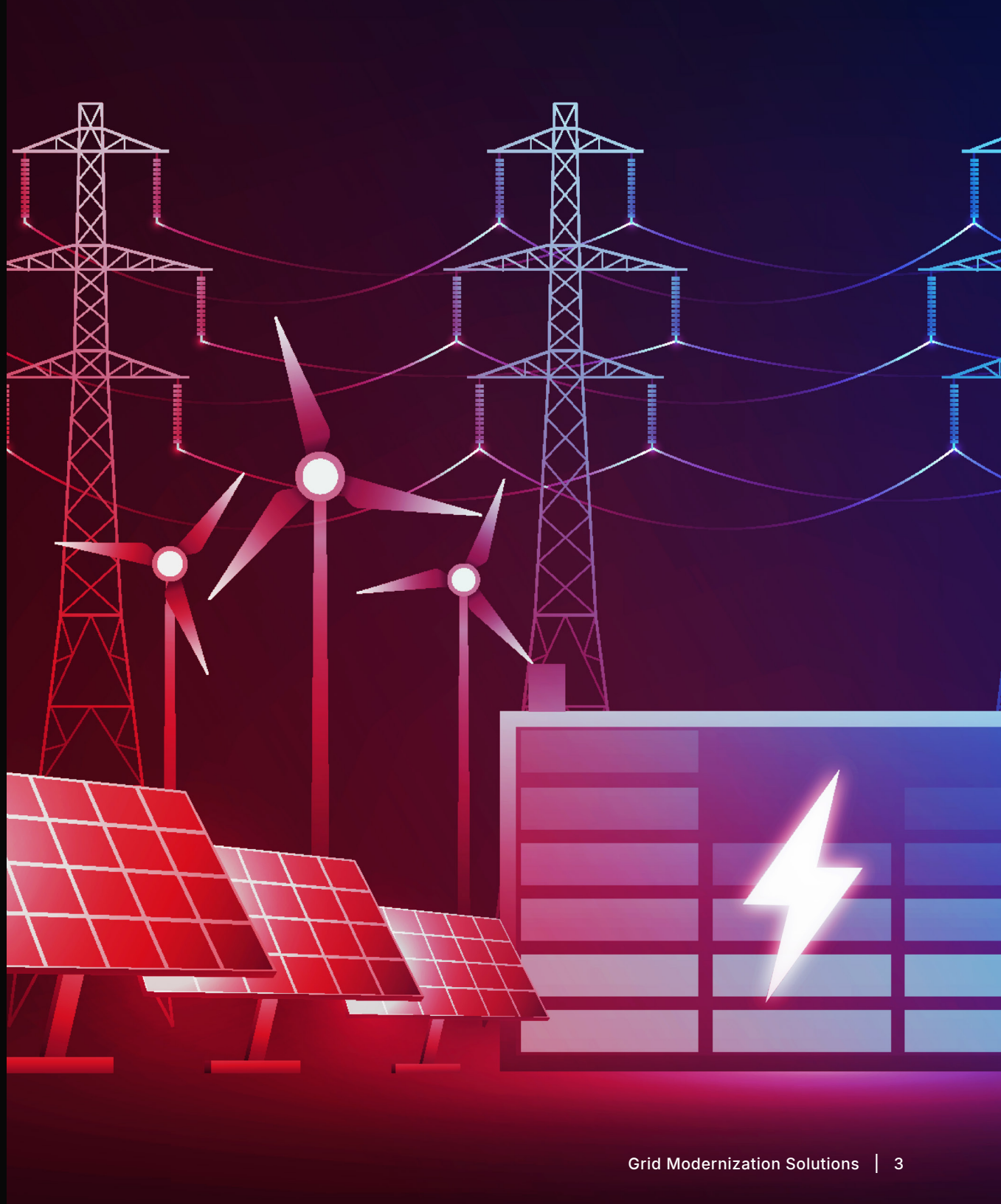
Modernize the Grid Without Compromise

The energy landscape is evolving fast, driven by rising power demand, grid modernization pressures, expanding DER integration, and increasingly complex regulatory standards. Keysight accelerates grid modernization from concept to connection with integrated, standards-compliant grid simulation and emulation solutions. These tools enable utilities, OEMs, and energy stakeholders to modernize the grid while ensuring you can validate interoperability, safety, and resilience from design through deployment.

Did you know you can access grid modernization test solutions without tapping into your CapEx budget?

KeysightAccess provides subscription-based access to Keysight's advanced test systems, software, and expert support—when and where you need them. Available in select geographies.

[> Learn more](#)



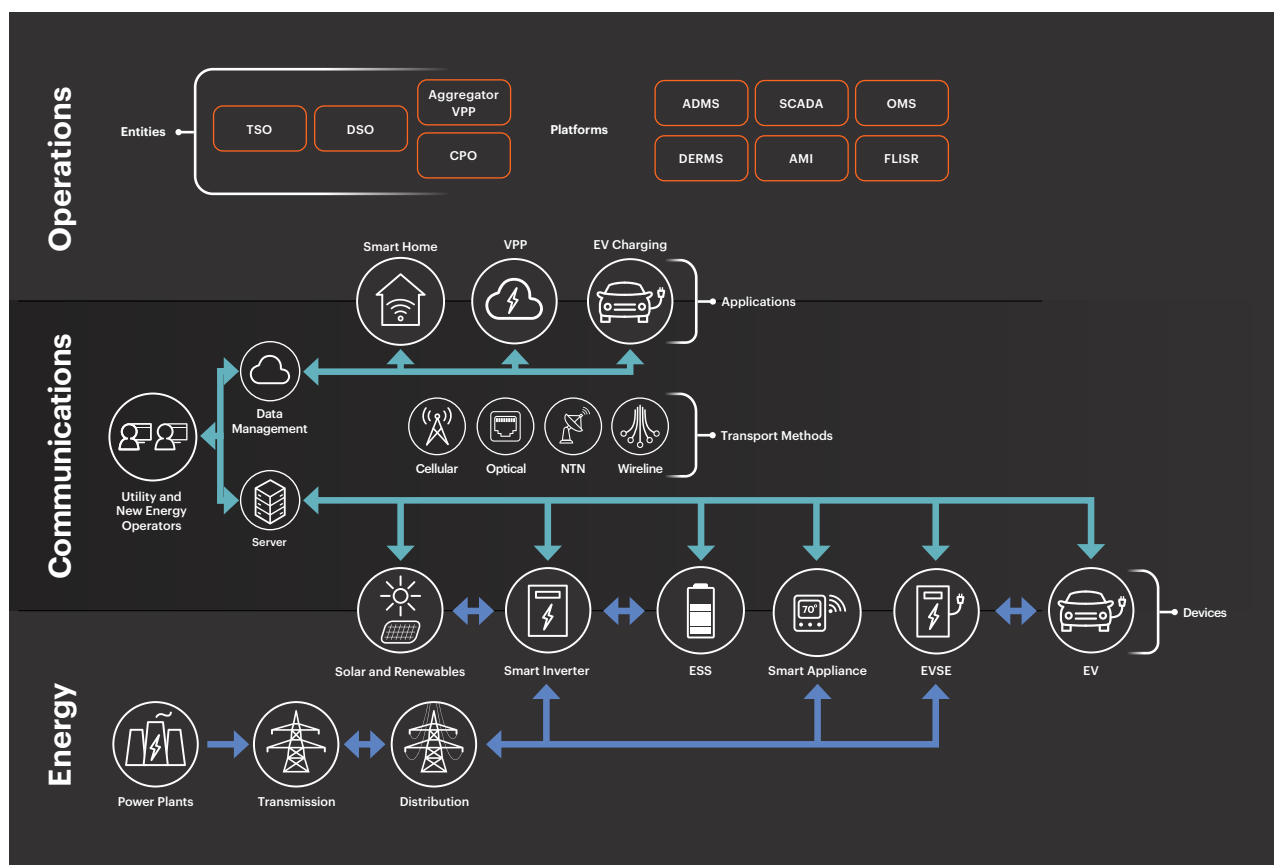
Compliance and Security for Connected IBR / DER Designs

For cross-functional engineering teams developing advanced inverter-based resources (IBR) and distributed energy resources (DER), Keysight's design and validation solutions facilitate integration by seamlessly combining power and communications testing.

Accelerate DER compliance and assess cybersecurity readiness with proven measurement solutions grounded in deep standards expertise.

Understand the power grid transformation ecosystem at the energy, communications, and operations levels with this visual tool.

See how grid modernization strategically converges operations, communications, and energy, highlighting the tightly coupled technologies, operational risks, and decisions across an increasingly complex grid ecosystem.



[Download poster](#)

PHIL-Based Automated Anti-Islanding Test Solution

Validate DERs with power hardware-in-the-loop (PHIL) grid simulation for fast, repeatable grid compliance testing.

- Automated anti-islanding testing aligned with IEEE 1547.1-2020 / UL 1741 SB standards
- RLC autotuning technology eliminates manual tuning, reducing setup complexity and test time
- PHIL-based real-time simulation ensures reliable and fast testing

[More information](#)



Verify Standards-Compliant Performance of IBR and DER Devices

	Model	Features	
Grid simulation	SL1200A Series Regenerative AC / Grid Emulators	- Emulates worldwide electricity grids, 1-,2- or 3-Φ - Built-in resonant RLC autotuning - Parallel up to 810 kW	Get a Quote >
	SL1221A PHIL-based Anti-Islanding Compliance Test Automation Software (requires KS8400B)	- Enables automated PHIL anti-islanding test in SL1200 emulators - Automated data formatting and report generation	Get a Quote >
	KS8400B PathWave Test Automation	Test automation platform	Get a Quote >
V2G / EV emulation	SL1047A Charging Discovery System	- Tests charging interfaces of EVs and EVSE during high-power charging - Up to 1,500 V DC and $\pm$ 800 A DC	Get a Quote >
	SL1800A Series Regenerative DC Emulator	- Bi-directional power flow - Achieve high-power DC charging test up to 300 kW; parallel for up to 1.5 MW	Get a Quote >
	SL2000A Charging Discover Software	High-performance charging interface testing software	Get a Quote >



Vehicle-to-grid (V2G) / electric vehicle (EV) emulation solution

Test battery cells, modules, and packs

Model	Features	
SL113XA SL10XXA Series Cell Test Solution	• 0 to +6 V output voltage • $\pm 150 \mu\text{A}$ to $\pm 1600 \text{ A}$ output current • < 1 ms current dynamics • <0.05% current measuring accuracy	Get a Quote >
SL1001A Battery Module Test Solution	• $\pm 68 \text{ kW}$ output power per channel and voltage range up to 300 V • Voltage applications from 20 V to 300 V • Communications with battery management system • Bidirectional regenerative source / sink	Get a Quote >
SL1700 Series Battery Pack Test Solution	• SiC technology for higher dynamics, precision, and efficiency • Up to 1.5 MW power due to parallelization • Cost-effective operation with energy recovery capability of 96%	Get a Quote >
SL1091A Energy Storage Discover Software	• Run function, aging, environment, and performance tests • Perform standardized and standard-compliant tests (for example, ISO, DIN EN, SAE) • Obtain powerful visualization of test analytics	Get a Quote >
EP1150A PathWave Lab Operations for Battery Test	• Register and track test objects in your lab • Analyze your data and statistics • Control your lab and its devices anywhere, anytime	Get a Quote >



Accelerate Testing with Regenerative DC Power Supplies

Validate grid-connected battery energy storage systems (BESS) by emulating load conditions, capturing grid events, and proving inverters and controls over long durations.



End-to-End Power Solutions for Grid Testing

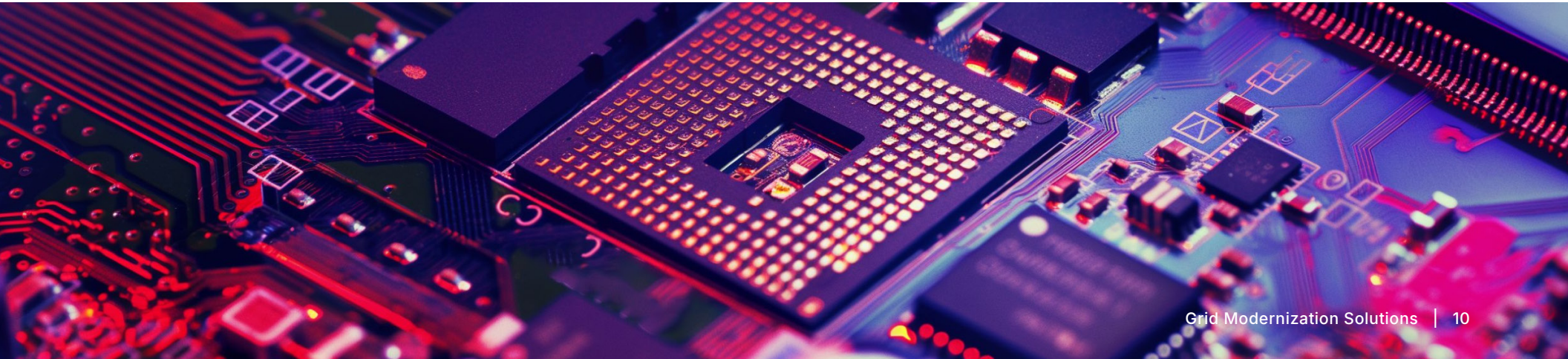
Use Case	Recommended Models	
Versatile DER and IBR applications	Bidirectional Regenerative Power Supply • 5 kW to 30 kW models • Supports up to 1.05 MW power or loading through easy parallel connection	Get a Quote >
Battery cycling for durability testing	Regenerative Electronic Load • 2 kW to 6 kW models • Regenerative electronic load enables long-duration discharge testing with energy recovery	Get a Quote >
Emulating BESS in inverter validation	Regenerative Power Supply • 4 kW to 12 kW models • Regenerative source simulates dynamic battery behavior across SOC ranges	Get a Quote >
Grid-connected BESS behavior simulation	Regenerative Power Supply • Paralleled units up to 192 kW • Supports up to 800 V / 240 A per unit; scalable to full system loads	Get a Quote >
Reducing test energy and cooling load	Regenerative Power Supply and Regenerative Electronic Load models • Regenerative operation returns energy to the grid, lowers lab power and cooling costs	Get a Quote >
For space-constrained test labs	High-Density Power Supply • 1.5 kW models • Compact form factor for tight benches or data center racks	Get a Quote >

Achieve accurate power electronics modeling, design, and simulation

Accelerate your electronic design automation (EDA) workflow and ensure your power electronics (PE) designs are accurate, reliable, and built for optimal performance in mission-critical high-power grid and energy applications.

Keysight EDA Model	Features	
W3631B ADS Core + EM Design + Layout + PEPro + PE Ckt Sim	Built for power converter design for power generation and transmission, aerospace-defense, automotive, data center, consumer electronics, and IoT applications.	Get a Quote >
W3026E PE Circuit Simulation	Includes transient / convolution and a power electronics library	Get a Quote >
W3035E PEPro	Includes method of moments planar simulation and finite element method for 3D effects	Get a Quote >
W7016E IC-CAP Power Electronics PowerMOS SiC Extraction Package Add-on	Keysight PowerMOS SiC model for SiC and Si power devices for power electronics applications	Get a Quote >
W7017E IC-CAP Power Electronics IGBT Extraction Package Add-on	Keysight IGBT model for power electronics applications	Get a Quote >
W7018E IC-CAP Power Electronics GaN Extraction Package Add-on	ASM-HEMT model for power electronics applications	Get a Quote >

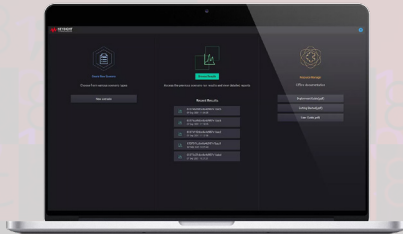
[Request a Free Trial](#)



Secure Your Grid-Connected Devices

Secure IBR and DER devices against exploitable vulnerabilities and side-band channels that bypass primary security controls, to ensure resilient and compliant grid operations.

IoT Security Assessment



Assess and strengthen the security of grid-connected IoT devices by identifying vulnerabilities and ensuring compliance with industry standards.

[Get a Quote >](#)

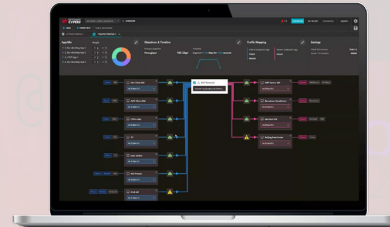
Device Vulnerability Analysis



Identify and mitigate security weaknesses in grid-connected devices through fault injection and side-channel analysis.

[Get a Quote >](#)

Network Security and Device Test



Enhance grid security by simulating threats, eliminating blind spots, and maintaining control over evolving attack surfaces.

[Get a Quote >](#)

Threat Simulator



Emulate real-world cyberattacks to assess and strengthen the resilience of grid networks and control systems.

[Get a Quote >](#)

Troubleshooting Your IBR / DER Prototypes?

Engineers need to capture and analyze fast, transient electrical signals with high accuracy to validate the stability, protection, and power quality of DER and IBR prototypes under dynamic grid conditions.

Inaccurate measurement of these transients can lead to flawed designs, compromised reliability, and potential grid instability during real-world operation.

Using the right oscilloscopes and probes can help you to visualize and diagnose voltage and current anomalies in DER and IBR prototypes, helping identify issues such as switching transients, harmonics, and control signal errors before these systems are deployed on the grid.

> More information



Model

Features

HD304MSO InfiniiVision HD3 Series Oscilloscopes	- Increases vertical resolution by four times with a 14-bit analog-to-digital converter (ADC). - Sees smaller signals with a 50 μVRMS noise floor. - Find signal glitches with a fast 1.3 M waveform / second update rate.	Get a Quote >
N7020A Power Rail Probe	- Measures large transitions with a $\pm$ 850 mV active signal range. - Finds high-speed transients with 2-GHz bandwidth. - Enables maximum sensitivity with low DC loading.	Get a Quote >
N2820A AC / DC Current Probe (2-Channel)	- Provides high sensitivity: 50 μA – 5 A - Wide dynamic range: 20,000:1 or 86 dB - Bandwidth: 3 MHz (zoom-out channel) 500 kHz (zoom-in channel)	Get a Quote >

Troubleshoot electrical integrity issues.

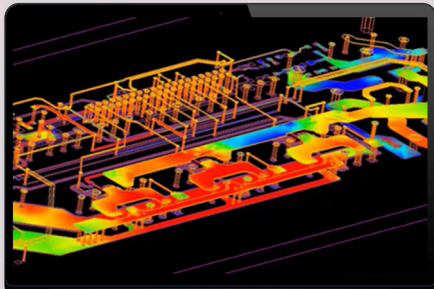


Increase Reliability in Your IBR and DER Power Converter Designs

Multiple high-power conversions occur across the modernized grid: from battery energy storage systems, to solar inverters, transmission and distribution systems, as well as electric vehicles and charging infrastructure. Wide-bandgap materials such as Silicon carbide (SiC) and Gallium nitride (GaN) are enabling increased power conversion efficiency. Now you can model modern materials and switch-mode power supplies to optimize power device designs for maximum efficiency.

W3631B

Advanced Design System Core

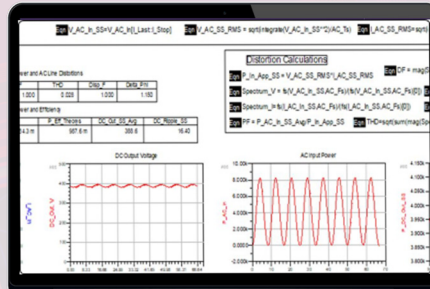


Accelerate your GaN and SiC switched-mode power supply (SMPS) designs. Address challenges such as high switching speeds, board parasitics, and electromagnetic interference.

[Get a Quote >](#)

W3035E

PEPro Virtual EMI Test Environment

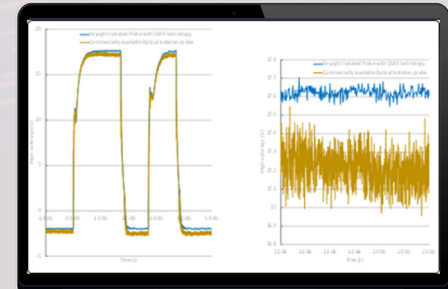


Detect and resolve electromagnetic interference (EMI) issues early to reduce costly validation and ensure compliance with EMI and EMC standards.

[Get a Quote >](#)

PD1550A

Advanced Dynamic Power Device Analyzer



Conduct reliable and repeatable characterization of your GaN and SiC modules and devices. Meet evolving JEDEC standards for wide bandgap power semiconductor testing.

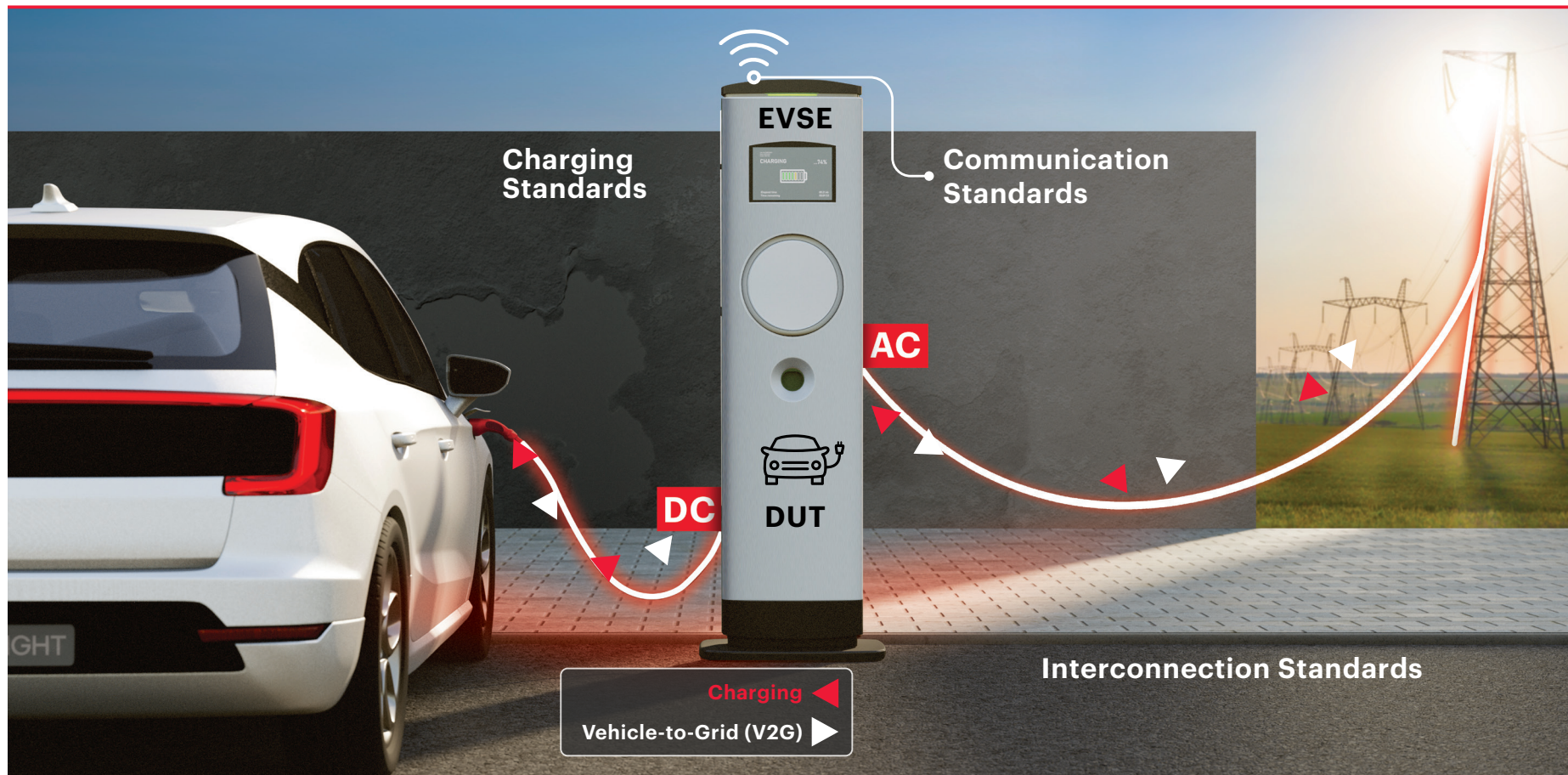
[Get a Quote >](#)

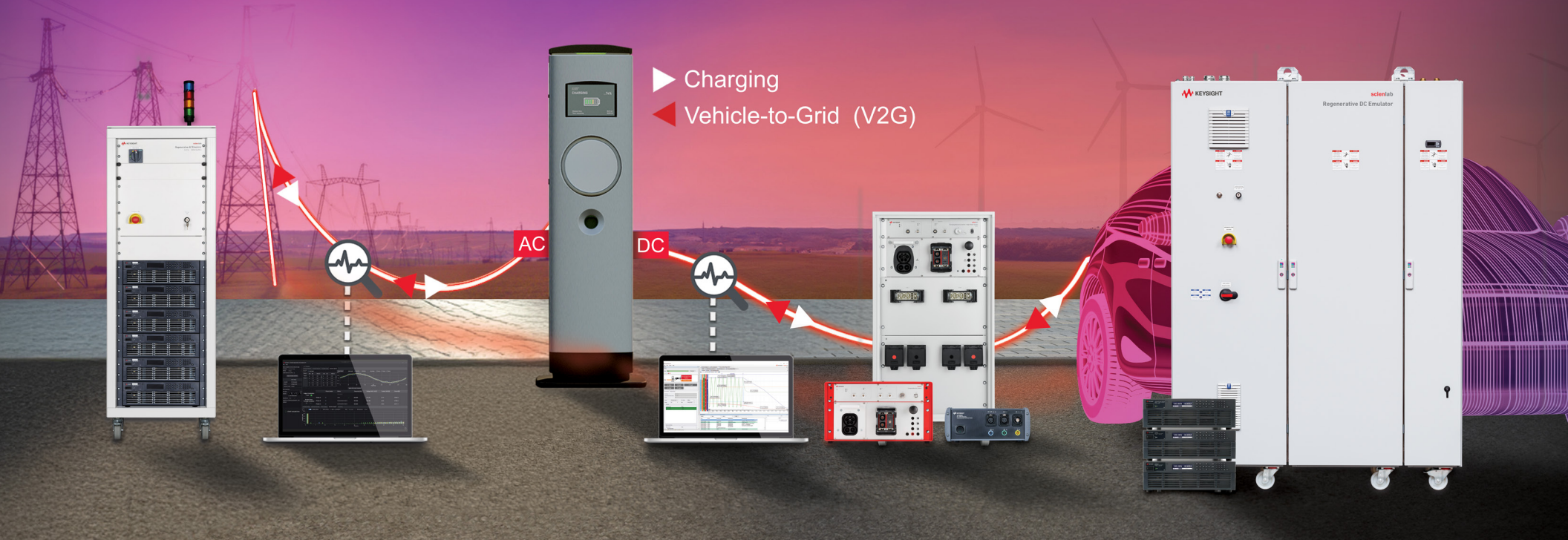
Integration and Deployment Solutions for Energy and Grid Systems

For lab managers and system integrators validating critical energy systems, Keysight's proven design and emulation solutions combine power, controls, and communications testing under real-world conditions for more confident deployments. Achieve interoperability through cross-domain validation, consistency with repeatable test configurations, and scalability with modular, software-driven measurement solutions.

Industry standards ensure the interoperability of grid and energy systems. Learn more about interconnection, communications, and charging standards.

[Download poster](#)





Emulate Vehicle-to-Grid Integration with Hardware-in-the-Loop Design and Validation

SL1200A Series Regenerative 3-Phase AC Emulator

- 3-phase AC output up to 1200 VL-L; up to 130 A; up to 810 kW / 1.08 MVA
- 1200 VL-L without need for expensive transformer
- Save energy with 100% regenerative (bidirectional) power solution with > 85% efficiency

SL1040A / SL1047A Charging Discovery System

- Up to 1,500 V DC and ± 600 A DC
- Automated functional, conformance, interoperability, and quality testing
- Extensive Test Case Library for automated conformance testing of CCS, CHAdeMO, and GB/T standard

SL1800A Series Regenerative DC Emulator

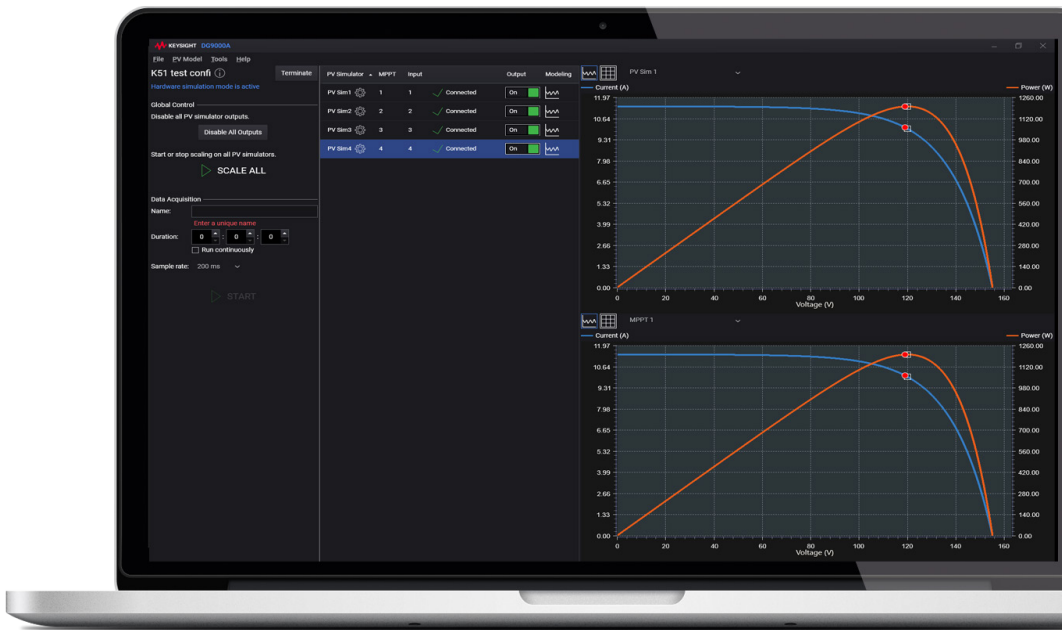
- High-power DC charging test up to 300 kW in a small footprint
- Parallel systems for up to 1.5 MW
- Available for high voltage, high-power applications
- Energy-efficient source and sink mode (96%)

Simulate Photovoltaic Arrays for Validating Your Solar Inverter Designs

Model	Features	
PV8900 Series Photovoltaic Array Simulator	• Test PV voltages up to 2000 V and 60 A with a single supply • Test up to 600 kW channels with parallel units • Allow built-in curves or custom table using up to 1024 points	Get a Quote >
DG9112A Advanced Photovoltaic 12-Input Inverter Test Software	• Evaluate single and multi-input inverters; tests up to 12 MPPT algorithms simultaneously, with inputs up to 2000 V • Create, scale, and download custom I-V curves for each channel • View a dashboard of aggregated real-time measurements of voltage, current, power	Get a Quote >



Simulate solar arrays to test your inverters.



Visibility Solutions for Grid Cybersecurity and Resilience

For network operators optimizing complex communication systems, Keysight's network solutions and visibility platforms ensure performance and security across every stage of the network lifecycle, from deployment to monitoring.

By combining AI / ML-driven visibility with comprehensive analytics, these solutions deliver actionable insights that reduce risks, costs, and response times, enabling intelligent, automated networks that operate efficiently and securely at scale.



Assess the Resilience of your Grid and Communication Systems

Connecting supervisory controls and data acquisition (SCADA) systems and operational technology devices via the Internet has significantly improved accessibility, automation, and efficiency, but it also introduces vulnerabilities. Every communication line is a potential attack surface. Because of this, testing your systems designs for withstanding cyber threats is imperative.

Keysight's high-fidelity network emulator, EXata Network Modeling, helps you to simulate the underlying SCADA communication fabric of electrical grids, and to test the cyber-resilience of such systems.

EXata Network Modeling is integrated with OPAL-RT's HYPERSIM simulator on the same hardware (or box) to offer a complete real-time cyber-physical solution for the development, testing, and assessment of electrical grids with communication networks.

[Learn more](#)



Monitor Wireless Communications Systems in Your Grid Infrastructure

Wireless networks are now a core communications layer of the modernized grid, connecting advanced meters, field devices, substations, DERs, and operators with secure, scalable telemetry and control.

Now you can ensure mission-critical cellular connectivity across private and public grid networks through predictive network monitoring with Keysight's Nemo Wireless Network Solutions:

- Monitor 5G networks for service level agreement metrics like ultra-reliable low-latency communications (URLLC), massive machine-type communications (mMTC), and enhanced mobile broadband (eMBB).
- Remotely monitor live networks and visualize key performance indicators (KPIs) such as latency, data connection quality, voice and video quality, and data throughput in real time.



The Keysight Nemo Industry Probes allow you to carry out autonomous remote-controlled wireless communication measurements in harsh indoor environments.



Ensure Storefront QoS for Utilities

Grid modernization is turning the utility web and mobile app experience into real-time operations surfaces with critical impact on customer satisfaction and confidence. Some customer touchpoints that utilities service providers need to monitor for quality of service (QoS) include advanced metering infrastructure (AMI), home and energy management systems (HEMS), and EV charging apps.

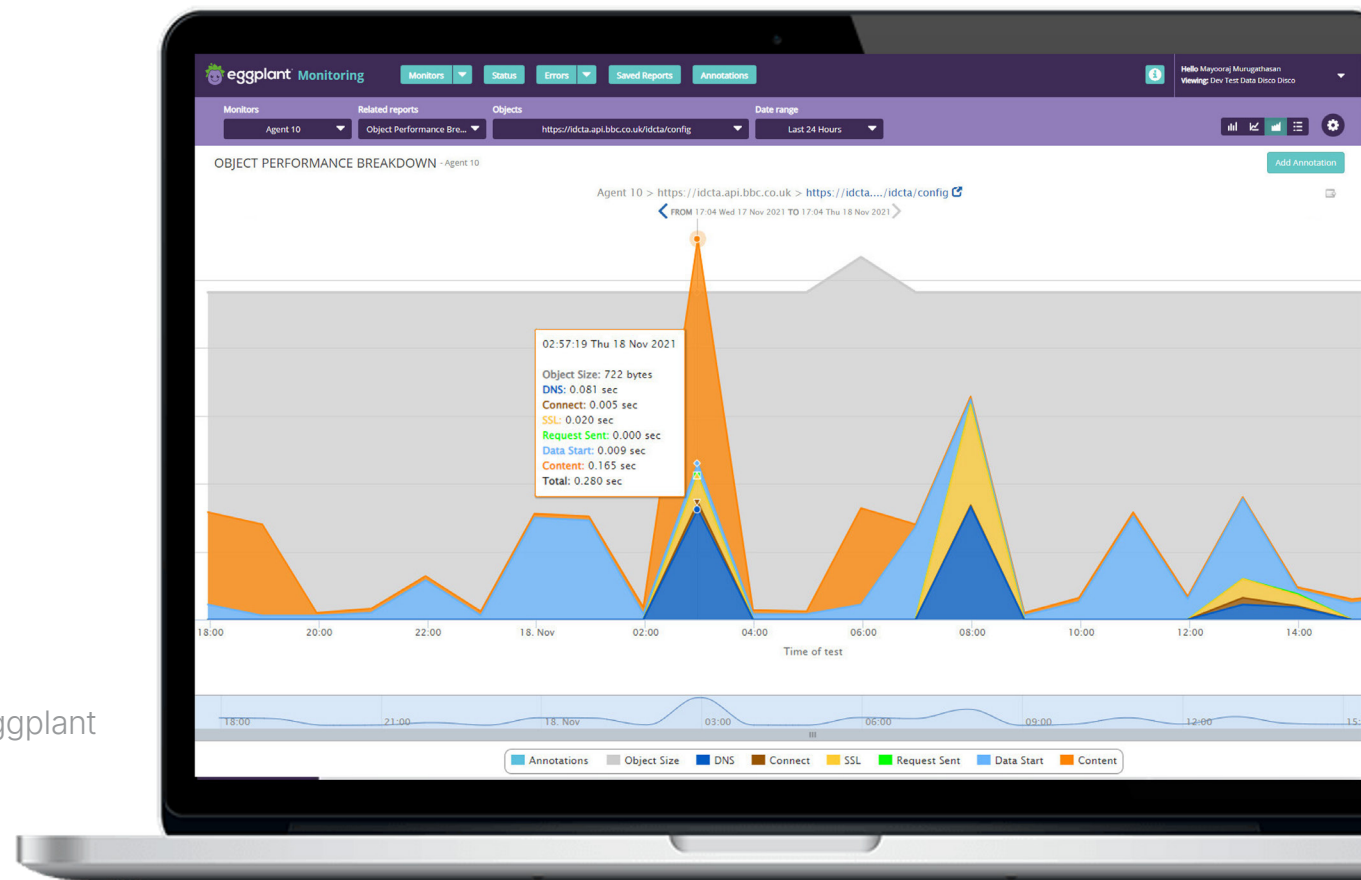
As these web interfaces provide real / near-real-time usage, outages/restorations, prices, and availability, any latency, data drift, or downtime directly erodes customer trust and program performance. Continuous, end-to-end monitoring of the storefront pages, application programming interfaces, maps, and payment flows is essential.

Keysight Eggplant Monitoring gives you real-time visibility into user journeys, helping you catch issues early:

- Simulate real user journeys to uncover friction points and improve the experience.
- Track key metrics with customizable dashboards and a native mobile app.
- Get real-time performance updates via SMS, email, XML, or RSS so you can act immediately.
- Use detailed reports to identify bottlenecks and optimize site performance.

 **Get a quote**

Keysight Eggplant
Monitoring



Transform Grid Cybersecurity with AI-Powered Network Visibility

As the power grid becomes more interconnected through AMI, DERs, EV charging, HEMS, and cloud-based operations, the cybersecurity attack surface continues to expand, raising risks to reliability, safety, and compliance.

AI-powered network visibility tools like Keysight Vision AI Insight Brokers process traffic at the edge, enrich data in real time, and use AI / ML to detect anomalies and emerging threats faster. By reducing tool load, lowering cloud costs, and enabling third-party security integration, these platforms accelerate response and streamline IT / OT security operations.



Accelerate Your Grid Modernization with Keysight Services

Let Keysight help you start off your grid transformation efforts with the technology you need, reduce risk and effort, and scale your operations more quickly and efficiently.



Financial Alternatives

Start with the technology you need while optimizing budgets. Explore our flexible alternatives to get the capabilities you need now



Support Services

Get going with less risk and less effort. Access support offerings and plans to maximize uptime, increase precision, and access expertise.



Managed Services

Scale your operations at greater speed and efficiency. Get managed asset and operational services delivered by the industry leader in test.

[> Learn more](#)

Explore Keysight grid modernization solutions



Keysight enables innovators to push the boundaries of engineering by quickly solving design, emulation, and test challenges to create the best product experiences. Start your innovation journey at www.keysight.com.

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