OPAL-RT TECHNOLOGIES

Start free trial

SPS Software: Power simulation you can trust

Continuity.
Performance.
Accuracy.

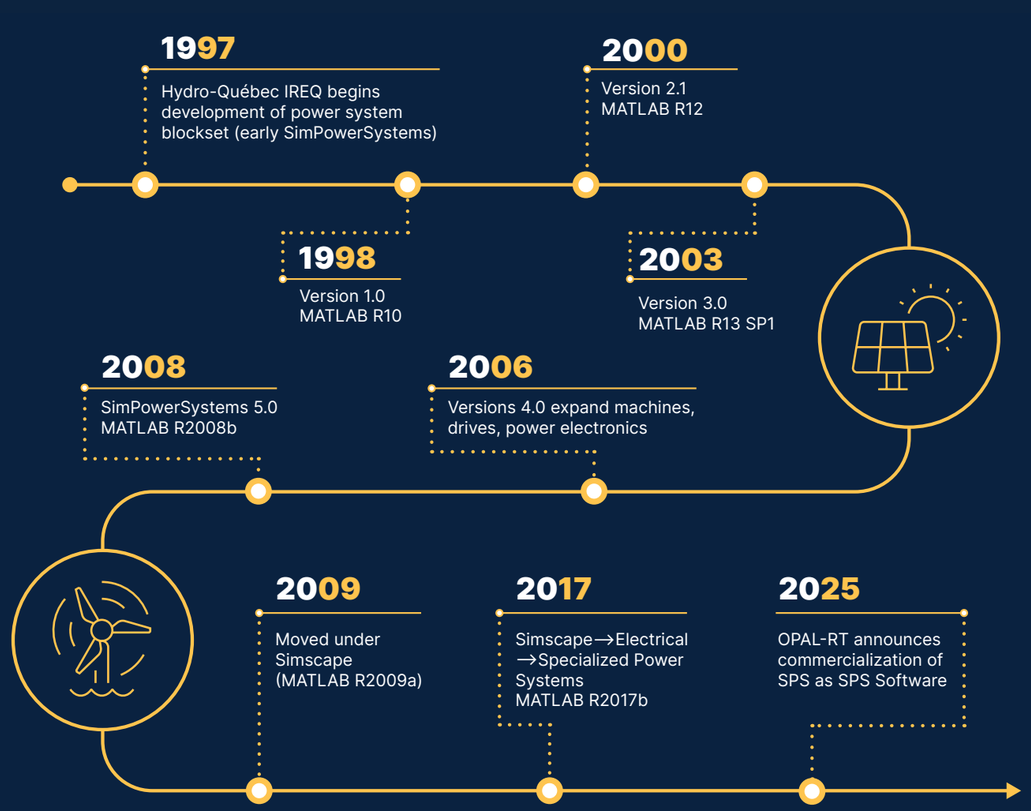
SPS Software

A new era for the SPS community

For over 30 years, SimPowerSystems (SPS) has been a trusted standard for power system modeling in MATLAB/Simulink, supporting engineers and researchers worldwide.

As MathWorks shifts toward Simscape Electrical, SPS users face a critical question: how to preserve existing models, workflows, and expertise without disruption.

SPS Software by OPAL-RT marks a turning point—ensuring continuity while enabling future innovation. More than a platform, it represents a renewed commitment to the SPS community, bringing users and experts together to shape the next generation of power system simulation.

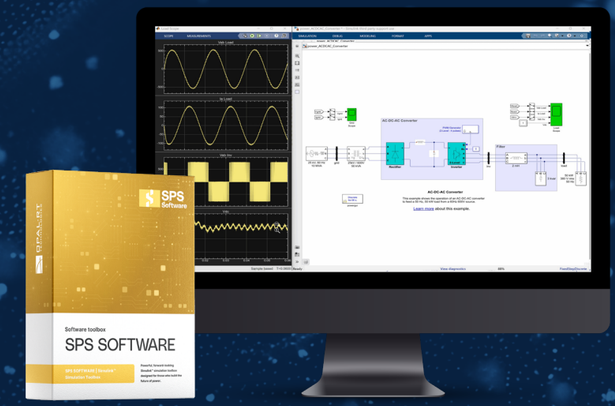


Introducing SPS software by OPAL-RT

Simulation is no longer optional—it is mission-critical.

Power systems are evolving rapidly

Modern electrical networks are no longer passive—they are dynamic, converter-driven systems shaped by renewables, HVDC, and advanced control strategies. As complexity increases, engineers must simulate faster events, larger systems, and more demanding scenarios—without compromising accuracy or stability.



WHAT THIS MEANS FOR YOU

Continuity without compromise

Preserve your models, workflows, and expertise

- 100% compatibility with SPS models
- No migration, redesign, or retraining
- Protection of validated engineering work

Performance at scale

Efficient simulation for growing system complexity

- Fast execution for large EMT studies
- Optimized solvers for switching systems
- Faster design, testing, and validation

Accuracy you can trust

High-fidelity EMT simulation for modern power systems

- Precise switching and converter modeling
- Reliable results for HVDC and microgrids
- Stable performance for complex networks

Why SPS software still matters

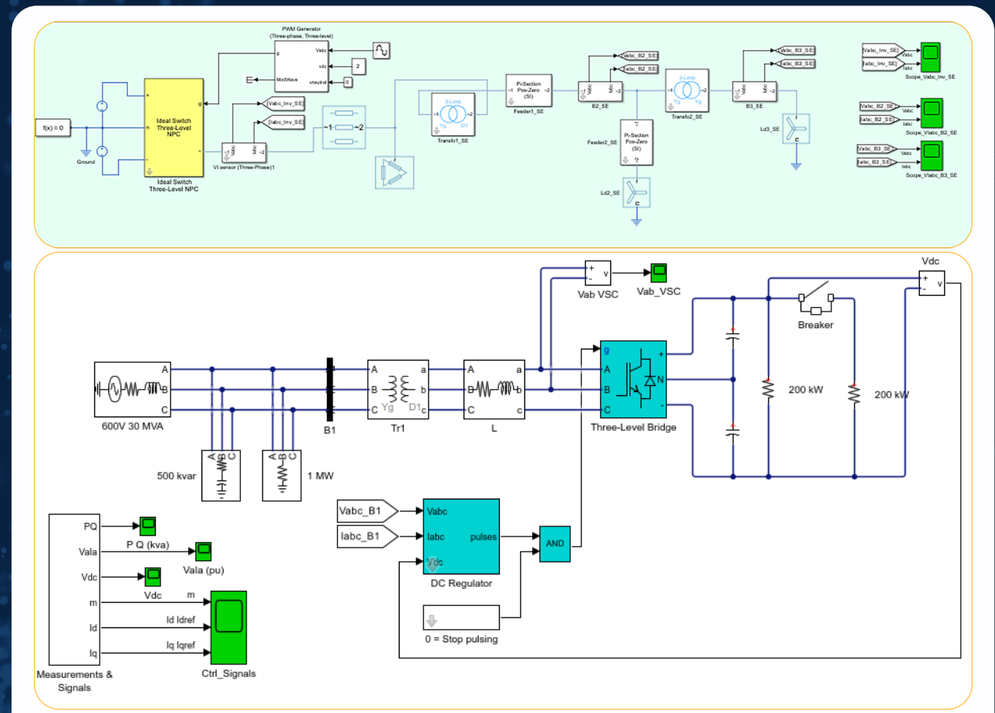
Engineering solutions for modern power system simulation

Challenges	Solutions
1. Limited model transparency Lack of visibility into system behavior makes debugging and validation difficult.	→ **Physics-based, transparent modeling** Full visibility into system behavior for easier debugging and control validation.
2. Slow simulation & limited iteration Long simulation times restrict testing, slowing design and validation cycles.	→ **High-performance EMT simulation** Faster execution enables more scenarios, quicker validation, and shorter development cycles.
3. Complex converter systems at scale Growing system complexity makes large networks difficult to model efficiently.	→ **Scalable modeling for large networks** Efficient handling of HVDC, MMC, and grid-scale systems without performance bottlenecks.
4. Risky & costly real-world testing Validating systems on hardware is expensive, time-consuming, and risky.	→ **Safe validation with real-time capabilities** Test controllers and system behavior in a controlled, risk-free environment.
5. Workflow disruption & model migration Tool transitions require rework, risking loss of validated models and expertise.	→ **Full continuity — no migration required** Reuse existing models, workflows, and expertise without redesign or retraining.

Proof in real systems

CASE EXAMPLE 1

NPC converter



A NPC Converter is a representative power electronics benchmark, commonly used to evaluate solver efficiency under switching dynamics and increasing state-space complexity.

Benchmark observations

Simulation tests showed that both SPS and Simscape Electrical can represent the inverter behavior accurately at small scale. However, scalability differences emerged as the number of internal states increased.

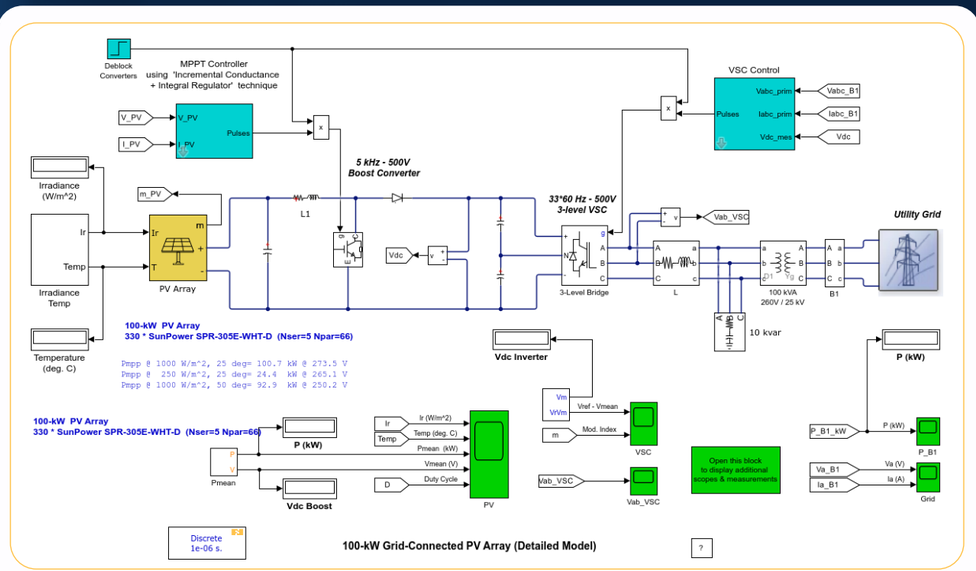
- SPS maintained consistent execution behavior as model complexity grew.
- Simscape Electrical exhibited increasing computational overhead, particularly during model preparation and execution under switching conditions.

Engineering implication

This case highlights the importance of solver scalability when moving from small converter models toward larger models.

CASE EXAMPLE 2

Grid-connected PV array



Grid-connected photovoltaic inverter models are increasingly important for renewable integration studies, particularly when assessing converter-grid interactions and control performance

Benchmark observations

- SPS provided efficient execution and well-established workflows for grid-connected PV EMT simulation.
- Simscape Electrical supported the modeling approach, but execution performance was less favorable, especially when detailed switching representations were required.

Observed practical limitations

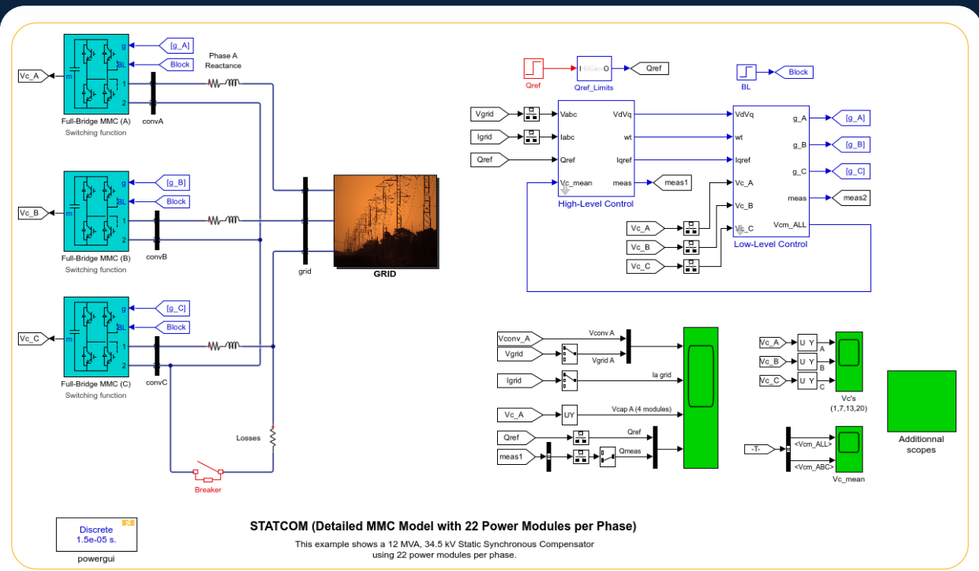
Benchmark implementation confirmed that simulation speed and solver overhead may constrain Simscape Electrical usability in renewable-rich grid EMT studies requiring repeated runs.

Engineering implications

As inverter-based resources become dominant in power systems, simulation efficiency becomes critical for system-level studies.

CASE EXAMPLE 3

MMC–STATCOM (22 Power Modules per Phase)



Modular Multilevel Converter (MMC) STATCOM systems are widely used in modern transmission networks for reactive power support and dynamic voltage regulation. With 22 power modules per phase, this benchmark represents a realistic converter-scale EMT challenge

Benchmark observations

- SPS executed the MMC–STATCOM benchmark with stable runtime performance suitable for iterative EMT studies.
- Simscape Electrical requires substantially longer execution time as the number of submodules increased, limiting practicality for large-scale STATCOM applications.

Observed practical limitations

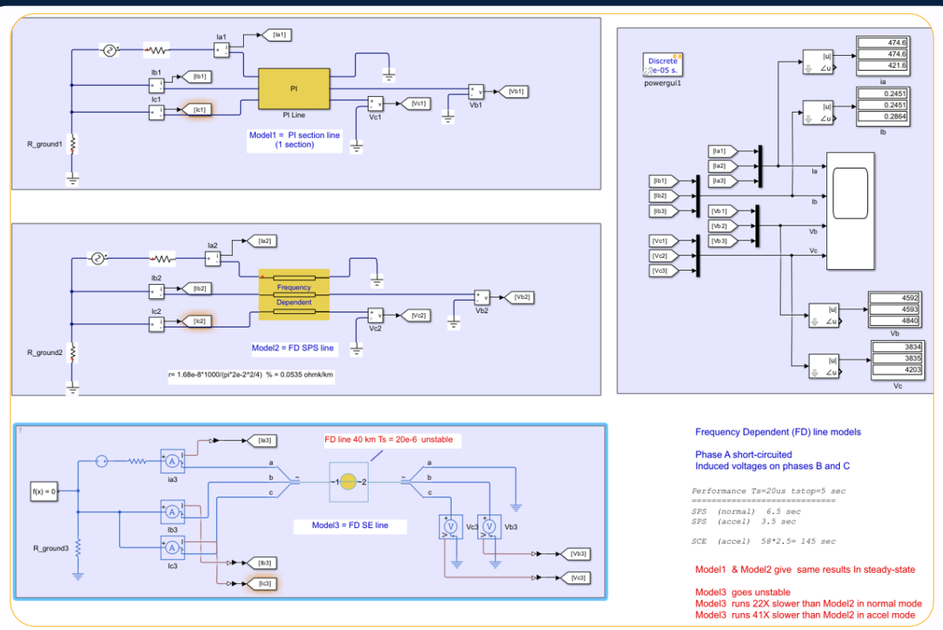
Model preparation and execution time in Simscape Electrical became a significant constraint when scaling to realistic MMC configurations.

Engineering implications

For FACTS and STATCOM studies involving high module counts, execution scalability remains essential for engineering productivity.

CASE EXAMPLE 4

Frequency-Dependent Transmission Line (FD Model)



Frequency-dependent (FD) line models are essential for accurate EMT transmission studies, particularly when analyzing fast transients, harmonic propagation, and wideband interactions.

Benchmark results

Testing showed that:

- SPS PI and FD line models produced consistent steady-state results at 60 Hz.
- The Simscape Electrical FD line model became numerically unstable after approximately 1 second of simulation.
- Execution performance differed strongly: the Simscape Electrical FD implementation was observed to be approximately 40× slower than the SPS FD model.

Observed practical limitations

The Simscape Electrical FD line model was only available for a restricted three-phase configuration (single conductors), limiting flexibility for realistic bundled or shield-wire transmission studies

Engineering implications

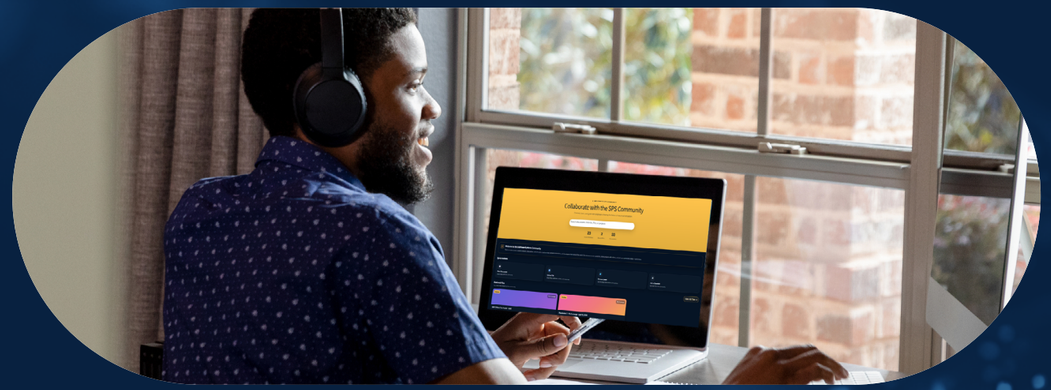
For transmission EMT studies requiring stability, scalability, and modeling flexibility, mature FD formulations remain essential, and SPS continues to provide significant advantages.

The following comparison provides a clear, engineering-focused view of how SPS Software and Simscape Electrical™ differ across performance, fidelity, and application readiness.

Engineering criteria	SPS Software	Simscape Electrical™
Primary strength	Large electrical networks and power system EMT simulation	Multiphysics integration with Simscape
Execution performance	Balanced and efficient for both networks and converters	Often significantly slower for EMT-scale studies
Library maturity	Extensive, grid-oriented component coverage	Rich library, but navigation and completeness vary
Initialization & load flow	Robust steady-state initialization and proven workflows	Convergence and unbalance handling still limited
Application readiness	Strong advantage in HVDC, MMC, transmission, grid studies	More focused on component-level and multi-physics modeling
Example quality	High-quality, well-documented legacy examples	Growing example base, but quality and robustness vary
User transition path	Full continuity through SPS Software	Requires adaptation; conversion tools remain partial

A new SPS ecosystem

More than just software, SPS Software is part of a complete ecosystem designed to enhance productivity, collaboration, and long-term success.



Documentation & resources

Modern Documentation

- Up-to-date guides and examples
- Ready-to-use models
- Easy onboarding and learning

User community

Active Global Community

- Engineers and researchers worldwide
- Shared knowledge and best practices
- Real-world applications and insights

AI support (Lisa)

AI-Powered Guidance

- Instant answers to technical questions
- Help with installation and licensing
- Direct connection to experts when needed

Continuous updates

Always Up to Date

- Aligned with MATLAB/Simulink releases
- Ongoing feature improvements
- No disruption to existing workflows

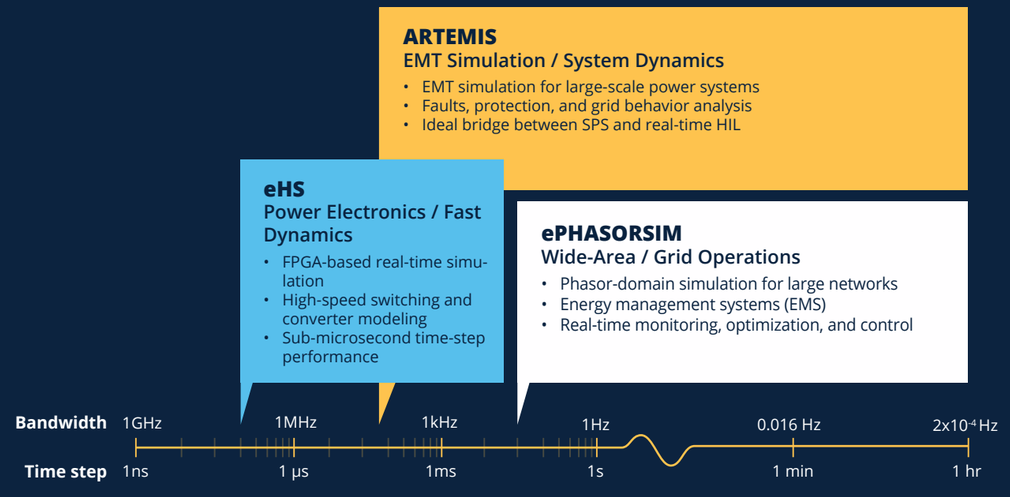
From simulation to real-time validation

Bring SPS models to real time with RT-LAB

SPS models can be seamlessly extended to real-time execution with RT-LAB, enabling safe controller validation and faster development cycles. The same modeling workflow is preserved from offline to real-time, ensuring a smooth transition to validation without rebuilding models.

Specialized toolboxes

OPAL-RT provides a complete ecosystem of specialized real-time toolboxes, each designed to address different layers of power system simulation and control.



Together, these toolboxes cover the full spectrum—from fast converter dynamics to large-scale grid behavior

Start your SPS Software journey

Seamless migration — no disruption

Same models. Same workflow. Same environment.

Enhanced performance, support, and real-time readiness.

1. Set up access

Create or reset your SPS account

2. Download

Get latest SPS toolbox (MATLAB add-on)

3. Install

Install directly in MATLAB (.mltbx)

4. Activate

Log in via OPAL-RT license portal

5. Start using

Switch between legacy and new SPS

From installation to simulation in minutes—no migration required.

Find the plan that fits your work

Contact us to learn more.

SPS Software offers flexible annual subscriptions for individuals, labs, and professional teams. Choose the license that matches your goals.

Student Subscription License

Perfect for undergrads or grad students learning power systems and electronics through coursework or thesis projects.

Full SPS Software access for personal student use

Node-locked subscription licence options for personal student use

Non-commercial use only

Requires valid university email for activation

Academic Subscription License

Designed for faculty, teaching labs, and research teams conducting non-commercial academic work.

Full SPS Software access for academic setups and environments

Node-locked or floating subscription licence options for academic use

Non-commercial use only

Ideal for classrooms, lab instruction, and published research

Professional Subscription License

Best for engineers, companies, and teams using SPS Software for commercial design and validation projects.

Full SPS Software access for professional environments

Node-locked or floating subscription licence options for professional use

Commercial use permitted

Enterprise and team deployment options available

Campus-Wide Subscription Licenses

Built for universities and institutions seeking scalable, multi-user access across departments and research groups.

Ideal for universities standardizing SPS Software across faculties, labs, and research centers.

Contact us to receive a customized offer and pricing details.

Ready to innovate?

For over two decades, OPAL-RT TECHNOLOGIES has been a global leader in real-time simulation and hardware-in-the-loop (HIL) testing. Since 1997, OPAL-RT has empowered engineers and researchers with accessible, innovative, and customized simulation technology—bridging the gap between modeling and real-world applications. By leveraging high-performance computing, OPAL-RT accelerates the development of advanced solutions in energy, automotive, aerospace, and beyond. With our ISO 9001:2015 certification and a strong commitment to sustainable development, we're not just developing technology—we're building a better future, together.

Become part of developing the future and work with the world's leading innovators

Learn about our office culture, our benefits, our hiring process, our partners, and more

Stay in the loop with our events

OPAL-RT is present at numerous industry events around the world, culminating in our yearly RT conferences. These global gatherings provide a platform for industry leaders, researchers, and engineers to exchange knowledge, network, and explore the latest advancements in real-time simulation technology.

Join us to stay ahead of the curve and drive innovation in your field

OPAL-RT TECHNOLOGIES

opal-rt.com