SES renewables SOLUTIONS
STRESS ENGINEERING SERVICES INC.

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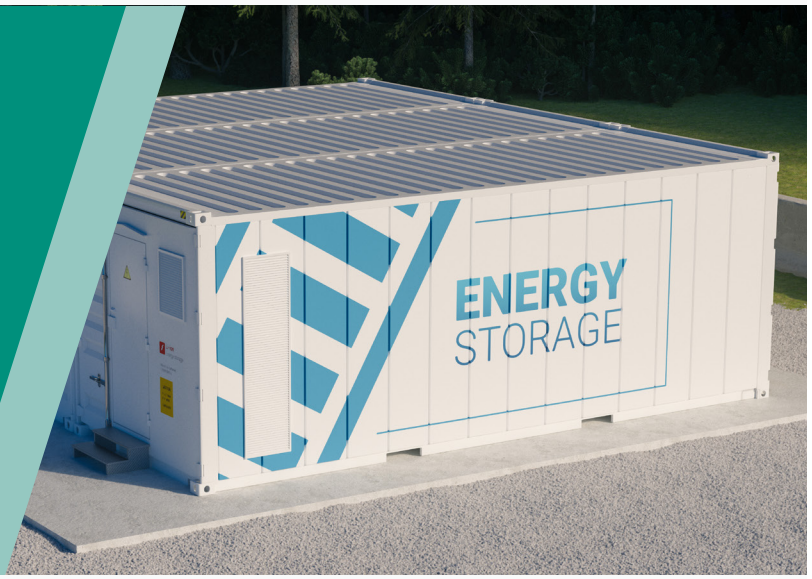
ENERGY STORAGE

Delivering sustainability driven solutions to your energy storage projects.



Safety Testing

SES Renewables Solutions™ specializes in delivering comprehensive and tailor-made safety testing solutions for energy storage systems (ESS). Our team excels in conducting controlled abuse testing on various ESS types, enabling us to establish safe operating boundaries and identify worst-case scenarios accurately. Through our testing services, clients gain access to realistic failure data and a profound comprehension of system limitations. The outcome is the enhancement of ESS safety, ensuring the protection of assets and personnel. With our turn-key and standards-based approach, we provide clients with the necessary tools to build safer and more reliable energy storage systems.

Specific test offerings include:

- Thermal runaway propagation and containment testing
- Heat-to-vent/heat-to-thermal runaway
- Overcharge, overdischarge, external/internal short circuit
- Nail penetration, crush, drop, shock, and vibration
- Combined electrical, thermal, mechanical loading
- Certification testing to various industry standards (UL, IEC, UN/DOT, SAE)

We dig deep into complex electrochemical/thermal systems to provide answers to critical questions such as:

- Which factors have the greatest influence on the probability and severity of a thermal runaway event?
- How can thermal runaway propagation be mitigated using safety-focused module/pack design?
- Should a failure occur, what fire suppression techniques are the most effective?

Performance Validation Testing

We use our expertise and specialized safety testing equipment to offer performance validation testing services to our clients. Validation testing plays a crucial role in the success of new product launches, whether it's part of an independent third-party evaluation or an internal development program. Offerings include:

- Demonstration of battery fire suppression/thermal barrier/engineered material performance in simulated off-nominal or live-cell environments
- Cycle-life, aging, thermal, and high-rate testing of ESS and related systems
- Independent third-party electrochemical assessment of cells, modules, and packs
- Performance checks pre- and post-abuse testing

Analysis-Driven Design

When combined with testing or when testing is impractical, analysis-driven design can greatly increase the understanding of battery thermal behavior, allowing for improved safety while optimizing weight and volume. We use coupled electrochemical-thermal analysis via computational fluid dynamics (CFD) to simulate operational and thermal runaway conditions of battery modules and racks to determine suitable thermal designs in collaboration with our clients. Our experts have the unique capability to combine test data with analysis, which validates models and provides accurate solutions to thermal hazards.

Design Reviews and Failure Analysis

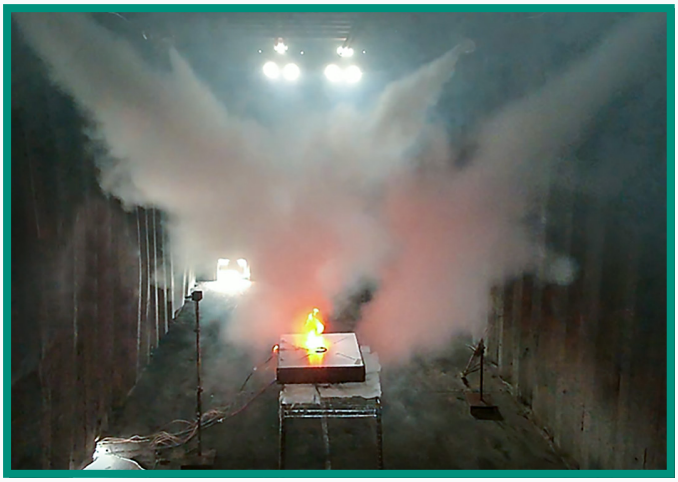
With the increasing number and capacity of ESS installations, failures are also on the rise. Our skilled team of engineers acts as impartial assessors, examining ESS designs and failures to deliver valuable feedback and root cause analyses. Our goal is to provide actionable insights that enable improvements in ESS performance and reliability.

- Destructive physical analysis (DPA) of ESS of various design and complexity
- Failure analysis at the cell or electrode level using CT and SEM
- Replication of failure events via testing
- Full electrical design reviews of ESS per applicable codes and regulations
- Root-cause analysis and FMECA

Integrity Management and Digital Solutions

To ensure maximum economic efficiency, battery energy storage systems (ESS) must have operational lifespans comparable to the generation equipment they are paired with. However, most electrochemical storage systems undergo capacity degradation during charge and discharge cycles, leading to a dynamic state-of-health (SoH). Leveraging our NeoSight® platform, we can continuously monitor energy sources, loads, and temperatures in ESS. This monitoring facilitates accurate estimation of SoH, minimizing downtime and prolonging the system's lifespan.

- Monitoring performance through condition monitoring and/or physics-based digital twins
- Actionable insight from the data
- Integrity management services for condition-based maintenance (CBM) and extension of operational life of our client's assets



About SES Renewables

SES Renewables Solutions™ is a division of Stress Engineering Services, Inc. that specializes in renewable energy consulting. Our expertise lies in supporting clients throughout the entire lifecycle of renewable energy projects, regardless of their scale. We offer comprehensive guidance in developing, executing, and commercializing these projects. Our focus is on providing clients with sound technical solutions to design, install, commission, operate, and maintain their energy systems safely and economically.

About Stress Engineering Services

Since 1972, Stress Engineering Services, Inc. has been a global leader in engineering services and solutions for a variety of industries. We are committed to providing the most comprehensive design, analysis, and testing services with an unsurpassed level of engineering integrity and skill. Our multi-disciplinary engineering methods, advanced technology, innovative applications, and highly knowledgeable and experienced staff provide proven, quantifiable benefits to its worldwide portfolio of clients. For more information, visit www.stress.com.