Current Status of the Sandia Lightning Simulator

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The Sandia Lightning Simulator at Sandia National Laboratories, which replicates the peak current and waveform of severe, direct-strike lightning, has recently been re-commissioned after a decade of inactivity. It can provide up to 200 kA for a simulated single lightning stroke, 100 kA for a subsequent stroke, and hundreds of Amperes of continuing current. The Sandia Lightning Simulator operating parameters, shown in Table 1, mimic elements of up to the top 1% direct-strike natural lightning, based on measurements of Cianos and Pierce.

The Marx banks that create the simulator's high voltage and current have been refurbished and tested. The UV laser system that triggers the 1 MV switch has been replaced with a lower energy, less hazardous system. The delay and trigger generators that automate the critical timing of the simulator have been upgraded. The single-stroke capability has been demonstrated up to 200 kA, and it is planned to demonstrate the double pulse and continuing current capability this year. The simulator capabilities, basic design components, upgrades, and diagnostic capabilities will be discussed in this paper.

Table 1. SLS Operating Parameters

Peak current	200 kA, max
Current rise time	1 to 5 us
Current rate of rise	200 kA/us, max
Pulse width (full width half maximum)	50 to 500us (dependent on load impedance)
Charge transfer of a single pulse	40 C (200 kA peak, 100 us pulsewidth)
Number of pulses	1 or 2
Interval between pulses	variable
Continuing current	100s A for 100s of ms
Charge transfer of continuing current	250 C (for 500 A @ 500 ms)