

Gen 3 Particle Pilot Plant (G3P3) - 34211

Next-generation particle CSP pilot plant to be built at Sandia

1. Impact

The Gen 3 Particle Pilot Plant (G3P3) will de-risk particle-based CSP technologies that can achieve a wider range of temperatures (sub-freezing to over 1000 °C) for next-generation power cycles (e.g., supercritical CO₂ Brayton cycle), industrial process heat, and thermochemistry (e.g., H₂ and ammonia production).

2. Project Goal

The goal of G3P3 is to design, construct, and operate a multi-MW, falling-particle CSP system that can operate for thousands of hours, provide six hours of energy storage, and heat a working fluid (e.g., sCO₂ or air) to ≥ 700 °C while demonstrating the ability to meet DOE SETO cost and performance goals.

3. Method(s)

The project consists of three phases:

Phase 1: De-risk particle components (receiver, storage, heat exchanger, lift, particles) and subsystems through testing and modeling

Phase 2: Develop final design and drawings of integrated pilot plant

Phase 3: Construct, commission, and operate G3P3 pilot plant to test and evaluate individual components and system performance.

4. Outcome(s)

Final G3P3 design was selected by DOE for Phase 3. All permits and construction approvals at Sandia have been approved. Construction bids for the G3P3 tower have been received. Equipment and subsystems are being finalized and procured.

5. Conclusion/Risks

Construction of the G3P3 tower is expected to be completed in 2023, followed by commissioning and testing in 2023 – 2024.

6. Team

Sandia National Laboratories, Georgia Institute of Technology, King Saud University, Australian Solar Thermal Research Initiative (CSIRO, U. Adelaide, Australian National University), CNRS-PROMES, German Aerospace Center, EPRI, Bridgers & Paxton, Bohannon Huston, SolarDynamics, Carbo Ceramics, Solex Thermal Science, Vacuum Process Engineering, Materials Handling Equipment, Allied Mineral Products, Matrix PDM Engineering, and Saudi Electricity Company

Visuals

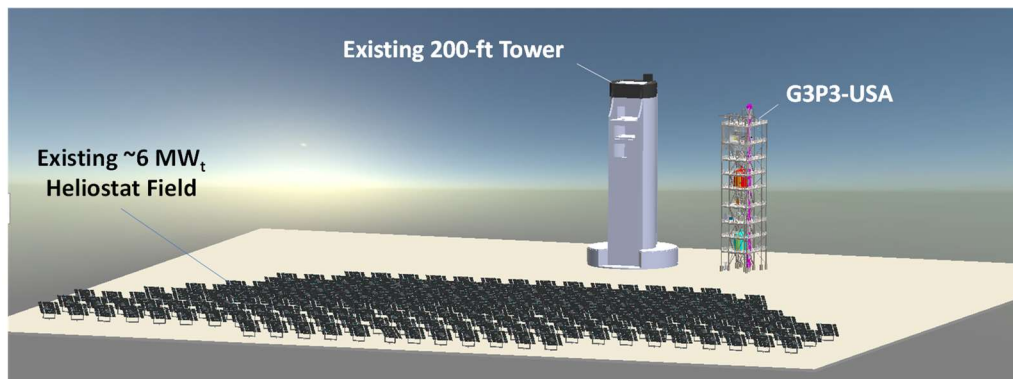


Figure 1. Rendering of the proposed G3P3-USA system at the National Solar Thermal Test Facility, Sandia National Laboratories, Albuquerque, NM