

# Geothermal Manufacturing Prize

Prepared for The Bit Guys, Jay Hewitt

*Sandia National Laboratories*

**Objective: During the GEO! portion of the competition, Sandia National Lab will be using their facilities to test The Bit Guys working prototype under simulated drilling conditions**

**Anticipated scope of work:**

**Tasks:**

**Use the H.O.T test facility to run a test on prototype to simulate drilling conditions. Supply a third-party and independent evaluation of the down hole hammer**

**Deliverables:**

**Access and operation of the HOT test facility.**

**Complete test of 1-3 prototypes.**

**Written report and evaluation of each of the prototypes**

**You must include a statement of support from the relevant PI – this could be an e-mail or short note confirming they agree with the proposed scope of work.**



# Sandia National Laboratories

The HOT test facility houses a 20-foot-tall drill rig, heating chamber and process gas heater. Researchers can simulate conditions deep underground and the elevated temperatures affecting the hammer and can drill into different types of rock, like the granite commonly found in geothermal-rich areas. In addition to testing drilling tools at temperature, the facility is also capable of conducting research in drilling automation and control.

- ▶ Weight on Bit to 6000 lbf
- ▶ Rotation speed up to 60 rpm
- ▶ Rotation torque up to 2500 ft. lbf
- ▶ Hammer heater up to 300°C (9kW heater)
- ▶ Process gas heater up to 300°C (190kW heater)
- ▶ Simulates high-temperature drilling conditions up to 300°C
- ▶ Evaluates effects of thermal shock on hammer components
- ▶ Evaluates effectiveness of coatings in simulated geothermal conditions
- ▶ Automates the drilling functionality
- ▶ Closed-loop control of drilling parameters



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*Trumpf*

**Objective:** During the Make portion of the competition, Trumpf will be making material test blocks and the final prototype bits

**Anticipated scope of work:**

**Tasks:**

Help come up with the different raw materials , shapes and combinations that should be tested to withstand the heat and pressures of a downhole hammer.

**Deliverables:**

Build a minimum of two test blocks. These will use different inserts to tell us the correct configuration of base metal, insert and 3D printing material.

Build a working down hole hammer from the information gained during the tests

**You must include a statement of support from the relevant PI – this could be an e-mail or short note confirming they agree with the proposed scope of work.**



# Trumpf

TRUMPF Inc. has significant expertise with the use of Additive Manufacturing and Laser Technologies. Specifically, in additive, the use of Powder-Bed Fusion and Direct Energy Deposition methods.

- ▶ Test Materials- test cubes will be made with different additives, interface sleeves, and insert designs
  - ▶ Destructive test can be preformed at temperature to test each design
- ▶ Final working prototypes- fully functional and ready for a field test



TRUMPF has brought two additive manufacturing laser processes to industrial maturity in the last 20 years which can be used to create complex shapes and individual metal components layer-by-layer from metal powder quickly, with flexibility, and cheaply: Laser metal fusion and laser metal deposition. As a pioneer in additive manufacturing methods, TRUMPF provides complete solutions with machines, beam sources, and services - all of which they have developed and produced themselves.