



Electro-Pulse Boring (EPB): Low-cost Geothermal

Overview: Humanity's ideal energy source is deep (6-10 km) geothermal – benign, baseload, autonomous, inexhaustible, free of hydrothermal prospecting risk, and ubiquitous, on Earth. But, we cannot afford to bore deep enough to access it. EPB is novel rock-fracturing via high-voltage, low-power electric energy pulses. Goal is 50 cm diam borehole to depth at \$150 / m, to supply 200+ C water for electricity gen and DHS anywhere on Earth via single deep borehole, closed system.

IP: Pioneered in 2005-12 by European collaborative of NO, CH, RU, with preliminary IP of unknown extent and quality to Unodril AS, NO.

Development Stage: TRL 3-4: proof-of-concept to 200 m in granite, NO

R&D & Demonstration NEED

Proof-of-concept to 200 m depth, 15 cm diam, in granite, in NO, using surface-mount pulse generator from Technical University, Tomsk, RU. A Down Hole Pulse Generator (DHPG), attached to the rock-breaking electrode array, must be designed and proven at full depth T and P, using pulsed-power technology from Directed Energy Weapons (DEW) and particle accelerators. Total EPB system R&D&Demonstration in field requires progressively-deeper test borings. Risk-sharing investments: DHPG ~ \$25 M. Pre-commercialization TRL 8, including full-depth boring and complete, competitive, deep geothermal energy plants: ~ \$150 M. Includes EPB system design optimization for production for global deployment. R&D&D risks: (1) EPB system function at 6-10 km; (2) Achieve \$150/m long-term boring cost; (3) Need for and costs of upper casing, when needed. Attempt piggyback on USDOE "FORGE" program.

Alaska Applied Sciences, Inc. (AASI)

Mission: R&D to transform global energy system from fossil to CO2-emission-free sources. Low-embodied-energy structures: thin-shell concrete. Wind-to-Hydrogen via novel generation, electrolyzer coupling. Public science education and informed energy policy decisionmaking.

Founded: 1990, Juneau, AK. C-corp. Privately held.

Number of Employees: 2: founders Leighty and Waterman; none paid

Facility Description: 13-turbine windplant in Palm Springs, CA for R&D on novel SEIG gen system for lower-cost Hydrogen fuel production.

Product Sales: 1991, computer-guided telescope, Hyatt Regency Maui.

OPPORTUNITY

Need/Problem: Humanity needs affordable, benign, dispatchable energy everywhere on Earth. Deep geothermal is only non-nuclear solution. Need low-cost deep boring tech for EGS, perhaps simpler methods. ARPA-E investments disappointing. Boring equipment must be small, low-power, transportable to access two-thirds of humanity's needs.

Target Market and Customer: Global energy majors; elec & gas utilities; new distributed (DER) business models; benign, low-cost electric + low-grade heat for all purposes, anywhere on Earth. Drilling contractors.

Value Proposition: Achieve long-term Cost Of Energy (COE), electricity and lowgrade thermal, anywhere on Earth, via low-cost geotherm access

Market Opportunity: Benign global energy supply for all purposes.