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Electro Pulse Boring for Low-cost Access to Deep Geothermal Heat, Anywhere on Earth

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Affordable access to deep geothermal heat, available anywhere on Earth but at costs depending on geological conditions near the surface and equipment access, is the most promising solution for humanity's need to deeply, then completely, decarbonize its total energy supply, as quickly as we prudently and profitably can. Nascent Electro Pulse Boring (EPB)technology, proven in concept in test boring to 200 m in Europe, is very promising for low-cost access to deep (6 - 10 km) geothermal, but a major R&D & Demonstration program will be needed for evolutionary equipment design based on progressively-deeper field boring tests. This project will attempt to organize and fund that program. EPB is a rock breaking technology for both sedimentary and crystalline bedrock, compatible with conventional pumped mud cuttings removal, with potential for high rate of penetration (ROP) with relatively light, transportable, low-power-consumption equipment. It may be capable of directional drilling, to replace deep rock fracking and the high operating pumping costs of conventional EGS with deep hole branching and multiple thermosiphons, delivering water to the surface that is hot and copious enough for both electricity generation, by steam or organic Rankine cycle (ORC), and district heating and cooling systems (DHCS).

The critical EPB component is the Down Hole Pulse Generator (DHPG), which must operate at full-depth (˜ 300 C) while providing ˜ 10-20 pps, ˜ 10 ns, at 1-10 KJ, 500-1000 KV, with DHPG lifetime of 10ˆ5 - 10ˆ7 pulses before refurbishing. When design and construction of the DHPG is funded and completed, progressively-deeper boreholes may be constructed at a test site like USDOE "FORGE".

This may be an ideal commercial application of DEW technology developed by several defense contractors. EPB commercialization may be the "transformative" and "disruptive" technology needed for benign, inexhaustible, baseload electricity and thermal energy, nearly anywhere on Earth.

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