Geothermal Revolution and a Groundbreaking Drilling Technology

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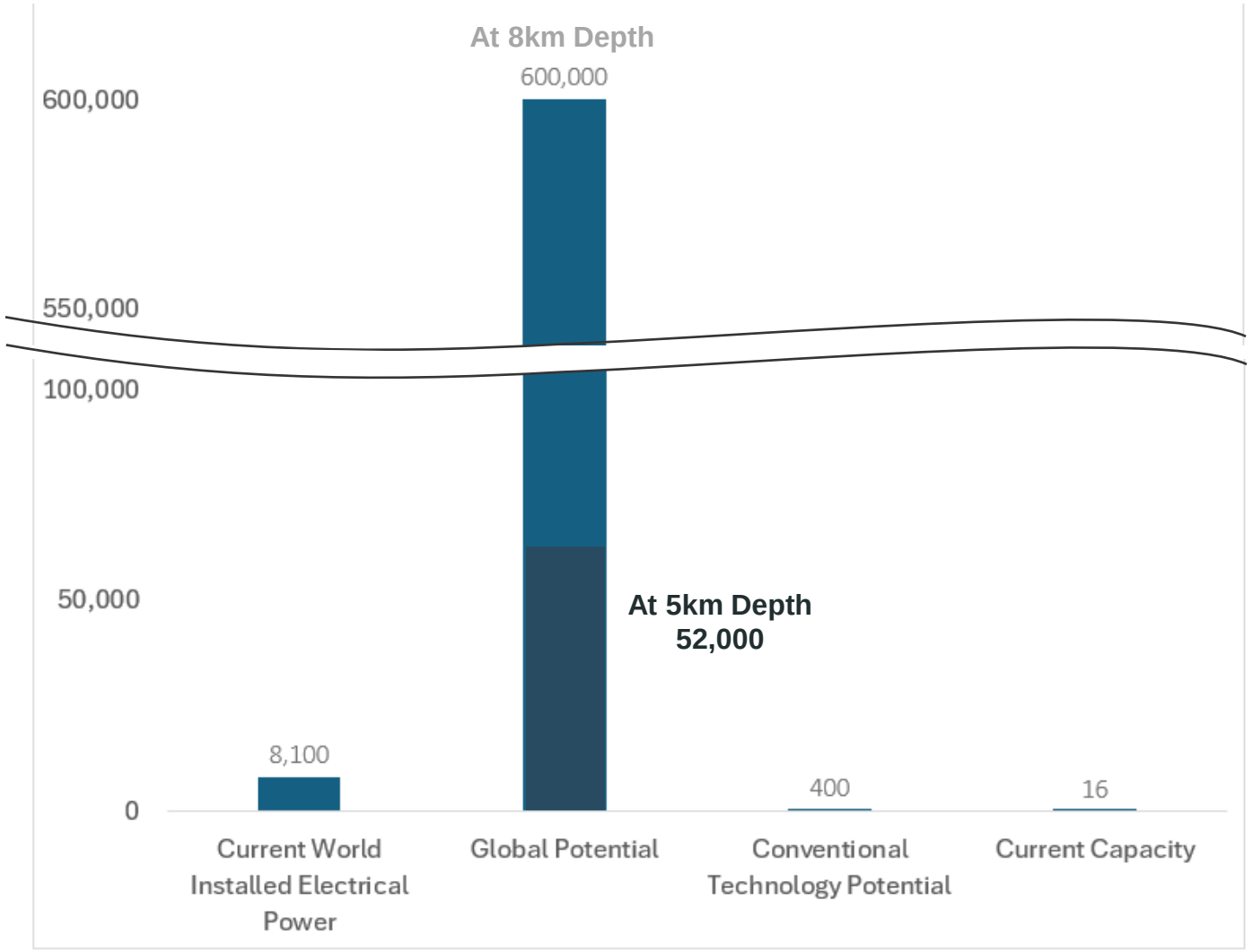
Why Geothermal Energy?

- 100% renewable
- 24/7 non-intermittent power
- No energy storage requirement
- Short development time compared to lengthy nuclear process
- No landscape change
- Small environmental footprint
- Multi-functional (power, heat, cooling, H2, etc.)

Geothermal Energy: A Hugely Underutilized Resource

World Resources of Geothermal Power

GW of Geothermal Power Sources



- **Vast geothermal resources around the world remain drastically underdeveloped**
- **This is because conventional geothermal technology can only be applied in areas with sufficient natural hot fluid reservoirs**
- **Next generation technologies – enhanced geothermal systems (EGS) and advanced geothermal systems (AGS) – which do not require such geological conditions have been developed and are proven**

Source: GIEC report, Renewable Energy Sources and Climate Change Mitigation, IEA World Energy Outlooks

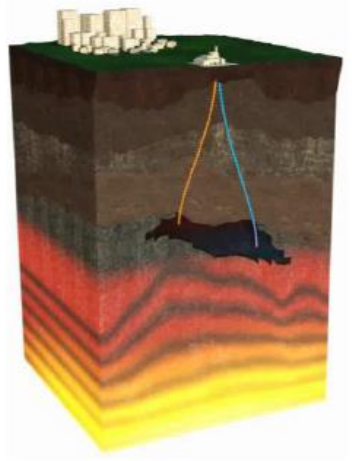
Conventional vs. Next Generation Geothermal Systems

Conventional Hydrothermal Plants

Utilizes natural hot fluid reservoirs

- Available only in specific geographies
- 1% of global geothermal potential

Hydrothermal



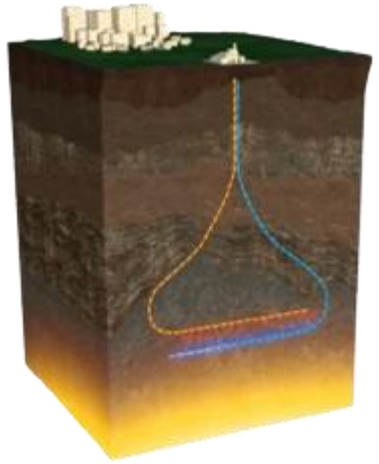
- >98% of current geothermal wells
- Uncertainty in exploration, development, and operation

Next Generation of Geothermal Plants

Fluid injected into the ground, heated at depth, and recovered at surface

- Available in wide areas
- 99% of the global geothermal potential

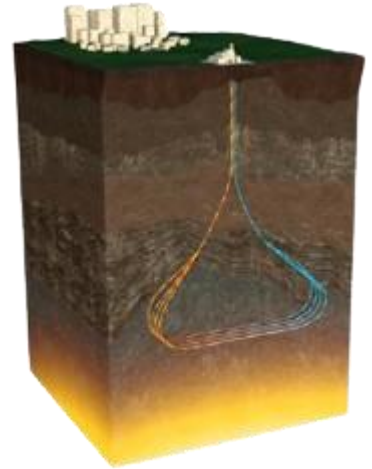
Enhanced Geothermal Systems (EGS) Open Loop



Drilling Costs: 60-70% of capital costs

- Hydraulic fracking to re-open natural cracks for heat exchange
  - Seismicity risk / regulatory barriers
- Difficult to fully engineer cracks in the rock and secure necessary flow rate in operation
  - Economic risk

Advanced Geothermal Systems (AGS) Closed Loop



Drilling Costs: 80% of capital costs

- Drill closed-loop holes for heat exchange
  - **No seismicity risk**
- Stable and controlled flow rate
  - **Less economic risk (best for bankability)**
- 4x to 6x more drilled length

Comparison of EGS and AGS and the necessity of drilling cost reduction

Item	EGS	AGS
1. Expansion of geothermal power potential areas	○	○
2. Ensuring long-term stable flow rates	△ ▶Difficult to control fracture formation in rock, risk of injected water not being sufficiently recovered	○
3. Ease of financing	△ ▶Due to the above risk	○
4. Induced seismicity risk	△ ▶Risk present＊	○ ▷No risk (No hydraulic fracturing used)
5. Cost	△→○ ▶Drilling cost: **60–70%** of power plant construction cost	△→○ ▶Drilling cost: **70–90%** of power plant construction cost

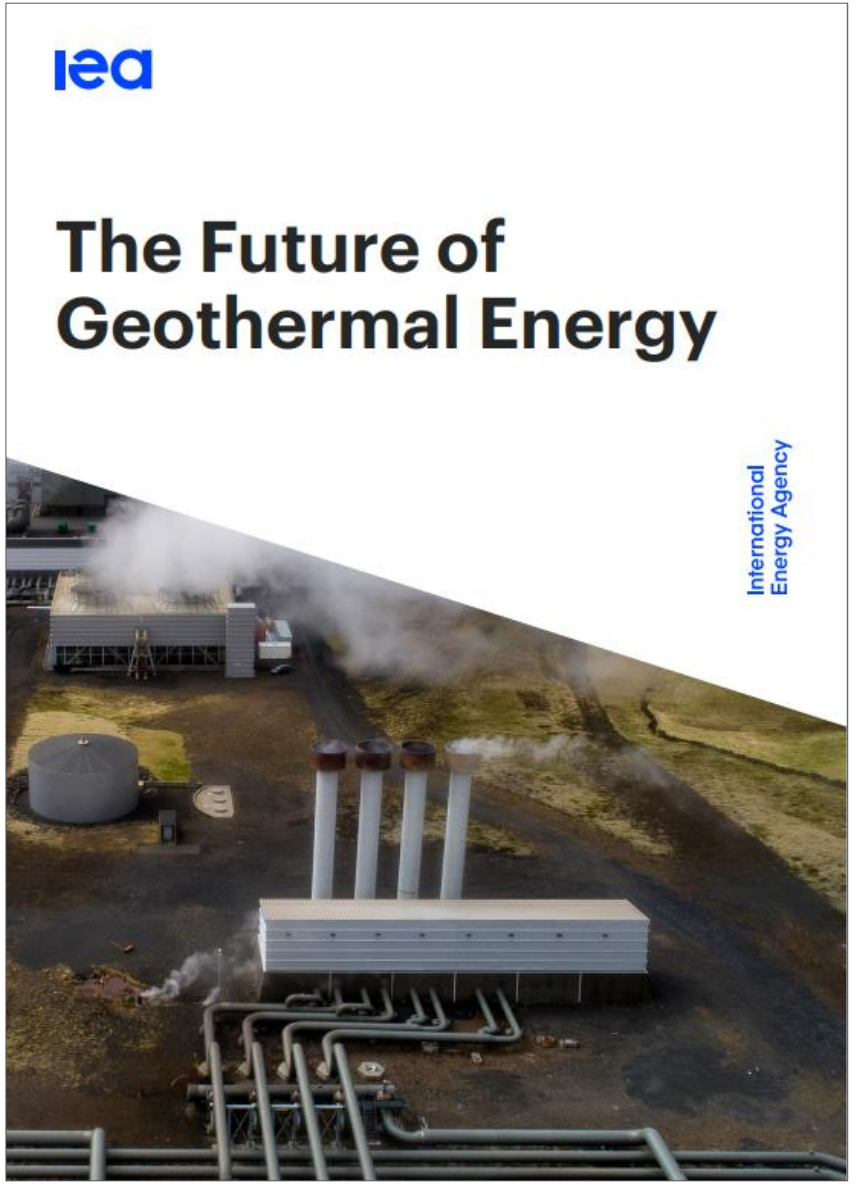
＊In Nov. 2017, hydraulic fracturing at an EGS project in Pohang, S. Korea, caused a M5.4 quake, leading to 80 injuries and US$50M in damages, canceling the project.

The reduction of drilling cost is critical to success.

The International Energy Agencies Anticipates Rapid Expansion of the Next Gen Geothermal System

- The global energy resource of next generation geothermal sysytem **within** **8 km underground** is estimated at **600 TW**, which is 2,000 times that of conventional geothermal system
- This is approximately **150 times** the current annual global electricity demand.
- The global market potential of next generation geothermal can be as much as 400TW in 2040.

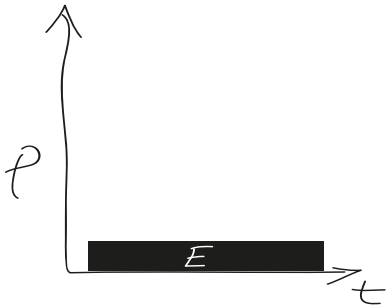
(“The Future of Geothermal Energy” Dec. 2024)



Power is Key. We Know How to Produce a Tremendous Amount of Power with Very Little Energy

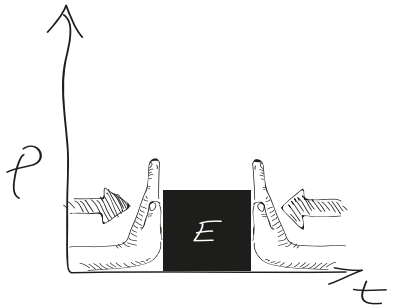
Our proprietary technologies convert small amounts of electrical energy into enormous power to address a broad and growing suite of applications across multiple end markets.
Our technologies are proven, cost-effective, efficient and green

t -> P



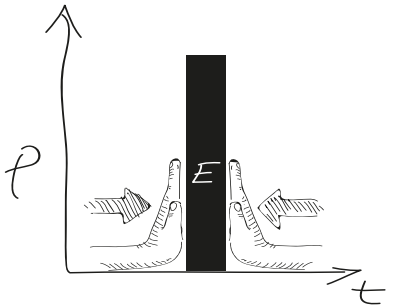
The power of a phenomenon results from the total energy applied divided by the time of application.

t/2 -> Px2

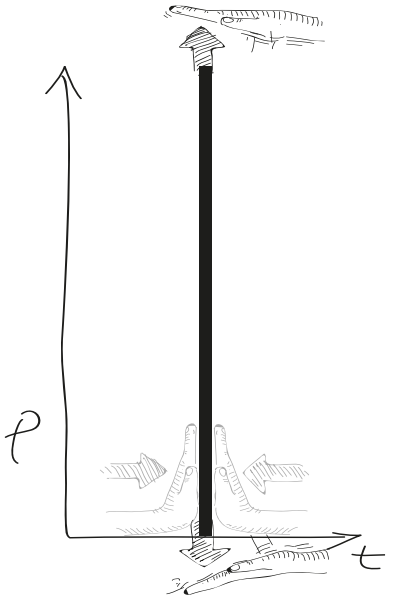


If you halve the duration (time compression), the power available will double.

t/4 -> Px4



If you divide the time by 4, the power available is multiplied by 4, and so on.

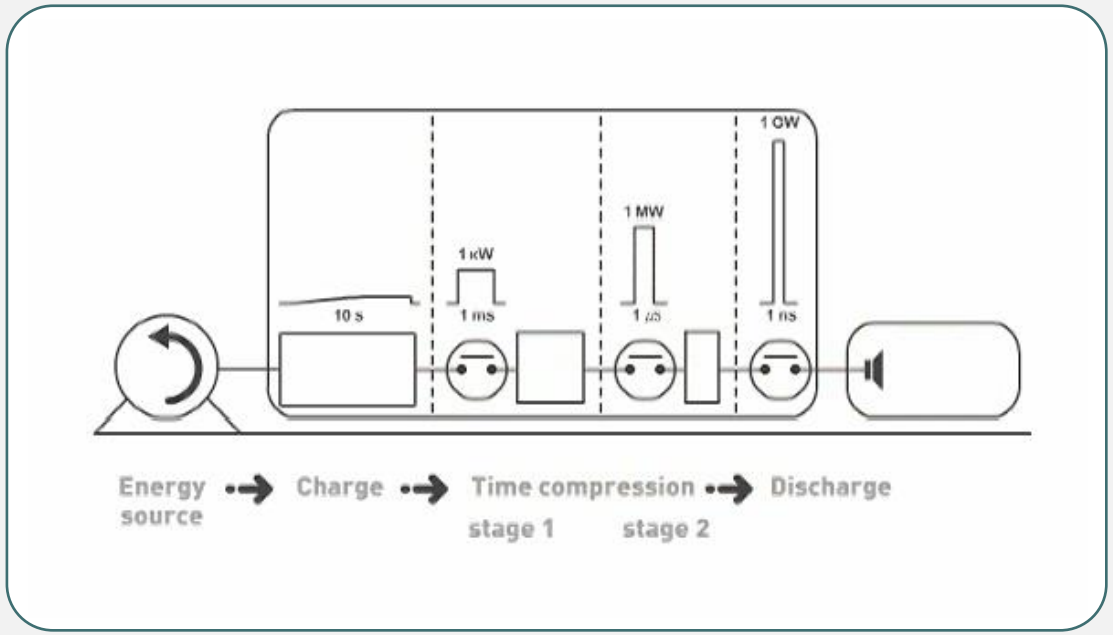


What if you could divide the time by 1,000,000 (µs scale)?

Unlike steady DC or AC power, Pulsed Power is a revolutionary new way to use electricity

Pulsed Power Allows Us To Do Incredible Things

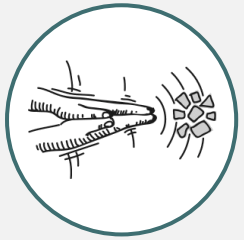
We Use *Low Average* Power (Very Low Electricity Cost) To Create *Gigantic Instantaneous* Power



Pulse compression is capable of releasing the power output of a nuclear power reactor for a billionth of a second with the electrical energy stored in your wristwatch battery

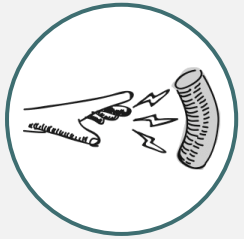
HIGH POWER ELECTRICAL FIELDS

can **reveal the presence of mineral or water resources** at significant depths



HIGH POWER SHOCKWAVES

to **break apart rocks** or to **reconnect geothermal production wells to reservoirs** by removing blockages



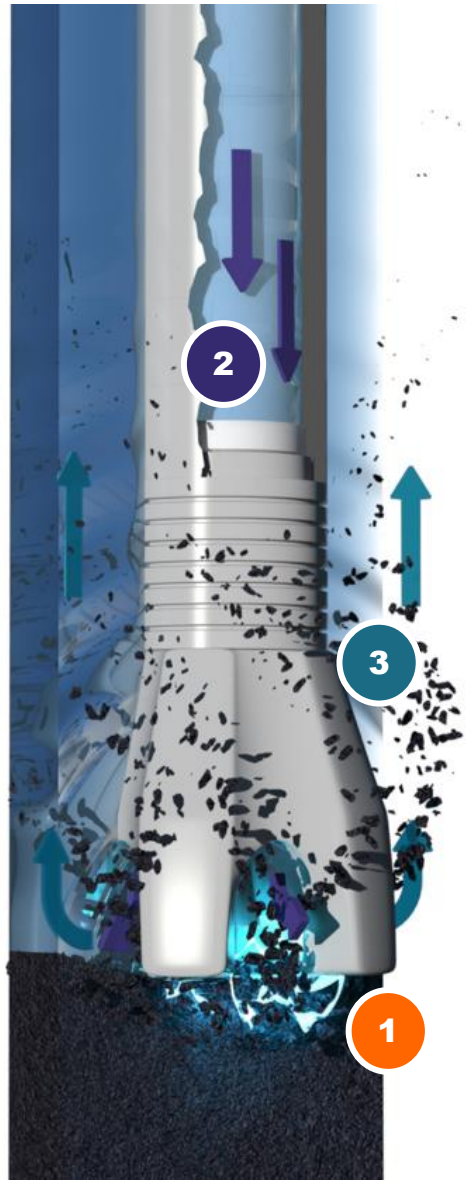
POWERFUL MAGNETIC FIELDS

to displace metals at extremely high speeds, enabling **new forming and welding applications**

POWERFUL ELECTRICAL DISCHARGES

to **disaggregate rock** and **rapidly penetrate extremely hard rocks** for deep drilling or tunneling

High Pulsed Power Drilling Principle

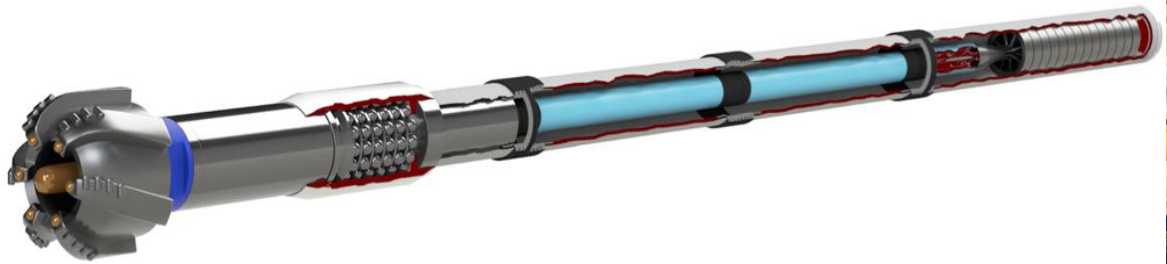


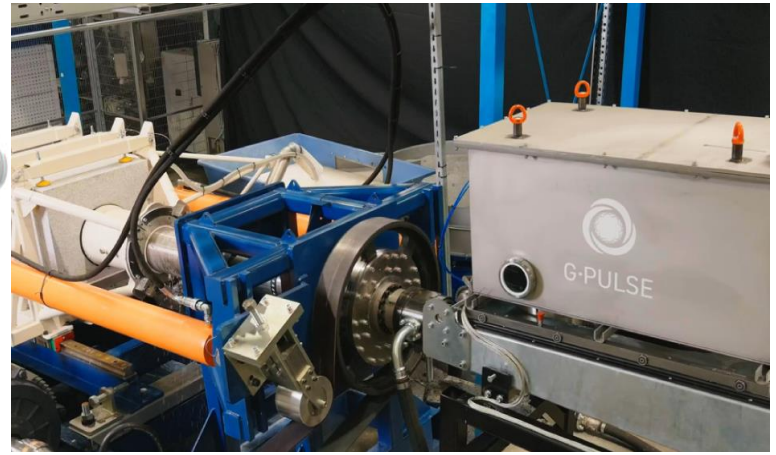
1. Rock is spalled by repetitive electrical arcs
2. Drilling mud flows from the inside of the tool
3. Rock fragments are evacuated by the mud stream on the outside of the tool

By inducing High Pulsed Power breakdown in the rock, the rock is fragmented by tensile stress with very small amount of energy

G-Pulse Hybrid Drilling Equipment

- **G-Pulse is developing a hybrid tool** using High Pulsed Power and standard PDC. High Pulsed Power soften the rock before PDC drills. This makes drilling speed faster and PDC lifetime longer.
- By the combined effect, **70% drilling cost reduction in hard rock has already been achieved**.
- Can drill larger diameter holes, increasing efficiency.
- This reduction will come **on top of** any improvement of drilling cost reduction (e.g., operational improvement) using conventional drilling tool.
- Compatible with conventional drilling assets and personnels.
- **To be commercialized by 2027**.





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