

Geothermal Energy R&D

Prompt to AI

I want to create a vertical tunnel boring machine that operates at high temperatures, and I want to create both vertical and horizontal tunnels, with a concrete lining, for purposes of extracting geothermal energy. For example, the machine goes down 1 to 10km to access 200°C to 300°C temperatures, and then installs a network of pipes that push water into the material and collect steam for making electrical power. The pipes might look like ribs on a spine where the tunnel is the spine and the steam/water pipes are the ribs. The system would target rock that is hot, close to the surface, and porous.

Also, we need to hold pressure. And we do not want pressure to press against the tunnel, since it would cause the lining to buckle. So, we need a formation of porous rock, with a seal above it (e.g. layer of impermeable hard rock above layer of porous rock). The formation might be in the shape of a blob or a horizontal layer. So, we might have a vertical tunnel that connects to a horizontal tunnel. And then 300 to 2000 meters of hard rock under the horizontal tunnel is used to hold back pressure (i.e. seal), and with a layer of hot porous material under the granite rock. The steam is kept in the porous layer, and we don't want this steam pressure hitting the tunnel.

The vertical tunnel boring machine can in theory, excavate a cavity to the side, and assemble another tunnel boring machine that creates a horizontal tunnel. This way, you can place a horizontal tunnel above a layer of porous rock, with a non-porous seal between the horizontal tunnel and the porous layer.

The problems are: (a) you need components in tunnel boring machines that operate in the high 200°C to 300°C temperatures, (b) you need to keep the pressure away from the tunnels, (c) you need cost per unit electricity generated to be low, and (d) you want this to last for many decades.

The tunnels could be anywhere from 2m to 6m in size (e.g. cross-section diameter), and lined with concrete. There could be metal rails in the lining that support electrical power (across the rails), and also an elevator system that

brings material down (e.g. lining segments, machine parts), and also an elevator system that brings material up (e.g. broken rock). In theory, multiple elevators could operate simultaneously on the downward rail system, and multiple elevators could operate simultaneously on the upward rail system. And, at the bottom of the shaft, a vertical boring machine could attach to both of these rail systems.s?

ChatGPT 5.2 Thinking

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Gemini 3 Pro

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Grok 4.1 Expert

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