**You may remember back in April I had a chat with a nice man called Matt Toews who is the Chief Technology Officer at a Canadian Geothermal Energy company called Eavor Loop.**

**That video and that technology attracted quite a lot of interest in you good folks out there, and it also prompted a good number of you to suggest that I take a look at another promising potential Geothermal market disruptor that coincidentally was also already on my radar. That company is Quaise Energy, based in Boston, Massachusetts.**

**They reckon they’ve developed a new technology to massively improve the efficiency of geothermal drilling and significantly increase the depth that drilled bore holes can reach.**

**We’re talking potentially harvesting slightly mind-boggling amounts of energy from extremely hot rock formations that lie almost twenty kilometres, or thirteen MILES beneath our feet.**

**So how on earth do they reckon they’ll do that?**

**Hello, and welcome to Just Have a Think,**

**I think it’s fair to say there’s a bit of a buzz around geothermal energy at the moment. Theoretically it’s an effectively inexhaustible source of energy producing no greenhouse gases or pollutants at the point use. And when I say inexhaustible, it really is worth taking a moment to consider the scale we’re talking about here.**

**The core of our planet has a temperature somewhere between six and seven thousand degrees Celsius, and according to this article in New Scientist, there’s enough heat just in the upper three kilometres of crust to satisfy the entire world’s energy demands many thousands of times over.**

**Our planet is continuously radiating heat out from the core, partly as a result of the friction and gravitational pull generated when Earth was formed billions of years ago, but largely because of the decay of radioactive isotopes like potassium-40 and thorium-232. That release of energy will continue for a few billion more years. As long as we humans manage our energy harvesting wisely and only draw heat off at a rate that can be replenished by surrounding rock, then Geothermal power plants could be run for decades or even centuries. And, unlike other renewable energy sources, geothermal systems are generally capable of providing baseload power generation. In other words, they can potentially produce electricity or heat twenty-four-seven, without any dependence on the sun or the wind. The energy crisis, driven largely by events in Ukraine has disrupted global energy supplies, and of course our rapidly warming climate is making it more urgent than ever to find clean and sustainable sources of energy. So Geothermal energy ticks a lot of boxes and really does look like a promising solution. The challenge is accessing as much energy as possible at the lowest cost and with the least amount of environmental disruption.**

**The Eavor Loop system is certainly one of the most promising ways to achieve that goal, and it’s probably worth a very quick recap of how their technology works. Unlike the traditional approach to geothermal energy, which is to find an already existing hot permeable aquifer underground, drill down to it and pump that hot water back up to the surface, Eavor Loop create their own closed loop system with a working fluid circulating through a set of continuous bore holes drilled down into deep hot rock. The fluid is forced back up to the surface as a result of a natural thermo-siphon, driven simply by the difference in density between cold water entering the system and warm water coming out. That means there’s no need for an electrically powered pumping system, which is what makes up a large part of the cost of existing geothermal technology. There’s also none of the fracking or seismic activity associated with so called “Enhanced Geothermal” technology, which essentially uses the same destructive machinery as the US shale industry. Eavor Loop relies on heat from the surrounding rock transferring into the fluid via conduction. Their system that has been carefully calibrated to allow each well bore to operate at around a hundred percent of maximum heat availability for at least thirty years with only a very minimal drop off of zero-point two percent after that point has been passed. In theory that means a well-maintained installation could still be happily generating useful baseload energy for a century or more.**

**For a much fuller explanation direct from CTO Matt Toews, you can click up there to jump back to the interview I conducted with him earlier in the year.**

**So, what about Quaise Energy then? Is it a competitor for Eavor Loop, or could we possibly have two complimentary technologies here? These guys actually emerged as a start-up company out of MIT. Now, I’ve become acutely aware over the years that for many of you good folks out there, just the mention of MIT immediately starts to ring alarm bells. The institute is full of bright young things constantly coming up with all sorts of genius ideas that work beautifully in their lovely laboratories, but often not so well in the real world. The technology being developed at Quaise exists because a research engineer called Paul Woskov, who was working at MITs Plasma Science and Fusion Centre a few years ago, accidentally vaporised a large hole in one of the walls of his lab. Now, for normal folks like you and me, vaporising a wall in your workplace would probably represent at least a third and final written warning, but for the folks at MIT, it was apparently a joyous breakthrough… quite literally. What Woskov had happened upon was a way of creating very high-power millimetre wave energy in something called a gyrotron, which is essentially a bit like a microwave on steroids driving something called a maser, which is essentially a laser on steroids. Think of it as the sort of thing that Darth Vader would have had in the armoury on the Death Star.**

**Anyway, used responsibly, Quaise reckon this device can focus energy into a beam that can vaporize rocks to create bore holes several miles deep, all nicely sealed up with vitrified walls. The idea is to first use conventional drilling technology to get down to about three thousand metres where the basement rock is. That technology is of course already widely used in the oil and gas industry, which by the way is why there is such a lot of interest and investment from fossil fuel companies into geothermal energy in general – it could genuinely represent a transition technology that salvages hundreds of thousands of jobs and allows them to utilise a great deal of their existing infrastructure. Anyway, after 3 kilometres, Quaise deploys the gyrotron to send their ‘high-power millimetre waves’ plus high-pressure gas down the bore hole to start vaporising the deeper layers of rock. The ash created in the process is shoved back up to the surface by the gas. In traditional drilling, the deeper you go the tougher it gets.** **So far, the industry record is a depth of just over twelve kilometres, which in itself is an astonishing achievement. But Quaise claim their technology can keep going deeper and deeper without losing any of its destructive power…all the way down to 20 kilometres, where the temperature of the rock can reach more than five hundred degrees Celsius, which for you imperial types is almost a thousand degrees Fahrenheit. Once the inlet and outlet bore holes have been created, pressurised water can be sent down to the depths to absorb all that energy before being brought back up again as steam that could drive turbines to generate electricity. Quaise Energy’s goal is to send that steam into existing fossil fuel fired power plants, eliminating the requirement for coal or gas, and thereby enabling a much faster energy transition using existing facilities all over the world. And from a technical point of view there’s no real reason why their technology couldn’t be used to provide deep bore holes for the Eavor Loop system I mentioned earlier. But of course that would require a calm and rational discussion and negotiation between two commercial North American operators, so while I won’t exactly be holding my breath for a joint venture to emerge in the coming years… you never know eh?**

**Arguably, the much more important question for Quaise Energy though, is whether you’ll be seeing one of their gyrotron machines burning deep holes into a plot of land near you anytime soon. And here’s where we arrive at the now very well-trodden ‘crystal ball’ territory. I can certainly show you the proposed timeline outlined at the Quaise Energy website. According to that, the first full scale demo rig should be up and running by twenty-twenty-four. The first operational systems boasting generating capacities of a hundred megawatts are planned to come online a couple of years later, and the first fossil fuel fired power plant could be repurposed to use super critical water vapour from a twenty-kilometre deep Quaise bore hole before the end of this decade.**

**Doable? Realistic? Who knows, to be honest. But Quaise are backed by seventy million dollars of seed funding from these organisations, and they’re committed to the long term, as Quaise co-founder and CEO, Carlos Araque pointed out in this recent interview**

**“but indeed you gave to find investors that are willing to take on the long term. So, the investors we have are committed. They are mission driven to climate change and they will invest over five or ten year horizons.”**

**So, I think for now, the best we can do is keep our fingers crossed for Quaise Energy and put them on our list of companies to come back and review in a year to eighteen months’ time.**

**It does look very likely though that geothermal energy will play an increasingly important role in the energy transition. Will it become just another cog in an ever more complicated sustainable energy system or could it genuinely be a global gamechanger? Well, the energy is certainly there for the taking. There’s literally hundreds of thousands of times more energy down there than our species could ever come close to knocking a dangerous dent in. Someone will get there, I’m quite sure of that. The question is who will it be? And will any of these competitors be smart enough to collaborate for the greater good of humanity. I’m an optimist by nature, so I certainly hope so. But what’s your view? Exciting prospect or total pipe dream? Why not jump down to the comments section below and let me know.**

**That’s it for this week though. Thanks, as always to our Patreon supporters, who help me keep the channel completely independent and keep ads and sponsorship messages out of my videos. And I must just give a quick shout out to some folks who’ve joined recently with pledges of ten dollars or more a month. They are Andrew Cornwall, Raymond Astrue, Graham Abrey, Peter Urban, Garry George, KN, John Wrenn, Pete Sloane, Laura Rithig, Todd Quinn, Rolle at Trail of Fears**

**And of course a huge thank you to everyone else whose joined since last time too.**

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**As always, thanks very much for watching! Have a great week, and remember to just have a think. See you next week.**