**You may remember a few months back I took a look at technologies that could convert algae into useful products like foods, medicines, nutritional supplements and even biofuels and bioplastics that could help replace the fossil fuel versions.**

**We found out that algae’s ability to proliferate rapidly has made it one of the most successful organisms ever to have existed in nature, and we looked at the very significant climate mitigation potential of growing large quantities of seaweed in ocean farms and sinking it to the seabed to lock away its carbon content more or less permanently.**

**It all sounded very encouraging indeed.**

**And now, a UK company has taken the concept of algal carbon capture one giant step further with the introduction of managed algal blooms in enormous man-made ponds in coastal desert locations, designed specifically to suck vast quantities of carbon dioxide back out of our atmosphere.**

**But of course, like most things I talk about on this channel, it’s not quite as simple as it sounds…**

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

**The company in question is called Brilliant Planet. It was co-founded back in twenty-thirteen, and now, after several years of research and development in stealth mode, it has emerged into the public realm with twelve million pounds of seed funding and a technology that, they reckon, has the potential to sequester two billion tonnes of carbon dioxide a year…which is an awful lot of CO2!**

**I was fortunate enough to spend a bit of time on a webchat with CEO Adam Taylor and Chief Scientist Raffael Jovine recently, and they gave me the low down on how their technology works.**

**The process involves pumping deep upwelling seawater, rich in carbon and nutrients, from the ocean into algae aquaculture facilities located at carefully selected coastal desert sites, the first of which is already up and running on land owned by Brilliant Planet in Morocco.**

**The carbon and nutrients in the seawater are used to feed local strains of algae as part of a greatly accelerated growth process that has taken Brilliant Planet many years of research and development to perfect. That unique, proprietary process allows the algae to double in biomass in less than a day without the need for all sorts of other expensive additives. That’s much faster than existing biofuel facilities which typically double biomass in twelve to eighteen days.**

**Brilliant Planet’s entire growth process only takes thirty days. It starts with ten days in an on-site laboratory, where the algae grow from about the volume of a glass beaker up to large trough sized containers. After that the algae are transferred to greenhouses for a further ten days, where they continue their daily doubling in biomass through progressively larger and larger growth pools, until at day twenty they are transferred to a set of outdoor open-air ponds to go through the final ten days of the cycle. Ninety nine percent of the growth happens in that las ten days.**

**Once the algae have reproduced to fill up the largest outdoor pond, they are filtered out of the water and dried out naturally under the desert sun, after which the dried biomass is buried at a depth of between 1 and 4 metres below the desert surface. That may sound quite shallow compared to other carbon sequestration methods, but the objective here is simply to ensure the biomass doesn’t get wet and start rotting. The locations and processes that Brilliant Planet have chosen provide a kind of quadruple lock to avoid this ever happening. Firstly, the desert sun gets the algae to a very high level of dryness in the first place. During that process the proteins in the algae biomass crosslink with each other, making them harder to break down through enzymatic digestion.**

**Secondly, the biomass is buried away from the watershed, in an inherently arid desert environment. Brilliant Planet have a lot of land – six thousand one hundred hectares in Morocco and three thousand two hundred hectares in Oman to be precise. That’s sixty one square kilometres. In Morocco alone there’s about two thousand five hundred square kilometres flat, easily accessible, coastal land, unencumbered by infrastructure and with no other conflicting uses. So, there’s no physical constraint requiring deeper sequestration sites. Deserts do very occasionally get rain though, so the third element of the quadruple lock is to cover the biomass with a geomembrane liner, so that if there is a ‘once in a century’ downpour, the water would simply run off the side of the burial site. Last, but not least, the dried marine algae have about a forty percent salt content. That means any water that did manage to seep into the storage site would be absorbed by the salt before it had the chance to act on the organic matter.**

**At the end of the process the seawater that has been used to grow the algae is now depleted of bicarbonate, and CO2, but it hasn’t lost any of its alkalinity. And because the outgoing water is slightly warmed, and because it’s put out to sea in shallow waters at the beach, the operators can be confident it stays at the surface long enough to reabsorb CO2 from the atmosphere. If the operation was carried in the middle of the ocean with colder water like some other ocean-based carbon dioxide removal strategies, it would be very difficult , if not impossible, to verify that CO2 was genuinely being reabsorbed.**

**Perhaps the most crucial advantage of the Brilliant Planet system is the use of locally sourced algae. Open air ponds are an inexpensive and simple way to achieve the final growth stages, but the fact that they’re exposed to the elements means other contaminants or even other strains of algae could infiltrate them and disrupt the process. Brilliant Planet have identified four algae strains for their Morocco operation. Three of them were isolated less than a kilometre away from the site, and the fourth one was isolated just ten kilometres away. Those local algae are already acclimatised to that environment, and they’ve evolved their own built-in resiliency specific to that region. That works both ways of course, so if the open pond system ever leaked, then it would only be returning something to the ecosystem that was already there anyway, rather than an invasive species that could cause damage.**

**Essentially that’s it in a nutshell. A low density , very fast, very simple outdoor system that Brilliant Planet refers to as “scaling down the ocean” rather than trying to scale up the laboratory.**

**So, if they’re just pulling water out of the ocean and growing algae and then burying it in the desert, how on earth can these guys be making any money to maintain a viable operation, I hear you ask!**

**Well, good question. And the answer is that they’re able to trade their captured carbon on the rapidly growing global carbon credit markets.**

**Carbon offsetting is a somewhat contentious issue in the climate mitigation sphere, as no doubt many of you know. In fact, I made a video some time ago specifically looking at the potential pitfalls of carbon offset schemes around the world, some of which have questionable practices that don’t necessarily provide a net benefit in terms of global atmospheric carbon dioxide removal.**

**That’s an issue that the folks at Brilliant Planet are acutely aware of, and it’s precisely why they believe their technology has an edge of over many of the other competitors in the market.**

**For a carbon removal method to be genuinely effective, apart from the obvious imperative of not having any negative impacts, it also needs to tick these six fundamental boxes. Some of the better methods in existence today tick four or five of those boxes but Brilliant Planet say their technology is one of very few that tick all six.**

**Their credits are sold into what’s known as the ‘voluntary carbon market’, which can be divided into three categories of buyer.**

**Two or three percent of the market is made up of leading companies like Microsoft, Amazon, Facebook, and others, who are willing to pay very high prices to support the industry. They have their own in-house teams with a deep knowledge of what makes sense and what doesn’t, and they’re not risk averse, which means they’re willing back newer technologies.**

**The next twenty percent of the market is made up of other large reputable corporations who have typically made a net zero commitment mainly because it’s being demanded by shareholders and customers. Their first priority is, quite rightly, to look for ways to reduce the company’s emissions. That’s obviously the best solution for all of us, and those emissions reductions often bring long term cost savings through reduced energy and materials consumption costs. But they’re often expensive up front and very difficult to implement in large organisations, so to stay on course in the shorter term, they have to buy carbon credits on the open market. The biggest risk for these companies is reputational. If they back a project that gets exposed as fraudulent or has other problems like trees dying two years after they were planted or indigenous people being displaced to facilitate the project, or whatever, then it could blow up in the media and become a big embarrassment for them. So, those companies really need high quality projects that have been certified and tick all the criteria boxes we just looked at. Prices for projects in this sector tend to be between one and two hundred dollars per metric tonne of carbon dioxide captured, and it’s in these top two sectors that Brilliant Planet operates most competitively.**

**Sadly, the remaining seventy five to eighty percent of the voluntary carbon market is populated by companies with no real insight into quality, and who just want credits at the lowest possible price.**

**Thankfully though, it’s the high-quality sector that’s growing at the fastest pace, almost quarter by quarter, because as everybody, including customers, employees, shareholders and board members, get more and more knowledgeable about the vital importance of quality and all the other criteria, companies are rapidly jumping away from ‘cheapest option’ and moving towards high-quality.**

**The Brilliant Planet folks retain the carbon they sequester. They bury it on their own land rather than dumping out at sea. So, companies buying credits from them can physically come and see the space where their carbon credits are stored, and if they want to, they can literally stick probes in the ground and verify for themselves that the carbon content is there.**

**On top of all that, the decarbonised water that comes out of the Brilliant Planet algae farms can deacidify enormous tracts of the ocean water, which helps local ecosystems to thrive.**

**The global strategy for Brilliant Planet is to licence their technology to local operators in areas of the world where the right conditions exist. They estimate that there are about five hundred thousand square kilometres of land around the world that could be used for this technology.**

**Brilliant Planet will provide all the tools to other countries, including finding locally suitable algae strains, plus satellite data analysis to search out remote areas with precisely the right topography and oceanography, and of course all the other support necessary to get the systems up and running in what are typically remote desert locations whose local economies stand to benefit significantly from job opportunities and a general income boost.**

**As biologists first and foremost, Brilliant Planet are acutely conscious that they need to structure their system very much in the context of ecosystem stability and restoration. The Intergovernmental Panel on Climate Change, or IPCC, is very clear that we’re not going to decarbonise fast enough simply by reducing our current level of emissions. We’ll need to physically remove CO2 from our atmosphere as well if we’re to stand any chance of hitting the 1.5 or 2 degree Celsius targets.**

**The resources are there. The underutilised seawater is there, the local algae are there, the sunshine is there, and even the renewable energy is there, because the geographical conditions in these places make them all favourable locations for wind and solar. And if Brilliant Planet do manage to reach their goal of 2 billion tonnes of carbon capture per year, through an environmentally beneficial process, then they really will be making an enormous contribution to our global climate mitigation challenge.**

**So, what’s your view? Can we get there with technologies like this? Let me know what you think in the comments section below.**

**That’s it for this week though.**

**A massive thank you, as always, to our fantastic Patreon supporters who keep these videos completely independent and ad-free.**

**And a special thank you to the folks whose names are scrolling up the screen beside me here, all of whom celebrated an anniversary of Patreon support in July.**

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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**