**At the risk of you good folks starting to wonder if I might be developing some kind of unhealthy obsession with algae, this week’s video is, well, all about algae – again.**

**The thing is, the more you delve into the stuff, so to speak, the more you realise just how versatile and potentially transformative it is.**

**We’ve already looked at how algae are being used to make foods and pharmaceuticals, and replace plastics and fuels made from oil, and if you were watching last week’s video, you’ll have also seen how well-managed algal blooms in industrial-scale, man-made ponds could be pulling as much as two billion tonnes of carbon dioxide a year out of our atmosphere in the not-too distant future. So, you might think that we’ve pretty much covered all the bases on what the old green slime can do for our planet. I mean what else is there, eh?**

**Well, of course we’re all overlooking the completely obvious option of growing it in sealed glass panels on the sides of large office blocks, to capture carbon dioxide, provide power for the building and biomass for heat? I mean you wonder why we didn’t think of it before really don’t you, because there’s clearly nothing at all bonkers about that idea is there?**

**Well, it turns out we have thought of it before, and down there in Mexico, where strong sunshine and even stronger liquor can do funny things to a person’s mind, a group of pioneering engineers has just launched what they claim to be an algal window technology that will increase the value of buildings and revolutionise the way we all think about energy efficiency.**

**They’re certainly not short on ambition, are they, bless ‘em.**

**So, let’s have a look at what they’ve come up with shall we?**

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

**Now, I’m not going to pontificate yet again about the wonders of photosynthesis and algae, I’ve done that in several videos now, all of which I’ve linked in the description section below. I would, however, highly recommend you get hold of a copy of this beautifully written book, called Light to Life by Raffael Jovine, who has spent a lifetime studying the subject and who has distilled his experience into a couple of hundred extremely readable pages.**

**But as versatile and robust as it is, you might not immediately think of growing algae inside the windows of your building – at least not on purpose anyway! That idea was first put into practice almost a decade ago in Hamburg, Germany. It was called the Bio Intelligent Quotient, or BIQ, building and it was designed by the engineering group Arup, who also did the Sydney Opera House and the Pompidou Centre in Paris.**

**Transparent outer panels of algae are attached to the side of the building to act as ‘photo-bioreactors’. They’re filled with water and pumped with liquid nutrients and carbon dioxide to help the algae grow. That process harnesses solar energy which passively cools the building on warm days. That energy can also be run through heat exchangers to provide warmth on colder days. Once the algae growth has filled up the panels, the biomass is removed and fermented to produce carbon-neutral fuel that drives an on-site boiler providing hot water for the building.**

**In twenty-twenty, researchers at the University of New South Wales carried out a cost benefit analysis of implementing a similar system on the front façade of a multi-storey building at the Sydney University of Technology. They compared a proposed solar panel system with a closed tubular photobioreactor, or PBR system, and presented their findings in this research paper. From a purely short-term monetary perspective, the conclusion was that a solar panel system was a more feasible option, not only generating more energy but also more revenue and a faster return on investment, at sixteen years compared to twenty-four years for the PBR system. But after that twenty-four-year payback period, the PBR system becomes more profitable than the solar panel-based system. Plus, it would of course have significantly more benefit from an environmental impact perspective because of the amount of carbon dioxide that it would be capturing during its operational lifetime. And as always, I’ll leave links to that Open-Source paper in the description section below so you can scrutinise their calculations at your leisure.**

**No doubt buoyed by all this jolly good news, the folks down in Mexico set up a firm called Greenfluidics, with a view to properly commercialising the technology. And it will no doubt appeal to certain commercial organisations trying to find ways to green up their businesses in readiness for the brave new world of Environmental, social and corporate governance, or ESG.**

**What Greenfluidics have come up with is something that they call the Intelligent Solar Biopanel. Now of course any self-respecting 21st century tech start-up knows that the best way to generate interest in their technology is to make sure it includes elements that begin with the word ‘nano’. And Greenfluidics are no exception. Their system uses nanofluids, which they describe as recyclable carbon nanoparticles. Adding them to water apparently increases its heat conductivity. That supercharged water is then fed through one side of the panel to improve its ability to capture solar thermal energy, which is then run through thermo-electric generators to produce electricity. Now, producing electricity from panels on buildings is, of course, not exactly a revolutionary new idea. Solar Photovoltaic panels do quite a good job of that already, and according to most of the sources I looked at in my research for this video, including the Australian paper, at the scale of an office block building, Solar PV is currently way cheaper too.**

**But we’ve still got to factor in the algae part of the equation, haven’t we, so how does that work?**

**Well in the Intelligent Solar Biopanel system, microalgae are grown on the other side of the panel to capture carbon dioxide and release oxygen, which Greenfluidics reckon can be circulated into the building to provide a generally better working or living environment for the occupants.**

**Plus, the solar thermal energy that the microalgae absorb as part of their photosynthesis is energy that doesn’t get into the building, which means the building stays cooler.**

**Greenfluidics reckon that each of their panels can generate up to three hundred and twenty-eight kilowatt hours per square metre per year and that the cooling effect of ninety kilowatt hours per square metre per year represents a thirty percent saving on air-conditioning costs.**

**Those are pretty bold claims!**

**According to this Solar PV output calculator from the US National Renewable Energy Laboratory, a decent modern solar PV panel, measuring 1 metre by one point six, or about 3 foot three inches by five foot four inches, installed in a relentlessly sunny country like Mexico would be producing something like three hundred and twenty two kilowatt hours per square metre per year , so it seems very ambitious to claim that capturing heat in water inside a window pane and using that heat to drive lots of little thermoelectric generators would produce more electricity than a standard solar panel.**

**And as far as I can make out from the company website, there’s no mention of what happens to the algae once they’ve out grown the space inside the panel. Are they harvested for processing into biofuels, like the BIQ building in Hamburg or just scraped out and thrown away? It’s really not clear at all. And what will be the cost of maintaining the panels and making sure the green slime doesn’t leak out and start causing havoc? Again, not clear.**

**That’s the sort of detail that’ll need to be teased out at prototype stage of course. Greenfluidics having been working towards that milestone since their inception in twenty eighteen and the company appears to have been received quite favourably by various institutions around the world, picking several accolades and awards along the way.**

 **According to their CEO, Adam Ramirez Sanchez, speaking in this web presentation as part of an event called Unicorn Battle in December twenty-twenty-one, they now have a full-scale prototype panel working in a real-world environment from which they should at least be able to extract some test data and cost numbers for potential investors to pick over. The next step will be to integrate a meaningful quantity of those panels into a working building to establish how they perform over the medium to long term.**

**In July twenty-twenty-two Greenfluidics officially launched their concept towards early adopters, aiming fairly and squarely at forward-looking real estate developers.**

**Let’s not forget that by twenty-fifty nearly two thirds of all human beings on the planet will be living in urban environments populated mainly by large multi-storey buildings of various types and functions, so the challenge of making those buildings as energy efficient as possible is a hugely important one as we travel along the rocky road towards sustainability. So, if the folks at Greenfluidics can get anywhere near the energy generation claims they make on their website, then they might be on to something.**

**Right now, though, that looks like a pretty big ‘IF’.**

**So, what’s your view. Is this a sneak preview of how all urban buildings will look in a few decades time, or is it yet another exercise in wishful thinking that’ll fall by the wayside as the harsh realities of economics and public perception kick in? Maybe you’re actually working in the industry, and you can provide us with a bit of further insight into the prospects for the technology. Either way, the place to leave your thoughts is the comments section below. I’ll be interested to see what you guys make of this one.**

**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 I must just give a quick shout out the folks who’ve joined recently with pledges of ten dollars or more a month**

**They are**

**Alessio De Bonis**

**Stephan Rombach**

**JD**

**Richard Warren**

**Al Abali**

**Matthew Burdett**

**Edmund Bialek**

**Todd Sears**

**Ron Kidder**

**Patrick Hort**

**and**

**Glen Butt**

**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**