**Economies all over the world are growing, because of course that’s what economists tell us economies are supposed to do in a capitalist system, isn’t it? What those economists don’t worry much about though is the side effects of that growth - something they rather dismissively refer to as ‘externalities’. Externalities occur when the activities of individuals or businesses impose non-financial costs that are not accounted for in the market transaction. Typical examples are things like air pollution from factories and greenhouse gas emissions from the combustion of fossil fuels. So, as western nations get ever richer and developing nations continue to pull hundreds of millions of people out of abject poverty, the obvious implication is that energy consumption will increase and so will the pollution and greenhouse gas emissions that inevitably come as a result of that consumption.**

**But is it inevitable though? Or are we simply basing our assumptions on an old, out of date and hopelessly inefficient system? That’s a question being posed by an increasing number of companies who are using tools like AI and other technologies to completely re-imagine the fundamentals of supply and demand in our energy systems. They tell us that the greenest electron is the electron that doesn’t get used at all, and they reckon they’ve cracked the code for moving us all in that direction.**

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

**Talking of green electrons, I must just let you know about the upcoming Everything Electric Live show in Farnborough in the south of England this October. The Farnborough International Exhibition and Conference Centre is a massive venue with tons of outdoor space, not just to display all the new private AND COMMERCIAL ELECTRIC vehicles that are now flooding onto the market, but also to house some great attractions and safe areas for the kids to run around and have some fun. Inside the conference centre you’ll find all the major suppliers of things like wall chargers, heat pumps, solar panels and battery energy storage solutions with experts on hand to guide you through the process of choosing the best system for your home. I’ll be hosting several live discussion panels there across all three days, so I’ll be around to say hello if you decide to come along. The whole thing kicks off on Friday the eleventh of October and runs through to Sunday the thirteenth. Tickets are available now at the link on screen, and in the description section below, and if you use the exclusive Just Have a Think discount code shown at the BOTTOM of the screen then you’ll get twenty percent off ALL tickets purchased. This one is the biggest event in the Everything Electric UK calendar folks, so I’m really looking forward to it and I hope to see you there!**

**Right, back to today’s business then.**

**Thanks to much more advanced scientific data collection tools, alongside sustained pressure from environmental groups, the spotlight of responsibility for tackling our climate emergency has started to shift firmly towards CORPORATE greenhouse gas emissions nowadays. There’s a growing ECONOMIC imperative to do better as well. Here in Europe, for example, many countries have suffered a sustained period of high energy prices following Russia’s invasion of Ukraine, highlighting an unsustainable reliance on Russian gas and oil.**

**The answer that we all hear about in the news these days is to accelerate the move away from fossil fuels and towards renewables. And that is indeed a laudable aspiration.**

**As well as the blindingly obvious benefit of reducing greenhouse gas emissions, the transition will all but remove the roughly 60 to 70 percent of completely wasted efficiency that comes as a result of attempting to generate energy for work via heat from combustion. That means we don’t have to replace the amount of PRIMARY energy produced by coal, gas and oil. We just have to replace this bit over here at the consumer end of the so-called Sankey chart.**

**But as global demand for energy grows, renewables, despite the astonishing progress of recent years, are still not keeping up with that demand.**

**So, essentially, if we want to get anywhere near our net zero goals, the industry experts are telling us that we will need to do more with less. That way, the two lines on the graph start to come together and we really start to unlock the full potential of solar, wind and battery energy storage.**

**A huge part of that is energy efficiency. According to an early analysis by the World Resources institute, state energy efficiency programs in the US over the last decade or so may have saved consumers between two and five dollars for every dollar invested.​**

**The International Energy Agency, or IEA, tells us that a collective push for energy efficiency could deliver more than a third of the total emissions reductions needed to reach net zero by twenty-fifty. By that time, according to the United Nations, more than two thirds of all the humans on the planet will live in urban environments.**

**The World Economic Forum points out that buildings are responsible for nearly forty percent of global greenhouse gas emissions, so one of the biggest opportunities available to us is to radically reform the way those buildings are heated, cooled and lit.**

**And that’s where artificial intelligence and the so-called Internet of Things, or IOT come into play, especially in places like large corporate office blocks. Companies like 75F and in the US and BrainBox AI in Canada have developed control systems that optimize building energy management using networks of smart sensors, cloud computing, and machine learning algorithms. Those systems continuously monitor real-time data like temperature, humidity, occupancy, and air quality throughout a building, as well as external influences like weather patterns. All that data is then transmitted to a controller in a cloud server, where clever algorithms crunch all the numbers and send appropriate messages back to adjust heating, ventilation, and air conditioning settings automatically, thus optimizing indoor conditions for energy efficiency. Their systems also learn from building usage patterns to make predictive adjustments ahead of time. All of that results in significant reductions in energy consumption, and a much more comfortable workplace for the folks in the building, which helps improve therefore their performance levels. And of course, the operational costs for building owners are much lower too.**

**Others, like Clockwork Analytics in Boston, Massachusetts, and Gridium in California, have developed data-driven systems that focus on optimizing building performance through continuous commissioning and fault detection. Facility managers receive actionable insights and recommendations through a user-friendly interface, enabling them to take targeted corrective actions that improve operational efficiency, reduce energy consumption, and lower maintenance costs.**

**And then there’s Audette, based in Vancouver, Canada, who use advanced integrated software to conduct energy audits in large corporate buildings. Machine learning helps to model energy consumption and benchmark buildings against industry standards. That then generates detailed, actionable reports highlighting potential retrofits, upgrades, and operational improvements.**

**It’s not all about commercial buildings though, is it? In twenty-twenty-one the UN estimated that there were something like two-point-three billion domestic households globally. And as I’m sure you’re only too aware, those are some of the leakiest and most inefficient buildings we humans currently inhabit. The IEA tells that heating and cooling in domestic households accounts for nearly fifty percent of their overall energy consumption. Improving insulation and the air tightness of what the industry bods call the building envelope is of course a highly effective strategy for reducing the amount of energy that escapes, and modern energy-efficient windows, especially double- or triple-glazed windows, can reduce energy use by a further twenty percent. Even the way we light up our homes can make a big difference. We all know about LED technology of course, but beyond that there are companies like Lumen Cache over in the States, who utilise data cables instead of standard electrical wires to create household lighting and device control systems. In fact, from a single control box, the Lumen Cache system can cover ninety percent of fixtures and appliances in the home, reducing copper wires by sixty percent, and offering a thirty percent saving by using low voltage DC power that can seamlessly integrate with rooftop solar without the need for the inefficient conversion from DC to AC that our traditional domestic electrical systems require.**

**Artificial Intelligence is now creeping into our domestic homes as well, in a very similar way to the commercial systems we’ve just looked at. According to the IEA, our domestic appliances account for around fifteen to twenty percent of household energy use, but as we move to smart meters and smart devices, all controlled by servers on that internet of things or IOT that I mentioned earlier, our homes are starting to become an integrated element of the electricity grid, in some cases even helping to ensure grid stability throughout the day. Water heating for example accounts for around fourteen percent of a typical household’s energy consumption, and companies like Mixergy, here in the UK, have developed products like the Mixergy smart water tank, that not only heats water up in an entirely different and much more efficient way than a traditional immersion heater, but also has the capability to communicate with a cloud controller to automatically switch on at a time of day when electricity supply is cheap and plentiful. That means savings for the consumer, but it also potentially means better, more efficient use of renewables like wind turbines that might otherwise have to be switched off, or curtailed, with all the costs and inefficiencies that that involves. Same thing with electric vehicles. I visited the head office of the UK’s largest electricity supplier, Octopus Energy, recently and had a chat with their CEO, Greg Jackson about how, among myriad other brilliant initiatives, they’re also revolutionising the EV sector.**

**“Using electric car batteries is an incredible way of balancing the grid, […] because today Octopus alone has one-point-zero-six-six gigawatts, so over a gigawatt, of electric vehicles that we charge with a bespoke schedule for each vehicle every day, designed to do this exact job of balancing the grid. It allows us to grab the cheapest electricity, often when it’s windy or sunny or when the grid’s underutilised and charge the cars at those times. That gives us…the drivers on these products can do a hundred miles for £2.40. That’s seven times cheaper than petrol or diesel. But they’re also helping to bring down the cost of electricity for everyone else, because they’re helping balance the grid and soaking up this cheap electricity when it’s abundant, using less when it’s in tight supply, which that for everyone else that’s using it at those times, there’s less demand.”**

**“But the scale is quite remarkable. I mentioned earlier that we’ve got about a gigawatt of smart charged electric cars. […]**

**And we’ve only got a market share of about twenty-odd percent in the UK. And not all cars have got the capability yet to do the smart charging. So, if you multiply that up, you know, if you went from 5% of cars to 100% of cars, instead of being one gigawatt, that would be 20. If it wasn’t just Octopus – if it was across all companies – you might get another four times that. You could be looking at the best part of a hundred gigawatts of shiftable power.”**

**So, it’s all moving at breakneck speed right now, and it can all seem a bit bewildering at times, but there’s no doubt that big corporations have well and truly cottoned on to the economic advantages of improving energy efficiency, and of course, they’re all very happy to get brownie points for ostensibly doing something for the climate as well, even if that’s not really their main motivation. And they can achieve that goal much more easily now thanks to incredibly innovative tech companies like the ones we’ve featured today, and many others all over the world. We still have huge challenges in all sorts of other sectors like land use, industry, aviation and shipping for example, but all of those sectors are being disrupted as well by innovators who are finally upending the old- fashioned, monopolistic, centralised energy supply systems that were tailored to the needs of the fossil fuel industry, and which are now starting to look hopelessly outdated.**

**Feel free to leave your thoughts on the subject in the comments section below, but that’s it for this week. Thanks, as always to the amazing folks who support my work via Patreon. Don’t forget to jump over to Patreon dot com forward slash just have a think to have a look at all the exclusive perks you can enjoy there. And if you found this video useful and informative then you can hugely support me absolutely for free by hitting the like and subscribe buttons on YouTube and clicking on all notifications, to help us get to our six hundred thousand subscriber mark before the end of the year. Doesn’t cost a penny to do that and it’s just a simple click away, either down there or on that icon there.**

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

**See you next week.**