how much money do we need in order to remove a significant amount of carbon dioxide it out of our atmosphere and what are the mechanisms that we should use to spend all of that money i'm the head of sustainability at shop of i accompany you may not know but you might interact with every day because our technology powers millions of online retailers and twenty nineteen we wanted to become a carbon neutral company and be accountable for all of our historical emissions instead of buying typical traditional carbon offsets that simply pay someone else to not pollute as much as we already had we actually wanted to delete or emissions it quickly became obvious that carbon removal those solutions that pull carbon dioxide out of the atmosphere and store it safely were very expensive and in short supply so to kickstart this almost nonexistent market we launched our sustainability fund and committed to spend a minimum of five million dollars every year on the most promising solutions now obviously we need deep emissions reductions i'm not disputing that but alongside this we also need to build the world's capacity to pull ten get tons of carbon dioxide out of the sky every year by twenty fifty now at the time five million was a big number and it was it a really big number to spend on something and it's infancy and we thought we were doing something significant but then we totally hit a wall we weren't even thinking at the right scale we need to build massive facilities capable of pulling one million tons of carbon dioxide out of the air every year and we need thousands of them and in order to do that we need project financing of boat one billion dollars per plant now to put that into perspective or five million dollar annual budget would probably by about ten thousand tons of carbon removal every year hats tiny that's only one percent of the annual capacity of the size of the facilities we need and like i said we need thousands of them so we've learned that in order to move the dial on climate and to build the necessary infrastructure we need more money way more money and in order to do that we need collaborations and we need structures that leverage the significant power of capital to create eight even bigger effects so now i'd like to tell you about what we did next it's a mechanism that we launched alongside for other companies it's an amc am see stands for advance market commitment and this one's designed to help guarantee a future market for carbon removal by trying to d risk of the are indie investment and

capital expenditures needed to scale carbon removal and grow that industry now why i think this is such a promising approach is because it's not new am sees have been used in the past in the healthcare sector to encourage and accelerate the development of vaccines it worked by essentially guaranteeing the economic viability of production by setting a price in advance this meant that companies could justify the are indie resources needed to develop the vaccine as well as the costs associated with bringing it to market these just needed to know that someone was going to buy their product at a set price so this a m c boroughs the idea of a purchase guarantee to try to accelerate the development and scaling of carbon removal and to do that we set up a fund and it's pretty big pot it's nearly one billion dollars and it's called frontier but frontier has to overcome some significant differences between vaccine development and carbon removal first vaccine development has been done for a long time and we've largely worked out the supply chain and infrastructure challenges the operational issues and the policy definitions but for carbon removal this is essentially still a new industry that faces all of these hurdles for example a lot of carbon removal technologies reliant clean power to operate because if they don't delimit more carbon dioxide then they capture but clean power does not exist today at the scale and distribution we need second vaccines are developed by established companies with deeper indeed teams and experience whereas today carbon removal largely exists on paper in the lab or at the start up stage there's only a handful of companies worldwide right now that are any further along third the manufacturing facilities for vaccines already exist at scale but for carbon removal the largest facility and operation today is climb works as orca plant in iceland it has an annual capacity of four thousand times which is orders of magnitude less than what we need this means that today there's no company or facility in operation that can respond to the demands signal of frontier so to summarize for vaccine development all these companies need it as an incentive was a dollar sign they had everything they needed to jump into action and respond but today carbon removal need so much more even though there's a lot of different ways to approach this i do believe that this is a significant market signal that shop of i alongside stripe alphabet matter and mckenzie sustainability have committed to buying nearly one

billion dollars combined of the product but a carbon removal ecosystem is under developed even though frontier is essentially helping to underwrite all of the brought investment needed to scale carbon removal this is an imperfect application of the advance market commitment mechanism because the carbon removal ecosystem is under developed however however this is exactly what we need to do to supercharge progress by accelerating innovation it is so important to take chances and to experiment and as buyers of carbon removal we have an opportunity to stand up and do our part to build for the future and this commitment and does just that so now we have frontier which is the demand poll by providing capital and resources through the advanced market commitment mechanism but what about the other side of the equation we also need a supply push to start in addition to all of the new climate companies being launched we also need companies from existing industries with transferable skills to jump in and start developing carbon removal i'm talking about now don't get mad i'm talking about industries like oil and gas mining manufacturing infrastructure and electricity who all have deep experience building huge projects that's the massive scale that we need that i was talking about at the beginning alongside this we also need to build a robust management system to ensure that all of these new carbon removal solutions are in fact capturing more carbon dioxide then they emit this is kind of along the lines of the quality assurance quality control and process trials we rely on to oh ensure that our vaccines are safe and that they work but most importantly we need more practice doing the actual thing rather than trying to get it perfect on paper if we don't try we can't learn and if we don't learn we cannot it or rate and improve this am see is technology neutral frontier sends out the demands signal but we do not specify which technology should be used to meet it but what we do specify is the quality standard we expect in order to ensure that real permanent carbon removal took place at the agreed upon price now this arrangement were hoping should encourage experimentation and tight aeration cycles that should quickly separate the promising solutions from all of the distractions now i'd like to ground this in reality by providing three solid examples of companies who are already on their way and some of them are actually doing the thing first we have climb works operating in iceland they use direct year

capture machines to filter carbon dioxide out of the air and capture it for storage and they've now since broken ground on their next scale facility which should be able to pull thirty six thousand tons of c o two out of the air next we have running tied who's think help deep into the open ocean to lock away carbon dioxide that's been captured through photosynthesis they're currently working through their first skill deployment and they're building all of the measurement quantification and monitoring systems at the same time i'm and third we have heirloom who plan to accelerate the natural capacity of limestone to react with and capture carbon dioxide and lock it away and now they plan to do this by accelerating the natural absorption rates of the rock from a approximately a year to just days are set to break ground on their first commercial scale facility in the united states and twenty twenty three now there are many other companies that are starting to emerge that i could have mentioned here however from these three examples but you can see is the diversity of solutions and were agnostic about that all that matters is that they achieve the results within those set parameters now before i and i must address the question of our own operations so to start shop advise the carbon neutral company and we've committed to kick starting the carbon removal market our business is all about helping millions of entrepreneurs succeed and today they're experiencing so many challenges we have an opportunity to help them become carbon neutral and to leverage carbon removal in order to fridge future proof their businesses which in turn safeguards ours now not a lot of them have climate teams but we have the opportunity to share our experience and expertise with them and so what we're trying to do is take everything we've learned about reducing and managing shop fires emissions and from vetting and buying high quality carbon removal and we're trying to take those lessons and put them out on our platform to make them available for all of our merchants not only will this hell produce emissions but this will also help create the very market that all of these new carbon removal companies who are building in response to frontiers demand signal will rely on this is a feedback loop that will spur innovation and drive the development of carbon removal at the scale the world needs thank you