Batteries Now Included

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Kousha Navidar: Hey Ariana.

Ariana Brocious: Yes.

Kousha Navidar: I need your advice about something.

Ariana Brocious: Okay.

Kousha Navidar: So you live in Arizona, right, Tucson?

Ariana Brocious: I do, that's right.

Kousha Navidar: Okay so I'm in New York as listeners might know. And it's getting really hot here. And I've had to run outside a lot because I love to run, I'm training for a marathon as you know. –

Ariana Brocious: Wait, you're training for a marathon?

Kousha Navidar: Yeah, thanks, yeah, right, right. What's the fastest way to know someone is training for a marathon? Yeah weird flex. But indulge me. So when I get back from my running, I'm sweaty for a very long time and I'm not used to this level of heat and I think you might be. So I'm wondering is there a way to cool off faster when you've been outside in the heat for a long time.

Ariana Brocious: Excellent question. I don't run in the heat so can't give you a direct answer. However, I know people who do. It's a thing. Heat training is actually really good for your and will probably make you better when do you compete because it increases the amount of oxygen in your blood, I think. But in terms of cooling off after you come back. I would say a cold shower. Like turn the shower on, and don't let it warm up, just get in right away. And I think that will help cool your body temperature a lot.

Kousha Navidar: But it's so painful to do that.

Ariana Brocious: I didn't say it'd be enjoyable.

Kousha Navidar: Why? Alright, that's very helpful. Listeners, if you have any tips for me, please let me know. This is partially on behalf of my wife as well, like the laundry basket is becoming a biohazard. So please. Let's dive in.

Ariana Brocious: Yeah, let's get on with the show.

Kousha Navidar: This is Climate One. The Trump administration has taken aim at green energy, but one technology has been largely left untouched: batteries to store wind and solar electricity.

Julian Spector: we're not building 10 nuclear power plants anywhere in the US. But you can build that much in batteries pretty quickly.

Kousha Navidar: While stored renewable power can help cut emissions, producing batteries isn't without its downsides.

Sheila Davis: we're most concerned that the extraction that's required for batteries is very damaging to communities and to the environment globally.

Kousha Navidar: Yet reusing and recycling those batteries can reduce the environmental impact **and** potentially benefit the US economy.

David Klanecky: The more we can recycle and recover these materials, keep 'em within our country, the less dependent we are on going to other countries to be able to find these materials.

Kousha Navidar: The Rise of Grid Scale Storage. Up next on Climate One.

Ariana Brocious: I'm Ariana Brocious.

Kousha Navidar: I'm Kousha Navidar

Ariana Brocious: And this is Climate One.

[music change]

Ariana Brocious: So Kousha, today I want to talk about a piece of the clean energy puzzle you might not think about every day: grid-scale battery storage.

Kousha Navidar: You're right, not every day! I take Saturdays off. So we're not talking about laptop or phone batteries, right? More like batteries the size of shipping containers.

Ariana Brocious: Exactly. These are huge batteries. And they can take the excess energy created by the wind or the sun and store it, and then put that power back on the grid even when the wind stops blowing or the sun isn't shining. Right now a lot of this happens the same day, because these batteries can only store power for so long. So think of extending the use of solar panels past sunset.

Kousha Navidar: This is a rapidly growing industry, I mean, in 2019 there was about 1GW of battery storage in the nation's electric grid. Last year - it hit 26GW. That's 26 times the storage capacity in five years! And it's equivalent to the power of more than 20 nuclear power plants.

Ariana Brocious: Yeah, it's a lot of juice! Of course, batteries don't generate power on their own, so it's not quite the same thing as a power plant, but that's still a mind boggling number. And their production cost has come way down in recent years too.

Kousha Navidar: So much so that a report from Ember Energy has said in the most sunny areas, solar plus battery storage could cover up to 97% of their energy needs – day and night – **and** be cheaper than coal and nuclear power.

Ariana Brocious: (react) Though, for the industry, there is some uncertainty about how tariffs will

affect all the imported battery components. And the fact that many of those components come from countries like China – could disqualify them from the tax incentives that are still available.

[music change]

To get a clearer picture of the grid scale battery storage sector, I talked with Julian Spector, senior reporter at Canary Media. He's been covering the industry for a decade and has visited a lot of battery storage projects.

Julian Spector: To be honest, they're not the most like visually dynamic thing to look at for the most part. the typical archetypal battery installation, it's, it's really a bunch of like white, gray metal boxes kind of spaced out in a field. these are containers that are packed with, with racks of, of lithium ion batteries. Kind of in the vein of like a, a server farm. You know, if you've ever seen those sort of data centers where there's just these, these boxes stacked up and there's cooling systems to keep them all in the safe operating temperature. It's a great, it's a great design to make it easy to package these things and ship 'em and drop 'em into place. There's a lot of efficiencies, but yeah, we always struggle to like illustrate our stories about battery projects. 'cause it's kind of just like a field of, beige boxes. Just, just sitting there.

Ariana Brocious: Yeah, well, uh, it's all right if they do the job. Maybe they don't have to

Julian Spector: That's the thing. They should be boring. It's much better for them to be boring to look at.

Ariana Brocious: So battery storage has often been seen as a companion to intermittent renewable energy, like wind and solar that generally only produces energy when the wind is blowing, the sun is shining. So how much power can a typical grid scale battery installation hold? And, you know, for about how long?

Julian Spector: Yeah. Okay. So this, this can get a little complicated because the how long is dependent on how much they're, they're being called on to sort of discharge back to the grid. We usually talk about batteries in terms of their, the maximum capacity that they can push out to the grid in an instant and that's in gigawatts or, or megawatts, as the unit. And then there's the sort of storage over time, which is megawatt hours or gigawatt hours, which you can think of as like how much is in the tank to be used eventually. It always hard to make like accurate comparisons. One, one frame of reference is like a, um, uh, a nuclear power plant, the big old kind, is usually around one gigawatt. Um, we haven't built any battery systems quite that big yet, but it's common now to see like 200 megawatt, 300 megawatt, that kind of range. And the typical format in today's market is batteries that can discharge their full potential for like four hours straight. So, let's say a very common type of battery plant today might be like a third of the instant power that a big old nuclear plant can do and then it can run for four hours straight out. and that gets at kind of like one of the limitations of batteries is obviously they run out, uh, and, and the current cost structure of lithium ion batteries, it's, it's come way down. Like it's, it's way cheaper than it was 10 years ago. But yeah, it's, it's still, it's. Too expensive to like, stack enough of them to be storing power for really long periods of time, like days. right now it's like a shorter term asset and, you know, the, the sort of roles they're doing, you could think of as like, when the sun goes down and you're, you're, you have this nighttime demand, everyone's coming home from work. Uh, battery's really good fit for taking solar from the daytime and covering up that, that nighttime peak window, you know, maybe five to 9:00 PM kind of thing. And just like serving that with the really cheap solar power from earlier in the day. But you know, it's not necessarily getting us all the way through the night at the moment.

Ariana Brocious: That's a great example, and a way to think about it because I, I, I think this idea

that's essentially extending the hours available that you would get from like a solar farm, um, or a wind farm. You called 2024, a great year for energy storage. What made it such a successful year for battery storage deployment?

Julian Spector: Well, it's really been a long time coming. So the storage industry 10 years ago, very, very small, you know, as a reporter trying to cover it. I think I had to spend more time trying to find any project worth writing about than I actually spent writing about them. Like it was very little happening. But then, a big early precursor was California passed some state level policies like including a mandate for their utilities to, to buy grid batteries. And, and that kind of kicked off a market. and then as more batteries got installed, they just worked really well and, and solved problems and they're very quick to build compared to a gas plant. So it's kind of like the more, the more we started using them in, in the US. The more people found uses for them. And so 2024 was the culmination of this long running, sort of, uh, trend, you know, building up that way. But yeah, definitely helped by the inflation reduction act that passed, uh, during the Biden administration, which created the first dedicated energy storage tax credit. So that gave this boost to storage developers And then the big story was also Texas, uh, getting into battery storage in a, in a huge way. Um, because for a while it, it kind of really was a California thing. You were seeing Arizona utilities were starting to build some big ones. And there, there were a few projects happening in other states, but it was very geographically limited. Um, and it, it still is basically a Californian, Texas game at the, at the moment. But, um, Texas has this, really just free market for energy on the grid. So there, there's no monopoly utility deciding what power plants get built. There's, just any, anyone who wants to really like you, you, it's kind of business people, private investors are able to come in and build a power plant they think they can make money on. And so, there's rules in the market that kind of govern what, what the batteries can do and everything. But, a lot of entrepreneurial developers decided they thought they could make a lot of money building batteries, and they did make a lot of money building batteries. And now there's gigawatts getting built like, I think they're gonna pass 10, 10 gigawatts this year. California has already passed, they passed 10 gigawatts last year. So if you're remembering the, big nuclear power plant is about a gigawatt of, of capacity. And, we're not building 10 nuclear power plants anywhere in the US. Um, but you can build that much in, in batteries like pretty quickly, actually.

Ariana Brocious: Yeah, that's a remarkable statistic. And, you know, staying on the California and Texas examples for a second here, as you mentioned, they've really led the way in developing battery storage and there's been a lot of reports about how well the batteries have helped stabilize the grid in those states, particularly Texas, during heat events. Can you explain just really quickly how that actually works? That, you know, what are the batteries doing mechanically to like offset peak temperatures or demand or what.

Julian Spector: So what's great about Texas is that there's a lot of good data, that the, uh, ERCOT, which kind of runs the grid they put out. So you can actually see graphs that visualize this, um, exactly how it, how it works. But, if you take, uh, like August 20th last summer, there was a record set for, uh. Electricity demand. Um, and you would think uhoh, like, that's probably bad. It's super hot summer day. Everyone's cranking the AC population, you know, has been growing. There's more people moving there 'cause California's so expensive and, you know, everyone's trying to stay cool. but actually the prices didn't spike at the moment that the, uh, you know, record demand hit. Uh, because that was kind of in the, in the afternoon and there's this whole new solar, fleet, uh, just like totally cranking, putting out lots of power. And so you have this, extra capacity of newly built solar that is keeping pace with the, the rising demand, during the sunny hours, but where the prices did start to spike is, uh, is of course after the sun goes down. So like, you know, seven o'clock-ish you can see the,instant, you know, the real time price in the energy, energy market starts shooting up. But that's when, the batteries come in and so they're able to just sort of suppress,the spike in

demand that you know would've happened if you didn't have, the gigawatts and gigawatts of batteries just built in the last two years. And, one really clear metric of that is, uh, there's sort of a, a thing called like a conservation. notice that they, they put out if the grid is running

Ariana Brocious: Oh, this is like telling people, Hey, turn your thermostat down a couple degrees.

Julian Spector: Yeah, exactly. So it's like you, you, you don't wanna as, as the person running the grid, you don't wanna do that unless it's gonna be bad. 'cause you know, people don't wanna be told they have to like, not use the air conditioning or else the grid's gonna break or something. Um, but, uh, yeah, so the ERCOT actually had to issue 11 of these conservation calls in the summer of 2023. Then the people in Texas built all these extra batteries and, uh, in 2024, uh, they didn't actually have to issue any of them. So, you know, that's like a pretty big, big difference from one year to the, to the next.

Ariana Brocious: And you know, I think, again, just to kind of emphasize this, When you're talking about places that are suffering from heat, in particular, you have that solar gain that happens during the afternoon. So buildings, cities take on a lot of heat that they then have to disperse through the night, and so your cooling demand continues after the sun goes down, as you mentioned. Then there's also the impact of people coming home, running their dishwasher, cooking dinner, you know, all those things. And so there is a lot of evening demand and this battery grid storage is really helping kind of smooth that out.

Julian Spector: Yeah. And then also some of these increasingly hot heat waves, maybe it's never getting below 90 degrees even at night. The demand certainly continues past when the solar, uh, can help. And that's, that's where the batteries come in and make a big difference. And, and that shows up in the prices people pay, to your electricity bill at home. Those are lower now in Texas than they would've been without the batteries. And, people have done studies on measuring how much the power prices have gone down compared to previous summers there.

Ariana Brocious: Yeah, and that matters for people. So we touched on how, President Biden's policies, especially the Inflation reduction Act, helped boost grid scale battery storage. President Trump's recent budget bill,slashed incentives for a lot of renewable energy. But it did, um, as you mentioned, kind of leave grid scale battery storage, you know, alone for the most part. What implications does the new law have on this industry, though? 'Cause there still are some impacts, right?

Julian Spector: That's true. Though one of the sort of asterisk or, or caveats there is, um, the law did put in some new requirements around what they call foreign entities of concern, which,Is a jargon, is it basically means for, for the purpose of this China, like equipment that comes from China or, corporate ties to, to Chinese companies. there's now, this like pretty detailed tests that's been written into the law that companies trying to claim the tax credits are gonna have to prove that the equipment in their projects doesn't exceed a certain threshold that's allowed to be from China. And that's actually, could be bad for, for storage at the moment, the sort of battery technology that's most favored for, for these grid installations is called lithium iron phosphate, and almost all of that cell manufacturing is still in China. So the model is basically you like import these cells that are made quite cheaply and, and very effectively in, in China. Uh, and you package 'em into your big, your big, blandly

Ariana Brocious: gray box.

Julian Spector: Yeah, exactly. And, and you know, so folks like Tesla or there's a company called Fluence like that, that happens in the US. Um, and you put your, you know, equipment to control it

and keep it safe and everything. Um, but uh, yeah, basically all those developers now have to figure out, okay, does the amount of value in those imported cells from China run up against this new limit, placed by Congress? it's one of these cases where the, the storage developers would probably say less government intrusion into the, the business world would probably be preferable there. Um, but you know, a lot of folks are supportive of the, the broader effort to bring clean energy manufacturing back to the US. So, so in, in theory, this is serving that goal that people like. But, we gotta see how the implementation actually goes.

Ariana Brocious: Right. So there's some impacts in terms of what. developers in the US are able to import or storage battery companies are able to import. And, um, we'll see how those have, you know, how those take effect. Plus the domestic battery manufacturing industry, that got a lot of boosts under President Biden's, um, administration. There's also some, similarly, some challenges affecting that industry. So a lot of concerns around some of the supply chains. You mentioned the prices of lithium have gone down a lot, but there's still concerns about where a lot of the minerals that go into batteries are mined and the practices that go behind that and environmental impacts.

Environmental impacts. So proponents of a circular economy want spent electric vehicle batteries to be used as grid storage. And this is really interesting because. You know, there's concern about the life of a battery in your car. You need it to be able to recharge quickly and deploy a lot of energy, but they're often retired when they still have a lot of useful life. So the company B two U just did this, uh, in California, they're expanding into Texas. And another company, Redwood Materials, just completed a grid storage project with over 700 used electric vehicle batteries. And you toured that. But what's the impact of these kinds of projects or potential impact?

Julian Spector: Yeah, so this is, JB Straubel who, who was a chief technology officer at Tesla and really built their battery business, which is a, a leader, in the field and he wanted to recycle batteries, you know, do the, figure out the, the, what do we do with them all when they're done being used. And then, I've covered the, the battery recycling industry. It's been having some troubles. It's been, um, you know, they're, they're, they raised a bunch of money from venture capital and had these, all these big promises that were gonna like, get 99% of all the useful minerals out and put 'em back into the battery manufacturing supply chain, and it's all gonna be great. Um, few years have gone by. There's been, uh, several of these companies have run outta money, closed up shop. Basically people are finding that it's harder than they'd hoped to like actually break down the batteries and get battery grade materials out in a way that's cost effective. but you know, Redwood's still still building their facility for that. And in the meantime, these used battery packs were sort of piling up, uh, on the lot. And they said, wait, you know, these still have like rule thumbs usually, like they might have 80% of their storage capacity in 'em, you know, in the way that your phone, the, the iPhone will tell you now, like, oh, you're, you're, you're down to 80% of what it was when you bought it new. Um, so a full charge doesn't last you as long, but if you're just putting it in a field with 700 other battery packs, it can actually be fine. so I went out to Reno and this is, uh, in this desert, maybe 30 minutes drive, east of Reno. So, basically, Redwood, they're putting the used EV packs in there. They're now selling grid scale storage way, way cheaper than what it would cost with brand new,fresh off the line lithium ion batteries. and with, with that cost structure, they're also trying to compete in this sort of long duration category, which is saying, Hey, we can give you power for, for 24 hours straight, and this is a data center being. Run 24 7 on solar power generated there and, and put into the old EV battery packs and then,guaranteed all, all night long. And even if there's no sun one day, they, they've got enough power and stuff. So that, that's, that's new as of like June. But as you said, a, a few other companies have have done this with the used packs of B two UII, I saw their project and,out in sort of the outskirts of LA County near the Mojave Desert. And, I had to view these myself. 'cause like people have been saying, oh, why don't we just repurpose the old EV batteries? That's such a good idea. And like. For a while, no one actually did it. So, so I needed to go

see that myself and be like, okay, this is a real thing. it's showing it's possible. At least that, you know, not, not a ton of it happening yet, but it's, it's possible.

Ariana Brocious: Yeah. So. You've covered this industry for 10 years. It's changed dramatically during that time. What do you think the future of this industry will look like in the next five to 10 years?

Julian Spector: Yeah. Oh, that's a good, that's a good question. So, I think the, the, just the, the volume of deployments is, is entering the kind of hockey stick growth curve. I think a, a key, limiting factor there is, is it's kind of boring, but it's, it's basically like barriers to entry in energy markets. The reason Texas took off so much is they let anyone who wants to build it come in and compete. And it's a fairly level playing field. You know, the legislature keeps trying to come up with ways to help out gas plants and sort of make it a less level playing field. But so far they've, they've kept it like an open competitive market there. The problem with a lot of the US is, uh, served by old school monopoly utilities that have been around for a century and they control everything. And you know, there's regulators that are supposed to oversee them, but like, yeah, there's a lot of places where you couldn't just come in and build a battery, even if it would be clearly helpful and lower cost for everybody and, you know, reduce pollution compared to some old coal plant or whatever. So that will be the thing to work on in other states to make sure everyone gets the benefit of these. New York has been trying to build batteries and they've got a few, but it's not really. a thriving market the way Texas is and New England. Like there, there's a lot of places that need to get their first few big, big batteries built and see that it's, it's good and it works. And I do think, we'll, we'll see more and more made in the US batteries also like the, you know, it takes a few years to build a battery factory and it's a, it's a billion dollar investment typically. Um, but like LG, the big Korean company just just opened a factory in Michigan that's specifically to serve these, the grids, stationary storage, market. So, um, yeah, I think we'll see more made in America, just more batteries. So if we're looking around and we need power fast, You gotta go with what you can actually build fast and that'll be batteries and, solar in its own way too.

Ariana Brocious: Mm-hmm. Great. Well, maybe we'll have you back on to evaluate the industry, in a few years time,

Julian Spector: Yeah, we could say hopefully, hopefully I got everything right and, uh, all the predictions came true.

Ariana Brocious: Exactly. Julian Spector is a senior reporter at Canary Media. Thanks for joining us on Climate One.

Julian Spector: This is a lot of fun. Thanks for having me.

Kousha Navidar: Coming up, recycling batteries here in the US may help change the whole energy storage supply chain.

David Klanecky: Localizing that supply chain helps us not only from a cost perspective, it helps from a carbon footprint perspective, it helps with just supply chain security, and at the end of the day, it's gonna help the consumer.

Kousha Navidar: That’s up next, when Climate One continues.

Ariana Brocious: Help others find our show by leaving us a review or rating. Thanks for your support!

This is Climate One. I’m Ariana Brocious.

Kousha Navidar: I’m Kousha Navidar

Ariana Brocious: Globally, manufacturers are ramping up production of big battery packs for grid scale storage and electric vehicles. One of the exciting features of these batteries is that theoretically more than 90% of the materials can be recycled and reused.

Kousha Navidar: Which is huge. When was the last time you recycled the gas in your tank?

Ariana Brocious: Hah, yeah, never!

Kousha Navidar: I don’t suggest people try that either. Not a good idea.

Ariana Brocious: Not a good idea. When your car burns gas, someone somewhere has to pull more petroleum out of the ground - over and over. With batteries, the minerals only need to be mined once. And increasingly, facilities are attempting to make high level battery recycling a reality.

Kousha Navidar: Currently, most large pack battery recycling happens in Asia. NPR's Camila Domonoske visited a factory owned by the company Ascend, which is trying to onshore that process here in the US.

CAMILA DOMONOSKE: Past a lab with liquids spinning and dripping in giant beakers - quick pause for safety gear.

ERIC GRATZ: So let's grab some goggles.

(SOUNDBITE OF PLASTIC RUSTLING)

DOMONOSKE: Through a nondescript door...

(SOUNDBITE OF DOOR SQUEAKING)

DOMONOSKE: ...There's a miniature chemical plant tacked onto the back of Ascend Elements' R&D facility in Massachusetts. Now, miniature is relative.

GRATZ: I mean, we have tanks that are up to 18 feet tall.

DOMONOSKE: Eric Gratz is Ascend's co-founder and chief technical officer.

GRATZ: And then this one here, which is taller than me, is one of our smallest tanks.

DOMONOSKE: But this is a fraction of the size of the factory Ascend is building in Kentucky. This month, this little plant sent its first commercial shipment of battery materials fully recycled in the U.S. The company thinks that's a first for their kind of product. They'll go back into batteries for things like electric construction vehicles. If you don't recycle batteries, they're hazardous waste, but if you do, they're a valuable resource. The more you recycle, the less you need to mine. Step one is collecting and pulverizing batteries. Employee Brian Garland scoops some black powder for me.

BRIAN GARLAND: Hang on, let me just give you a little so you can see it. And that's what we get from shredding the batteries.

DOMONOSKE: Literally shredding them - this step has been happening in the U.S. for a while. But today, that powder of jumbled up minerals mostly gets shipped to Asia, where companies had a big head start on building battery supply chains for the next steps. These molecules are going on a short journey here in the states. Gratz leads the tour.

GRATZ: Then you get pumped down to that leaching tank there where you'll be dissolved in sulfuric acid.

DOMONOSKE: Some of the minerals, like nickel and cobalt, dissolve. The graphite in the mix doesn't. That helps sort them apart.

GRATZ: Then you're going to go over to our impurity removal station.

DOMONOSKE: The exact combination of minerals gets fine-tuned, and finally, it's dried back into a powder, currently sitting on a shelf in 25-pound bags.

GRATZ: So it comes in as a powder, and it's leaving as a powder. It's just coming in, you know, very impure and - but leaving very pure.

DOMONOSKE:. Companies are trying to make the process more efficient and cleaner. At Ascend's R&D lab right next to that production line, Matthew Valdiviezo, standing before a beaker of swirling bright teal liquid, says chemistry is all about rules.

MATTHEW VALDIVIEZO: So we're trying to manipulate the rules here to make us money in the long run, you know, and help the planet, of course.

DOMONOSKE: Environmental groups do think battery recycling can help the planet if it's done right. To explain how these processes are improving - imagine you have a big LEGO creation, and you want to make a different LEGO creation. Melting it down to make new Lego bricks would obviously be a huge waste of energy. Taking it apart and sorting all the bricks - that's more finicky, but cleaner. Now, Ascend figured out you don't even have to sort all the bricks.

GRATZ: We're just removing the 2% that we don't want and keeping the 98% that we want together.

DOMONOSKE: Lots of companies with different approaches are scaling up battery recycling in the states and trying to do it quickly. At Ascend, Rebecca Neslusan is testing samples and feeling a sense of urgency.

REBECCA NESLUSAN: The pressure is on to, you know, make this product. And as fast as we can do it, it's not fast enough even then.

DOMONOSKE: In fact, the very existence of this mini chemical plant is a testament to this pressure. This is a research lab. There was never meant to be a commercial line here, but the EV industry is demanding recycled minerals now. And Ascend's billion-dollar plant in Kentucky - it's due to open next year.

Camila Domonoske, NPR News, Westboro, Mass.

Kousha Navidar: That report was originally broadcast on NPR's All Things Considered on July 10, 2024. Since then, Ascend has altered their plans at their Kentucky plant and agreed to return a $164 million federal grant awarded during the Biden era. They will still invest about $1 Billion into the plant and onshore as much of the recycling process as possible.

Now, let's dive deeper into the battery recycling sector here in the US. Joining me is David Klanecky, President of Cirba Solutions, a battery recycling company that has been in this space for 30 years, and recycled hundreds of millions of tons of battery material. He walked me through the recycling process for an EV Battery.

David Klanecky: Typically an EV battery pack has eight to 10 modules in it that are just different. Basically lithium ion batteries that are in there fairly large, they weigh about 70 pounds each. We actually disassemble that battery pack, take those modules out. The frame structure that holds the batteries into the pack that I mentioned is typically made out of steel. Again, reinforced steel to protect the batteries. It has also aluminum and.pPlastic and things like that. Copper harnesses. So we actually recycle all those materials as well. But once we have that module taken outta there, we put it into a device called a shredder. And it does exactly what it sounds like it shreds the battery. What we're trying to do is extract that very valuable. Powder in there that's on the cathode, in the ano that contains the lithium, the nickel, the cobalt, and the manganese. So we shred those up to, to basically allow that powder to be removed off of the substrate there. We recover that powder. That powder is called black mass. It's, it looks, it actually looks like black sand. So we recover that black mass powder. That's where the critical minerals are. The other material that's in a battery like the aluminum the copper, the plastic, things like that, we actually separate those as well. So that plastic goes to a third party plastics recycler, the copper and aluminum, recover that and work with a person as well, third party person to recover that aluminum and copper as well.

Kousha Navidar: how much of that process can be done in the US? Does any of it have to happen outside of the us?

David Klanecky: Yeah, currently of the shredding operation to actually produce the black masses done in the US. We can do that here. We've got a couple facilities that do that. One in Ohio and one in trail British Columbia, so in, in Canada. And we process batteries through those facilities. The next step that isn't done in the United States, which is what our next phase of growth is, is to be able to now take that black mass that has all those metals together in a mass of material, and then extract each of those individually out of the black mass.

Kousha Navidar: And so where does that generally happen if it's overseas?

David Klanecky: It's usually in Asia. A lot of obviously manufacturing, Japan, Korea, China. They've been producing batteries for a long time and they've got a larger footprint of material that they can access. A lot of those. If we call 'em hydrometallurgical refining plants, those plants are actually over in Asia. So that material today goes back there, those materials are removed, and then a new, basically a new cathode is produced, which goes back into a new battery. So we're in the process of, building that capacity in North America so we can keep those critical minerals here in the United States.

Kousha Navidar: It is so interesting you bring that up with the growth phase that you're looking at. Simultaneously working with overseas partners. Whenever we talk to folks on the show that are working with overseas partners, because the battery ecosystem is global, the current administration comes up, right? Think about the inflation reduction act for instance. It included grants included incentives for battery production and recycling. But now the recent budget law has undone a number of those policies. So how has that affected your industry?

David Klanecky: Yeah. It's interesting, I think there's two different approaches, right? That the administrations have had the, like you said, the previous administration was really focused on grants incentives to, to try and track that investment. This administration is still very focused on critical minerals. They still realize we need all this critical minerals because not only does your phone, my phone or laptops rely on lithium ion batteries, but the defense systems, military drones, those drones don't run on engines, right? They're, they run on batteries, right? So a lot of military applications use a lot of batteries as well. NASA, think about it. There's a lot of things that, that don't have a plug, you can't plug into a wall. So they use batteries. So there's a high interest with this administration, and continuing to make sure that we build out the infrastructure and build out the supply chain for

batteries. You think about data centers, right? They need backup systems and those are typically battery storage systems, right? So there's, with the growth of AI and the growth of data centers and stuff like that, batteries become also extremely important. So while we may have seen a little bit of slowdown in EV penetration just because there's less incentives to go out and buy an electric vehicle that take into effect here later this year, there's been a massive increase in data centers for AI and things like that, which need batteries as well to be able to operate. So it's interesting.

Kousha Navidar: What about like tariffs though? Have tariffs really impacted the way that you're doing business?

David Klanecky: A little bit. They've impacted us positively in some ways because the tariffs are obviously trying to attract people to build stuff in North America, right? Or in the United States.

Kousha Navidar: Exactly.

David Klanecky: Now you've got people that are saying I'm, I don't wanna pay that tariffs. So I want to build more batteries in the US because right now we're importing over 60% of the batteries that we use in this country are imported outside the United States. That means we've got a lot of capacity still to build up, to be able to self-support ourselves in batteries, right? So those tariffs have like again, given the opportunity for those companies and those countries to say, look, we're gonna build in the United States to make those batteries so we don't have to pay that tariff. Now, the, there's a little bit of a downside is we've gotta build all those plants. We don't make a lot of steel, we don't make a lot of pumps and valves and vessels and equipment. How do we manage that, right? Because you've got these tariffs that potentially could increase the cost of building facilities in North America because some of those equipment. Now the administration's aware of that. They're obviously gonna look at ways to probably avoid some of those tariffs on things like that. As long as you're building an asset in the United States, I would think they'd be a little bit more flexible when it comes to tariffs.

Kousha Navidar: Do you feel like there's a dialogue happening right now between folks within the industry like you and administration officials that are trying to plan out how to incentivize this kind of investment?

David Klanecky: Yeah, absolutely. They've been extremely active, I would say over the last six months and recently getting more and more active. Part of it's just learning, they're learning the industry, right? You got a lot of new people in there that didn't understand the battery industry before. Now they're learning it. But they're very engaged, like I mentioned about critical minerals. They're concerned of what's happening with China whether it's rare earth or critical minerals. They're very concerned about that. They've said to me like, we're looking at the periodic table right now and figuring out where we're vulnerable. And they obviously see things like the critical minerals I mentioned, the rares earths. There's some vulnerability there From, third parties to be able to supply the United States on that. So they are definitely very focused on this industry and understanding what they can do to help. They said it, they said what can we do from a market perspective to make sure that you can cost effectively and sustainably produce material within our borders?

Kousha Navidar: Oh, they ask you that directly? What do you ask for?

David Klanecky: Yeah, you've seen some of the deals that have been announced recently. There's things like, there, there's still funding incentives that are out there. People are still asking for grants and loans, so there's, when you're talking about a new industry, it's very capital intensive, so there's a lot of capital that's needed to be able to build these assets. Not to create a parallel, but if you

rewind whatever, 20 years ago, there were a lot of incentives given to oil companies to go out and frack for gas, natural gas, 'cause we wanted to be dependent on natural gas. They didn't do it all themselves and do it for free. There was a lot of incentives given there because the United States said, look, we wanna reduce our dependence from natural gas from other countries so that happened and we've got now, that independence. I think the same thing here. They're looking at how can they help us from an incentive perspective. There's things like, import, export restrictions, right? So exporting batteries we don't want batteries to leave our country, right? We want to keep those in here so we can recycle and recover those critical minerals. I think import control, like again, tariffs have an opportunity there to help out.

Kousha Navidar: So let's talk about recycling within the context of this kind of global marketplace. Do you think battery recycling would help us compete with China toward making those new batteries at lower prices?

David Klanecky: Absolutely. I think the more we can recycle and recover these materials, keep 'em within our country, the less dependent we are on going to other countries to, to be able to find these materials in a, in a mining environment. For example. So we ship a lot of lithium, cobalt, nickel from countries outside the United States, whether it's Indonesia, Australia, Chile, Argentina, places like that. They're not a foreign entity of concern, per se, but it's a high cost to do that. So if you can avoid all the logistics costs, the processing costs to be able to do that locally, you create a better cost position for yourself to be able to compete. The battery industry has become more and more localized, right? You don't like shipping materials around, you don't like shipping, all these things. Obviously you have supply chain issues. We faced that five years ago. That was a struggle for everybody. The auto man, yeah, the pandemic, the auto manufacturer struggle with chips and things like that. So localizing that supply chain only helps us not only from a cost perspective, it helps from a carbon footprint perspective, it helps with just supply chain security, and at the end of the day, it's gonna help the consumer. But I think when you look at our focus and the growth we look at, it's all around lithium ion. And we are seeing obviously material coming from gigafactories in the United States that are producing batteries, they have defective batteries, they have scrap material when they're, they're restarting a lineup or whatever it might be, but they produce, we call it gigafactory scrap. When a gigafactory is running. They're still producing 10 to 15% waste. It's just the way the battery operation, it's really hard to make a perfect battery. But at the same time, you don't want a defective battery in your vehicle or on your phone, right? You want everything to be perfect, so they make sure that the quality control that they have producing those batteries is extremely stringent, which means they do find defects and they are happy to discard those and not have that risk.

Kousha Navidar: Let me see that, if I got that so you've got a factory that's making the batteries for your electric car. Every 10 batteries, they make one of those batteries defective, not good enough. They send it to you or they send it to somebody like you.

David Klanecky: Yep, that's correct. That is correct.

Kousha Navidar: Wow. One out of every 10. From your perspective, where does battery recycling fit into the industry? And what I mean by that is how much can we currently produce with recycled batteries?

David Klanecky: That's a great question, and we've looked at that extensively when we look at supply and demand of these materials. I think if you're, if you fast forward to 2035, 2040 timeframe, you're talking about 40 to 50% of the materials that are required, four batteries in North America can be used using recycled content, recycled battery materials.

Kousha Navidar: And does that. And does that carry on from there? Batteries might get more

expensive in or more complicated in the future. Do you foresee that 50% being a peak and it going down from there or staying consistent with battery? Technology, which I know is impossible to foresee, but do you have any sense of that?

David Klanecky: Yeah, I think it will. I think the challenge, like you mentioned is there's always technology evolution, right? There's different types of battery chemistries that are coming out. Typically you see the nickel based batteries are the ones that have the highest energy density, which means you can, your phone lasts longer, your laptop lasts longer on a charge, your car can drive more miles, things like that. But I do think there's going to continue to be evolution in battery technology that I don't know if it'll make some of those materials obsolete, but it could potentially reduce the demand of those because there's either a new material or, when you look at solid state, right? Solid state is basically a battery that removes that flammable liquid electrolyte in the middle of the battery that's being used to transport the electrons from the anode to cathode, that is basically removed, but you're actually adding more lithium to the anode side of it, which again creates a higher energy entity. So you just now have more lithium to recover, which is still a good thing 'cause we know how to recover lithium, for example.

Kousha Navidar: David Klanecky is President of Service Solutions. David, thanks for all the work you do and for hopping on to talk to us about it. We really appreciate. It.

David Klanecky: Yeah. Thanks Kousha. This was a great conversation. I really appreciate the time. Thanks for having me.

Kousha Navidar: Coming up, how to reduce waste and make a new industry safer.

Sheila Davis: It's just really important that there's that transparency throughout the battery life cycle to make sure that its life can be extended and it can be recycled effectively

Kousha Navidar: That’s ahead on Climate One.

Ariana Brocious: This is Climate One. I’m Ariana Brocious.

We’ve heard about how large battery packs can help stabilize the grid, power electric vehicles, and get more renewable energy in the mix. Still, it’s a fairly new industry. And there are some real concerns not only about the production and use of these battery packs, but the recycling as well.

The Global Alliance for Incinerator Alternatives has been advocating for rethinking the battery production industry in order to make batteries safer and easier to recycle. Their EV Battery Waste Specialist Shelia Davis shared her concerns about the industry with Climate One’s Austin Colón.

Sheila Davis: batteries are really complex, require a lot of chemicals and a lot of resources. And so we're most concerned that the extraction, meaning mining that's required for batteries, of course, is very damaging to communities and to the environment globally, primarily in Latin America. But,of course lithium and, uh, other materials that are required from the batteries are mined all over the place.so we wanna make sure that the, there's, the batteries are designed so that you reduce the requirement to actually extract a lot of materials, from the earth. And that's the first thing. And secondly, once a battery is being manufactured again, it takes a lot of, resources and it requires a lot of chemicals in terms of solvents and, um. PFAS, uh, and other chemicals. so we wanna make sure that there's, uh, effort to reduce the amount of hazardous chemicals that go into a battery. So there's a variety of what they call stationary uses that a battery could be used for, but it has to be designed with that in mind, and there also needs to be a certain amount of transparency about what's in the battery and how it operates. So the people that are actually trying to make money off of repurposing

or reusing it can do it efficiently and effectively and safely. I.

Austin Colón: Right. So, speaking of the battery design, I saw on the zero waste hierarchy for batteries, the largest block is rethink and redesign So what are your suggestions for how they should be redesigned or rethought?

Sheila Davis: First of all, uh, the battery pack shouldn't be, uh, glued to the chassis, you know. For starters.

Austin Colón: That's a good start.

Sheila Davis: Yeah. Or connected to the chassis. So it should be able to be removed from the vehicle relatively easily. And then it should be designed so that it could be disassembled, uh, easily. So if you're trying to repair it or repurpose it, if you have to take the battery apart, then you could do it safely and efficiently and, uh, that there's not a lot of glues and screws, that prevent that from happening. So, being able to dis disassemble it is another really key component of redesigning it. And the other is just to make sure that the information that you need to actually extend the battery's life through repurposing a repair is available to the people that are actually doing the job. and that means that the manufacturer has to make that information available. And it can't be proprietary, so you shouldn't design your product if you're a manufacturer and say this is all secret sauce. You can't like know what's in it. and because that actually forces the battery to be prematurely either disposed of or recycled.

Austin Colón: Right. So, one of the ways that a battery, like you were saying earlier, an EV battery could be, reused as part of grid scale storage or, you know, storage for renewable energy. Are there any risks posed to surrounding communities for these big grid scale battery storage facilities?

Sheila Davis: Yeah, there is a risk to fire and we've seen some of that occur in, uh, California. I don't know if you're familiar with Moss Landing, but it was a battery storage facility or they were using batteries and there was just pretty significant fires there that kind of burnt down the whole facility and it burned for several days and there's just a lot of toxics that are involved. And so that's definitely a concern of, as well as in Detroit, there's been a lot of battery, uh, fires even in the manufacturing stage. and I guess one area in Detroit, there was like. Last year, maybe eight battery fires, uh, you know, at facilities. And so, it's a significant issue. And again, it comes back to, um I mean, it's a design, overall design issue with the battery manufacturers to make sure that the batteries are designed so that they're safe, uh, but also so that information about the battery safety is transferred to the person that's repurposing it, that the data, uh, safety sheets as well as, uh, the, the repurposer has all the schematics and everything else that they need so that they can reassemble it or that they can repurpose it safely.

Austin Colón: Right and these batteries are such a new technology. It's kind of a new industry. There's,seems to be, there's like a lack of, a universal standard. Is that true?

Sheila Davis: Uh, absolutely. it's a very new industry in the sense that, the batteries themselves, have, are so new on the market, like within the last 10 or 15 years. The technology continues to change. Um, and if you're trying to, uh, again, repurpose it or recycle it there, that's a whole nother industry that is emerging in which there are no real standards for.

Austin Colón: Right. That's, so, I, I want to get to that. So I saw, in Broome County, New York, there was a community led campaign that successfully stopped a lithium ion battery cycling facility that was proposed for the area. And I know for a lot of our listeners, when they hear, oh, it's a. Yeah. Battery recycling. That sounds like a good thing. what kind of issues can be posed for a battery

recycling facility to the community?

Sheila Davis: That facility especially, and that was one of our members, of course, with Gaia, who actually got that facility shut down. And of course, most of it had to do with where they were locating it. Uh, it was right in the middle of a residential area. And again, the, recycler wasn't being transparent about what they were were doing, and they were mostly burning the batteries, Again, it wasn't a good situation or a real recycling, which is something that Gaia is trying to make sure happens. Like when I say good recycling, meaning that they're not, again, tossing it in an incinerator and calling it recycling or smelting it, uh, and calling it recycling. And that was pretty much what was happening there. And so, uh, there was also a lot of air missions that the.community was able to get their hands on that wasn't basically reported by the facility in their permitting process. So that issue of the facility being very transparent about what they're doing, uh, and any kind of battery recycling uses either some type of heat application. Meaning you have to melt down the battery in order to get some of the material out, potentially, or else a lot of chemicals to extract the valuable material. And so if you're locating, especially near a community, that's really important. to be transparent about the chemicals you're using. About the emissions, uh, about the water use, which is another big issue, you know? So, uh, of course recycling is a good thing in terms of being able to recover the materials, but it has to be done properly.

Austin Colón: In some ways, the lack of transparency reminds me a little bit, I grew up in Pennsylvania, a big fracking state, and it felt like the mixes of the, uh, fracking fluid, nobody really knew what was in those. And, you know, that was getting into the, the land and the water and it's like, yeah, maybe we should know what's in those 'cause it's kind of affecting all of our communities.

Sheila Davis: Absolutely.

Austin Colón: And so let's say you had a magic wand and could make one big change to the industry. What is the biggest change you'd call for right now that would have the most impact?

Sheila Davis: I think the most important step if I could wave a wand, would be for companies to use available technology, talking about, uh, data analytics and artificial intelligence that platforms that are, are being applied to design industries to actually design the batteries so they can be recycled and that they also set targets and goals for doing that.

Austin Colón: Excellent. Well, Sheila Davis is EV Battery Waste Specialist at Global Alliance for Incinerator Alternatives. Sheila, thank you so much for joining Climate One today.

Sheila Davis: Thank you so much for having me.

Kousha Navidar: Hey everyone, it's Kousha and Ariana again. We're closing out our show and that means it's time for Climate One More Thing, Ariana, I'll go first. And you have every right to hate me for this, but I have another plea for advice about running because quality.

Ariana Brocious: Wait, are you running a marathon?

Kousha Navidar: Oh my gosh. How did you know?

So the air quality in New York is like iffy, and I've had to run very long distances on a treadmill. And I think it's good for my lungs, as listeners might understand from listening to the last episode, but it's also, frankly, mind numbing. So this is just a plea to the audience. If you have any tips for how to make long indoor treadmill runs better when you're trying to protect your lungs from the outside, please just email me.

It's Kousha, K-O-U-S-H-A at climateone dot org. I will be very thankful and I promise I'll respond. So thank you very much. That's my climate One More thing, Ariana. What do.

Ariana Brocious: Yeah, so I read an interesting article this week by Grist, an online publication that focuses on climate among other subjects. And it was all about how we can build cities to be able to better withstand heat.

And as previously mentioned, I live in a hot climate. This is very applicable to me and it's an area I just have interest in. I think city design is really cool. So this is an immersive article. It has a lot of explanations and a lot of things that. I was familiar with and several I wasn't. And one of these ideas that I had not really heard about before is what are called cooling towers.

And these are described as chimney like towers you can attach to the sides of homes and buildings. And they're essentially passive cooling devices. And actually they are used in a lot of Middle Eastern countries or Gulf countries already. But it's an older technology in terms of, it's not ac, but it helps bring in air, cool it as it moves through the building through this tower.

And those are the kinds of things I think we need more of as we figure out ways to make our cities better able to withstand heat.

Ariana Brocious: And that’s our show. Thanks for listening. Talking about climate can be hard, and exciting and interesting — and it’s critical to address the transitions we need to make in all parts of society. Please help us get people talking more about climate by giving us a rating or review. You can do it right now on your device. Or consider joining us on Patreon and supporting the show that way.

Kousha Navidar: Climate One is a production of the Commonwealth Club. Our team includes Greg Dalton, Brad Marshland, Jenny Park, Ariana Brocious, Austin Colón, and Megan Biscieglia. Our theme music is by George Young. I’m Kousha Navidar.