Rare Earth Elements - Chris Young

[00:00:00] **Bridget Scanlon:** I would like to welcome **Chris Young** to the podcast. Chris is the **Chief Strategy Officer at Element USA** and today we are going to talk about processing critical minerals and rare earth elements from a variety of **feedstocks**, but mostly **red mud or bauxite residue.** Thank you so much, Chris, for joining me.

[00:00:19] **Chris Young:** You're welcome Bridget, and thanks for having me.

[00:00:22] **Bridget Scanlon:** So Chris we've been chatting back and forth for maybe a year, year and a half now through the **Department of Energy CORE-CM Project**, looking at feed stocks for rare earth elements. And I really appreciate you reaching out and connecting with us. And so your company, **Element USA,** is looking at using various feed stocks and trying to extract rare earths and critical minerals.

Maybe you can give us a bit of background about Element USA.

[00:00:49] **Chris Young:** Certainly Bridget. Thanks. We started the company really focused on **red mud or bauxite residue**, which are the **tailings** in the aluminum supply chain. Wherever there's an **aluminum refinery** around the world for roughly for **every ton of alumina** that's produced a **ton to a ton and a half of byproduct of red mud** or bauxite residue, is produced.

And **Element USA started in 2020, 2021**, focused on the red mud that exists in **Louisiana**. The larger resource is the one at **Gramercy**, Louisiana, where there's **30 million tons** and growing a **million tons a year** because it's the last operating refinery in the US but also been working on the **Burnside red mud.**

And the Gramercy red mud is a very valuable red mud, because it's sourced bauxite as a **karst bauxite out of Jamaica**, which has much higher rare earth content. So you obviously have the **iron**, hence the red color and other valuable minerals like **alumina and titanium.** But you've got rare earth content in the **3000 to 4,000 ppm** in the bauxite residue.

So it's a great resource. Not only is it a great resource from an element standpoint, but it's a great resource to be sitting in Louisiana on the **Mississippi River**, where you've got great access to logistics and you've got good costs from a **power** and **gas** and **reagent** perspective.

[00:02:24] **Bridget Scanlon:** Right, and the cost and location, then I guess, will allow you to possibly access other feedstocks that you might import also.

[00:02:31] **Chris Young:** Exactly.

[00:02:32] **Bridget Scanlon:** And I guess Gramercy is located there because they were importing the bauxite from Jamaica.

[00:02:37] **Chris Young:** Exactly. Yeah. Bridget, the **Kaiser Aluminum** built both the bauxite export operation in Jamaica, concurrent, and for the purpose of supplying bauxite into the Gramercy Louisiana **Refinery** back in the early **1960s**. So they've been a supplier customer relationship for over 60 years.

[00:03:00] **Bridget Scanlon:** Right. And so during that time then it's nice that you mentioned, for **each ton of alumina** they generate, they generate a **ton to ton and a half of red mud**. And this red mud then has concentrated metals and a lot of rare earths. So maybe describe the Gramercy site a little bit. You've got these ponds with the red mud and one dry stacked site.

[00:03:25] **Chris Young:** Yeah, sure. The Gramercy site is about halfway between **New Orleans and Baton Rouge** on the, on what's considered the **east side of the Mississippi River**. Though it's a little bit more on the north side where the Mississippi's flowing at that point, there are **four mud lakes** where it's, call it the Mud's, coming right out of the operation, **impoundment** areas number one through four. But the site now is **dry stacking or filter pressing** about half of their production, and that goes into **Mud Lake impoundment number six**. So these mud lakes have **levees** built around them. So they're basically large ponds to control. the storage of these materials, the filter pressing squeezes most of the liquid out.

So it actually flips the ratio of liquid and solid. And so now you can store that into **mounds**. You can therefore extend the life of these impoundment areas. Obviously that's not the greatest value. The greatest value is figuring out how to separate that red mud into its **component elements** and put it into the marketplace.

So these impoundments are as deep as **40 feet deep** and, have been there for several decades, and that's true everywhere in the world. Wherever there's an **alumina refinery**, there are impoundment areas where the red mud is stored. Over the last, between two and three decades ago, the industry has moved towards storing that red mud.

And it's a **cost**. So there's both a cost to managing these impoundments from a capital expense, from an operating expense. And then the flip side of that is there's a great **opportunity** for the industry in general. It's not easy to separate it or it'd be done already. So that's the situation as it is.

And we're excited to be sitting kind of on the precipice of developing a solution for **extracting** value out of the red mud in Louisiana.

[00:05:20] **Bridget Scanlon:** Right, right. And maybe also we have a couple of sites in Texas that our DOE CORE-CM project has where we've got a red mud and quite a lot of it at **Copano site**. Maybe a hundred million tons or so, so that's also another potential site.

[00:05:36] **Chris Young:** It is- both of them, are a value. The **Copano** site that's near Corpus Christi actually used about two thirds Jamaican bauxite. I was involved with shipping that material from Jamaica when I was actually working for the Gramercy business at that time. So, it's nearly as valuable as the Gramercy mud. But a great source as well.

And then **Point Comfort**, Texas has a couple hundred million tons plus. Not quite as rich in rare earths, but still there's a lot of value in it. And obviously the **iron** itself can be used in the **steel** industry, and the United States imports roughly **5 million tons a year of pig iron** to serve the electric arc furnace, steel market.

So any red mud around the world becomes a potential source for metallic iron to go into the steel industry. Something as basic as that, but it's still sitting in a waste pile.

[00:06:33] **Bridget Scanlon:** Right.

[00:06:34] **Chris Young:** Figure that out.

[00:06:35] **Bridget Scanlon:** Well, I mean the USGS has this mantra or **waste to resources** or **trash to treasure**. So I think now there's a lot of emphasis in trying to extract critical materials from these waste and recovering from those. So, to produce the alumina from the oxide, then it's the Bayer process. So **sodium hydroxide** and so, the, the material then has a pretty **high pH**. The red mud has a fairly high pH, maybe **11 or 12 pH** when you're done with that process.

[00:07:08] **Chris Young:** Correct.

[00:07:09] **Bridget Scanlon:** And the **Gramercy** site then, you mentioned has about **30 million tons** of **red mud**, or more. And so what is the projected **lifespan** that you think if you created a plant then to extract various materials from that?

How long do you think if, if Gramercy stopped operating now? And you said it produces about a million **tons a year of alumina**, so.

[00:07:32] **Chris Young:** Yeah. **A million tons.** Yeah, a million tons a year.

[00:07:34] **Bridget Scanlon:** Sorry, yeah. Million tons. 30 million tons. Yeah.

[00:07:36] **Chris Young:** Bridget, in our modeling for the **flow sheet**, the base flow sheet we've developed, we used a million ton a year for the size of the plant. So obviously if the plant continues to operate, we'd really need to double the size of the red mud separation plant in order to draw it down to zero.

So, but in a hypothetical, if there was a cessation of operations, it's you're looking at a **30 year operation at a million tons a year**. I know that, certainly in our discussions with the local officials there's certainly a desire to repurpose that material. And I know that one of the first times we had a

kind of a collective meeting with some of the state officials said, oh, how quickly can you draw down that red mud and I said, well, it's been put there for 30 years. It's going to take a little while to draw it down, understand the desire, but it's going to take a little while.

[00:08:28] **Bridget Scanlon:** Right. Right. And so you mentioned then that the red mud, about half of it is iron, and that the US imports a lot of iron. So then you have a special process, and I can't recall the name that I saw for the material that you're going to produce.

[00:08:43] **Chris Young:** We called it eco iron just because it's coming out of a waste stream. So in our base flow sheet, we're using **carbo thermal reduction** to convert the iron oxide that's sitting in the red mud into a **metallic iron**. And it's of a spec that can go into the **steel** industry, among other industries, but obviously the large consumer of iron in the United States is the steel industry.

[00:09:09] **Bridget Scanlon:** Right, right. And then not all the aluminum has been extracted. And so there's some aluminum, but the rare earth elements, I mean, the numbers just blow me away. The concentrations of the rare earth. I mean, we have limited data from the Gramercy site, and you mentioned **4,000 parts per million**.

That's about **20 times** or more the average concentration in the continental crust. So maybe some people are confused. Rare earth elements are rare, but really they're not rare, but you don't ever get them **concentrated** as ores. But this type of concentration, where it's 20 times the Continental crust, that's just amazing. And fairly **uniformly** across all of the **elements**, they're all concentrated. And so the **permanent magnets** like Praseodymium, neodymium, terbium, dysprosium they're all 20 times at the Gramercy site. And then, of course, **scandium**. I mean, scandium is the highest value rare earth. I was just looking it up, maybe $3,000 a kilogram?

[00:10:09] **Chris Young:** It can be. It has been as high **$3000 a kilogram**, and as you and I have talked about the scandium, as an a **scandium aluminum alloy** can really significantly reduce the weight of **aerospace** applications. I think a figure that sometimes is used, it could be as much as **$9 million savings in fuel per year** by using the scandium aluminum alloys.

So yeah, the scandium an intriguing one because the global market technically understands the value of scandium. But users, potential users of scandium, aluminum alloys are reluctant to adopt that alloy as their material for fear that the **supply chain** gets interrupted and they've gone through a significant process of recapitalizing their operations to use the alloy and then run the risk of the scandium supply being cut off. Because today, most of the scandium is coming out of **China** and **Russia**, which puts you at risk. As we know that China's a couple, certainly 15 years ago, cutoff supply of rare earths. So if you're the, if you're the C-suite of a major company that's deploying alloys for making the skin, for instance, of **aerospace companies** and operations.

That's a risk that's too big. But I think the cool thing is that we're starting to see some other scandium suppliers. Namely **Rio Tinto** is now making scandium aluminum alloys. They're extracting the scandium out of the wastes from their **iron operations** up in **Quebec**. So I think, over the next five to 10 years, I think we're going to see significant growth in scandium.

Back to your earlier comment, Bridget, I always find it interesting. Yeah, the rare earths are everywhere, but just in such a low concentration. And we get excited about 3000 to 4,000 ppm. I always give the story that if someone who's kind of an old salt and been around rare earths a long time, like, the alumni of **MP materials** are revealed, **Moly Corp**. And their technology solve an extraction. They may be a little bit long in the face when they hear those ppms, but if you're doing work on other alternative sources there people usually lean in with a big smile and say, that's a high concentration of rare earths.

So we'll get there. We'll figure out how to get that out.

[00:12:37] **Bridget Scanlon:** Oh, definitely. I mean, when you mentioned **Mountain Pass, MP materials,** I mean, you look at their concentrations, it's mostly **light, rare earth**, the lanthanum, cerium and just the very light ones are the highest concentrations from that igneous source, **carbonatite**. So, that's not that great really these days when we are interested in a lot of the heavies.

On your website, you mentioned, a **Boeing 747** would be **15% weight reduction** with the scandium aluminum alloy, and that your $9 million fuel savings a year.

[00:13:09] **Chris Young:** Yeah. Yeah, it's real. It's real. I think the scandium opportunity is huge,

[00:13:14] **Bridget Scanlon:** Right.

[00:13:14] **Chris Young:** for industry as we **reshore** some of these industries.

[00:13:18] **Bridget Scanlon:** And I think the **aerospace** industry is very interested in scandium because of this. So, we have at the Bureau, **Brent Elliot, and Rich Kyle** and I have been working on the Red Muds at the Copano site with them. You mentioned that maybe there's mostly **Jamaican**, but also Brazil bauxite in there. And so concentration's about half of what you see at the Gramercy site, but still, I mean **10 times the Continental crust**. and fairly uniform across all of the elements. So, we were estimating if we had **120 million tons of rare earths** at that site, and we were looking at **rare earths plus yttrium and scandium**, it would be about, and we assume **50% extractability**. We would get about **$12 billion worth f**rom the rare earth and the scandium. And then the permanent magnets would be about **three and a half million dollars.**

[00:14:07] **Chris Young:** Hmm.

[00:14:08] **Bridget Scanlon:** But we're just real, back of the envelope doodling.

[00:14:12] **Chris Young:** Hey, it's worthy of raising the eyebrow. Those are, those are big numbers.

[00:14:16] **Bridget Scanlon:** Yes. And the fact that all of the **permanent magnet rare earths are also 10 times. And the scandium is 10 times,** these are all good. And then at the **Gramercy** then it's more like **20 times** at least. And **Yttrium** is also very high at these sites. That's more than 20 times the continental crust.

So, I don't know if you are down the road enough. One thing is the **high concentrations,** and the other thing then is the **extractability** and the chemical cost to do this. I've been reading some papers and I saw some papers where they said, scandium, **80% extractability** with some **acids** and stuff.

Do you have any ideas yet on what your extractability will be?

[00:14:57] **Chris Young:** We're modeling **50 percent extractability** for the rare earths other than scandium. On the scandium material, there are proven technologies using **carbonization** to get about **30% of the scandium**. But we're working with a number of different partners, and this is a little bit of the story about what we're doing at the **critical resource accelerator** is, we're developing flow sheets for extracting value out of alternative sources, out of wastes and tailings, like the red mud. And the way we're developing those flow sheets is we'll do a lot of the heavy lifting on the **separation**, particularly on the front side, but then partner with very specific technology owners at extracting specific elements and to improve the extractability, the extraction of those elements. And I always describe this as it's, hey, we're bringing together different **Lego parts**, and there are some really great technologies that are coming forth around using **Catalyst**, around using **electrowinning,** that are much better at identifying one or a small number of elements and extracting it from a larger combination of materials. Another way of thinking about it's, hey, we're the **prime**, but we're actually work in the defense industry of primes. And subs. So we're the prime, and then we're kind of knocking on the door of subs saying, Hey, we'd like to deploy your technology to extract **yttrium** or to get a higher concentration of the **scandium** out of that, in particular, industrial waste stream that we're working with.

So, I think the opportunity's there in front of us, we've got a lot more work to do on the red mud. But I think it's going to accelerate quickly here in the next six months.

[00:16:46] **Bridget Scanlon:** Right. And you mentioned the **accelerator**, and maybe you can describe to the listeners this is the accelerator in Round Rock, just north of Austin.

[00:16:53] **Chris Young:** Yes. Yeah, we're, it's actually in, it's in **Cedar Park** and we've got **30,000 square feet of space.** It's a research operation where we've got an analytical lab. Where we can do **mineral characterization**, defining what elements and, what is the **mineralogy** in a particular waste.

And then we can conduct the **laboratory** experiments, the **bench** scale experiments, and the **pilot** for developing **flow sheets** for extracting value out of different wastes.

And our, the world we're focused on is **inorganic industrial waste**. So this would be from the **aluminum industry**, from the **steel industry**, from carbon, **coal**, the coal industry, **copper tailings, phosphogypsum**. And so what we do from a process standpoint is go through that characterization and then determine pathways to liberate, and then separate, and then commercialize the value that sits in a waste stream like in the red mud.

While we started on red mud, and we're continuing to work on the red mud, we were coming across other opportunities that we saw this type of model being very apropos and strategic. In addition to that, we were getting phone calls from people saying, Hey, can you take a look at our waste stream to see what you might do with it? So we're bringing together research experts in the world of **extractive metallurgy.** Hydrometallurgy. Mineral processing, which gets into physical separation, grinding separating, using **density and surface area** and bringing those different disciplines to bear, to extract the value out of different wastes and incubating new businesses that would be specific to a waste stream, and even in some cases a particular waste location.

Given the waste that we're talking about, usually you're sitting at, not unlike red mud, where you've got **30 million tons in Gramercy.** Typically, your **fly ash** is sitting in a large volume of 10 to 20 million tons, just like the power plant we're talking to, that you and Brent have introduced us to. So we're bringing to bear the disciplines. A multidisciplinary approach from a scientific standpoint, but with an eye absolutely towards **commercializing**, economically, businesses for extracting value. The team has operating experience in mineral processing in the aluminum industry, in the steel industry. So we really bring an operational view towards applying science to extract these values.

[00:19:39] **Bridget Scanlon:** Right. That's, that's amazing. And we visited your accelerator recently and it's very impressive. Seeing students and employees and all sorts of new equipment and everything. So I'm very impressed with how rapidly you are ramping up that accelerator. And you'll

[00:19:55] **Chris Young:** Bridget, I, hey, and I again appreciate you coming up to see it. And we value, part of the reason we ended up in Texas, Bridget, is certainly the **University of Texas at Austin** is a powerhouse university. And, you and the university have put a stake in the ground to say, to increase, the impact that the University of Texas, Austin has in mineral characterization and critical mineral exploration.

So that's certainly part of the reason why we ended up in the Austin area.

[00:20:22] **Bridget Scanlon:** Right, right. And so one of the things that impressed me about the description of Gramercy and what you were planning on doing with it is that you mentioned **zero waste discharge**. So you're going to use all of the material. And so maybe describe that for me a little bit. I mean, so if you've got the wet pits, that's **50% water,** 50% mud, and then you've got 50% of the mud is iron. And on and on, and..

[00:20:48] **Chris Young:** Yeah, I, one of our guiding principles is that we have **zero solid waste**. After processing a waste, so specific to the red mud, we anticipate that on a dry basis. **20 to 25% of the volume of the weight after separation of iron, alumina, rare earths** will be still sitting in a residual, right? The residual after processing this waste residue.

And so we're doing a lot of work in the **cement** and construction markets work in the form of testing to deploy that material. So in the case of red mud, and this is true in a lot of industrial waste, you'll have a residual that's going to have some combination of **silica, alumina some residual iron,** those being the largest three components.

Some residual **calcium**, some residual titanium, so it becomes a very suitable material to feed into the **cement and concrete markets**. And at least in the United States alone, the **cement** market's about a **hundred million tons**. The **concrete** market is about **400 million tons**, so it becomes a good candidate for putting materials into those industries.

Additionally, we've been doing testing with a couple partners for putting it right into **road base** and depending on the market, like the state of Louisiana where there really is no aggregate in the Louisiana market. The aggregate that serves the **construction** market in Louisiana typically is being barged down river, down the Mississippi River, or imported from the Yucatan Peninsula.

So, those will be the primary locations where the residual then be **repurposed**. As a feed stock into the cement slash concrete market or the road construction market, so we can achieve that zero solid waste goal for each waste.

[00:22:50] **Bridget Scanlon:** Right. And so, the goal then for Gramercy, I mean, if you process all of this waste and then, you would just fill back up the pits and remediate the site? Is that the long-term idea?

[00:23:02] **Chris Young:** That would be a great day, when we're having a discussion about what are we going to do with these **couple hundred acres** that used to be filled with red mud?

[00:23:10] **Bridget Scanlon:** Yeah.

[00:23:11] **Chris Young:** Yes, the short answer is yes to that discussion.

[00:23:15] **Bridget Scanlon:** And so whatever they would make from the rare earth and the other materials then, that could help offset the **remediation costs.**

[00:23:24] **Chris Young:** Yes. Yeah, and I think most mine operations have to set aside some capital for remediation. But the purpose of that set aside capital, typically, is that you're having to **cover** over with dirt or some other remediation. It'll be a different day and a different discussion when the remediation is, all right.

Now we can, we've actually emptied the impoundment areas of all the red mud, and that now becomes a **development** opportunity to put other industries there. So I, I say that with a slight smile on my face. It'll take a little while to get there, but I think that would be the goal. And so actually the remediation capital that's set aside could be civil work to go put in a new type of **industrial operation** or perhaps some other commercial development.

That'd be a great day. That will be a great day.

[00:24:21] **Bridget Scanlon:** Right, and I mean the Copano site and Gramercy, I mean, these are close to **sea level**. And so, removing these very high pH material would be very important for the environment.

[00:24:35] **Chris Young:** It would, I think these materials, the red mud in particular, it is a high pH material. It's not people always ask me, is it **toxic**? And I go, you can go pick it up and put it in your hand. You need to wash your hand off after you, you put it back down in the impoundment area.

Around the world, there's a lot of different efforts being tested for repurposing the red mud, and one of those is **neutralizing the pH** in order to make that land, if you will. And these are in other climates that are drier climates, so you can make that land repurposable if you will. But yeah, I ideally we go use that red mud up.

And then there can be a different discussion for whoever owns that land.

[00:25:18] **Bridget Scanlon:** Right. And so when you describe what Element USA would do. Will you not do the processing much yourself, or would you look to other companies then to do the processing?

[00:25:29] **Chris Young:** Each waste will be a separate business discussion, Bridget. We anticipate that we will be running the business for separating the red mud. Partly because of the contractual relationship. We've already got set up for the red mud that's in Louisiana. For other red muds, that would be a discussion with the waste owner. What role do they want us to play? How active do they want to play in that, incubating that new business. And if that's true for each waste is, hey, some waste owners may say, Hey, you're really outside of the bailiwick strategically that we're involved with. Hey, we'd like a licensing fee for value of the waste that's being used.

Other companies may say, you know what we'd like what you guys are doing. We'd like to come alongside you and partner with you. So that model is dependent on, really on the waste owner's strategy and their deployment desires.

[00:26:21] **Bridget Scanlon:** Right, right. But at least you'll be doing the **Gramercy work** anyway. And so you will create a **rare earth oxide** then, and then you will market that.

[00:26:30] **Chris Young:** Yes. In each, for each material, Bridget, there's a discussion. How far do we go in the supply chain? I always say that we can't boil an ocean, if we're making iron, alumina scandium, neodymium, and praseodymium. A residual. And there could be, there are other materials in there, like, you said, Yttrium, Vanadium, Chromium.

Each one of those supply chains, just from an operational standpoint, requires its own set of expertise in processing. So, for each material, there's a question, how far down the **supply chain** do we go? And then where do we do that handoff with the next step in the process? So it could be for rare earth elements. We make a **mixed rare earth concentrate of 20 or 40%**, and we hand that off to someone else who's in the business of taking a concentrate like that and taking it to a four an oxide. So each material becomes a strategic discussion of, hey, what's the complexity? Who's out there in the marketplace that we can partner with, and what's our ability to identify the proper place to hand it off?

[00:27:41] **Bridget Scanlon:** Right, right. And so. Yeah. So that's really interesting. And of course the prices of rare earths are, kind of **volatile**.

[00:27:50] **Chris Young:** Yeah.

[00:27:50] **Bridget Scanlon:** Which make, but with all of the other materials that you are creating that will **stabilize** your market, I would assume. The other products you **briquettes**, **pellets**, this of **iron**, and all of these other materials.

So that would help to stabilize your market. And I haven't looked at prices recently. Have they been fairly stable for rare earths?

[00:28:11] **Chris Young:** Yeah, the prices on the rare earths are a little bit low, right now. You're looking at like a **neodymium** is in the **60 to $80 range**. And but to your point, with a multi-material kind of offtake agreements, you get to **de-risk** that from an investor standpoint. I think too as you've seen, there was a large announcement recently by the **DOD with MP materials** that put a **floor out there for the Neodymium and the Praseodymium.**

I think that is an important, and really a good mechanism to de-risk these investments. Particularly on the rare earths where the **Chinese** have a large influence on the market, and can crash the market with a lot of volume and dump the prices. Certainly even over the last five years you had neodymium selling as high as 140 to $160 per kilogram, and then it dropped down to $50 last year, early this year.

So I think that mechanism, and this is an important policy issue that the US government is talking about, and seem to be taking steps, given that announcement with MP materials, is providing a floor for some of these critical materials like Nd, Pr, like scandium, like yttrium, like gallium, all the critical minerals, such that if you on me and other **investors** say, Hey, we want to put money on this, but I want some **protection**, that, hey, if the market crashes again we don't go under. So I think that's a really important mechanism that it seems at this point, the DOD is acknowledging is one of the tools in the toolkit to reassure these rare earth critical mineral supply chains.

[00:29:54] **Bridget Scanlon:** Right, right. I know. As a hydrologist myself, when I was talking to people in Israel, when they were developing all of the desalination, they guaranteed the price of desalination water for 20 years. So that those companies, get a chance.

[00:30:09] **Chris Young:** Yep. Great tool. And I think the DOD, **Defense Logistics Agency, DLA**, can play an important part of that. That's more the execution arm of buying material at a floor price. But yeah, there's a great example, a 20 year off take with a minimum price, that really helps these businesses.

So we're in a pretty tough place 'cause we're so far behind in **reshoring** and developing the supply chains for critical minerals, not only from a **feedstock** standpoint that we're talking more about, but then the intermediate **processing**. I think what's going on right now, as you see in the news, there's obviously negotiations going on between the US and China on what does trade look like? But within **Chinese** policy, and as I understand it is that there are restrictions about rare earths going into the **defense industry**, defense companies. And the Chinese industry are requiring their supply chain partners to report where the critical minerals are going **downstream**. Not just for the buyer of it, but who is all the way down to the consumer. And they have restricted that critical minerals can't go to defense companies like **Lockheed, like Raytheon**, like the others that play in that market. And then as I understand it violators of those policies in the Chinese market are punished severely.

On top of that, they're really asking for supply chain information that I think, as I understand it today, **ITAR**, which is **International Trade and Reporting,** actually prohibits supplying that type of information to the Chinese. So it's one of those that you have to peel back the onion a little bit to realize the catalyst for change for reshoring these minerals, really it's going to come out of the **defense industry** because the Chinese are restricting supply chain movement through the chain all the way down to defense companies, even today.

[00:32:17] **Bridget Scanlon:** I had no idea about that. And do you think tariffs and things like that will impact?

[00:32:23] **Chris Young:** I think, yes, I think the **tariffs** provide some additional wind in the sails for reshoring materials. I don't, it's not necessarily the answer. And I think part of it is because tariffs come and sometimes they go. But I think it does provide some additional wind in the sail, some additional momentum, behind some of these investment decisions.

But as standing up an operation even for us, you're looking at **two to three years** for standing up operations. Once you get a go, once you get a **financial investment** decision, these things don't happen that quickly. So, that's part of the challenge is, hey, when you get changes in policy when there's changes of administration, you're left. So, there's risk, there's risk involved. I think the tariffs are helpful, but they're not the answer because they're subject to change.

[00:33:15] **Bridget Scanlon:** Right. Right. And so are there other points that you would like to make, Chris, that I have missed?

[00:33:21] **Chris Young:** I think we've covered a lot of ground here. We're super excited about what we're doing in the **critical resource accelerator.** Hey, at some level, this is an issue for our country. Obviously, at the end of the day, we need to return money to our **investors**. We're a private company. But I think we need to **innovate** in the area of extraction of critical minerals from alternative sources, from industrial wastes and tailings, that is the best way to reshore these feedstocks. Again, which is obviously that's where the process starts. We need the elements coming out of waste.

Obviously we can **mine**, but that's, that's, those are difficult and it takes a long time and they're costly. But the alternative sources, like we've talked about. Fly ash, red mud. There's zinc tailings, there's other industrial waste, low grade coal tailings. That's the way for us to reshore these critical minerals.

And frankly, we can't do it fast enough. We, I don't know the answer. It's almost like we have to operate on a wartime footing without actually being technically at war.

[00:34:27] **Bridget Scanlon:** And I like the point that you make. It's not just the **feedstocks**, having the feed stocks. It's the **processing** also. And so it's not just the **concentrations**, it's the **extraction** and the cost of all those things. But I think **Linus** may be developing a plant in the Gulf Coast region.

Do you talk to those people at all or?

[00:34:48] **Chris Young:** I'm familiar with them. They obviously are a large player between themselves. The newer performance materials are the two largest non-Chinese rare Earth

processors. And of course, **Linus** is also mining materials out of **Mount Weld in Australia**. So they are taking the lead there and **MP materials** call them on the feedstock, and as they move downstream.

So those three big players are pivotal. It obviously needs to be much bigger than those three, but I don't, Linus has been working on putting a processing plant in the state of Texas, I think that south of San Antonio. That would be a good step. I think it's an illustration of how difficult it is because it's taken longer than most people expected.

And I think Linus would say that themselves not only from an investment standpoint, finding the right **location**. Finding the people to run these operations because the expertise in these spaces has really gone away in the United States. So now you're having to retrain a workforce at all levels within that workforce, at the leadership, at the engineering level, at the operator level.

And that's some of the gap that we've got to close. And we've got to do it as quickly as we can. So thankfully Linus is in the game. MP materials has got a great resource. They need to push hard. We want them to push hard. So lots, there's a lot going on, but it's complicated.

[00:36:22] **Bridget Scanlon:** Right. Well, I mean, the red mud is amazing. It's an incredible resource and turning waste to resources is fantastic. And **zero solid waste**, that's amazing. I'm very impressed and really appreciate how rapidly you guys getting on with the things and, hiring people and, and taking on students from the university and then looking at other **feed stocks**.

We need a **portfolio** of feed stocks, and then a portfolio of **processing** approaches to make this work. So it's looking very promising.

Our guest today is Chris Young from Element USA. Thanks a lot Chris, for talking about Element USA.

[00:36:59] **Chris Young:** Hey, I appreciate you having us on this. Thanks, Bridget.