Robert Friedland: Investing in the Green Revolution

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Erik: Joining me now is billionaire financier Robert Friedland, best known as the founder and CEO of Ivanhoe Mining. But perhaps more relevantly to this conversation, Robert is also the chairman and CEO of Ivanhoe Capital Corporation. The private venture capital and family office enterprise, which invests in a lot of fascinating technologies that I want to talk to Robert about today in this interview.

Listeners, if you didn't catch it in the introduction with Patrick Ceresna. Please be sure to first listen to my two interviews with Robert on the subject of greening the global economy on the Smarter Markets podcast, because what we're going to do in today's interview is to expound on that conversation. If you didn't hear that conversation, today's conversation isn't going to make sense.

Robert, let's start not with those topics. But with you as an investor because your mind absolutely fascinates me. You wowed our Smarter Markets audience with the story of Camel Polo in the snow on your albino racing camel. So we kind of have this vision of Robert Friedland as the camel riding mining executive who sounds like an Indiana Jones kind of character. But you were one of the principal investors and creators of satellite radio Sirius and XM Satellite Radio. So I'm just trying to imagine how does a mining executive sit down one day and say, Hey, I think I'll take advantage of advancements in MOSFET transistors and, you know, invent Sirius XM radio? How do you know about all these things, and thorium reactors and all the other things that we're going to talk about today?

Robert: Well, you know, I grew up in the 1960s. When the motto was turn on, tune in, drop out, and I, my dad crawl back. So have you lived in the 1960s. And the psychedelic era, I think from a very early age, a lot of my friends and I sort of thought that it's possible to create a reality distortion field. And so unconventional thinking has been a part of my life for as long back as I can remember. And I've always liked to hang around with people who think that nothing is impossible. And so we always look at everything from first principles prep with a different sort of viewpoint than most people. But I've seen miracles created in my lifetime. I've seen many things become huge out of nothing. And so that's always changed my view, and made me feel that truly anything is impossible, and that we're really limited only by the human imagination and focusing our attention continuously until we achieve what it is we imagined.

Erik: Well, let's dive into some of these topics that we discussed in the Smarter Markets series on greening the global economy, starting with the Green Revolution, and decarbonization is obviously a big political theme. Jeff Curry from Goldman Sachs told us the biggest priority of financial markets has to be putting a price on carbon. How should we as investors think about decarbonization specifically. Where are the investment plays? And we'll get later into some of the energy generation stuff but just about this idea of decarbonization, and now the trading of carbon credits on markets. How do you think about that as an investor?

Robert: Just to start with a minor protest, we can't really eliminate one of the most common elements in the universe, carbon. We are a carbon based life form, as our pet dogs and cats. So it's really carbon dioxide we're speaking about. A global warming gas, which is not as potent a global warming gases, methane, for example. So there are a whole family of gases in the environment, that really, apparently, to the best of modern science are leading to a greenhouse effect, and are going to cause enormous long term problems for humanity unless that trend is reversed. You ask the average person, what percentage of the atmosphere is carbon dioxide? I wonder if you happen to know.

Erik: I ought to know that.

Robert: Well, let's take a guess, CO2, not carbon. I mean, not really. It's carbon dioxide. So let's take a look at Google. What does Google say?

Erik: Well, I don't…that's cheating. I want to say less than 2%. Because I know you got 21% oxygen and about 77% or 78% of nitrogen, so that only leaves one or 2% of CO2 and other gases.

Robert: Exactly. You're quite warm. So carbon dioxide is .04 of 1% of the Earth's atmosphere, .04 of 1%. So that's not very much at least optically or intuitively. But combined with other global warming gases. It doesn't take much to get a few degrees temperature increase and then all that permafrost in Siberia can melt and release a lot more global warming gas in the environment, and we could get sort of a runaway effect that we don't really want to gamble with. So the fact that we've evolved as a species with sufficient introspection, to think that it's possible that anthropomorphic global warming is even possible, is not unlike the evolution of our thinking that the earth is not flat, or that the sun does not revolve around the Earth. So these big concepts, they're very, very slow to be realized throughout the mass of total human consciousness.

The whole thought of plate tectonics, the fact that the continents are floating on a liquid golf ball as we hurtled through space, and then all these continents are eventually going to be recycled back into the core of the Earth, New York City is going to go down back into the mantle. Los Angeles, and London will eventually go back into the mantle. These startling concepts of plate tectonics, that modern geology now understands, these ideas have only been with us for 30 years or so, and really haven't permeated into, you know, human consciousness. So this idea about global warming gas is taken about a generation.

My daughter, Uma, who is sort of raised in an alternative lifestyle, from the time she was a kid was always talking about global warming gas, it's now gotten to the point where it's precipitating an almost species wise study of the Earth's atmosphere and humanity's impact on nature, in general. And this may mark the first time as a species, we abandon fire. There's a lot of places where you might not be allowed to have a fireplace anymore and burn wood, even though that's closer to being carbon neutral, carbon dioxide neutral, to be precise. So I'm sort of amused by everybody talks about a war on carbon, when in fact, we're made out of carbon. And the concept about reduction of global warming gas is complex, because when your dog is sitting there panting, he's exhaling carbon dioxide, and so are you every time you exhale.

So it's a very complex problem. And it requires us to look at, you know, all living systems and all technological systems in a completely new way. So this is going to be around for a long time. And this change is going to be a lot bigger than as we said in a previous talk, when Ronald Reagan's time, you could get long the bond market at 21% interest rates and going long bonds was a great idea from Ronald Reagan to say, Joe Biden. And now the bond market is looking like, well, maybe that's not such a good idea anymore. It's going to have a similar longevity, as we look at the transformation of the elimination of global warming gas and all of our systems and everything we do, just not to take chances, because of how disastrous it could potentially be, if the worst case came to fruition.

So this is going to be a really interesting topic a year from now, five years from now, 10 years from now, 20 years from now, 30 years from now. And these long term changes affect the financial markets. And they affect the perception of what has value, or what is currency or what is money. And, of course, everything is going to change through this enormous generational long transformation. And that's where we're playing, we're playing where disruptive technology is going to have a big effect on what elements in the periodic table are going to be more valuable in the future and which elements in the periodic table are going to be less valuable. And if carbon dioxide and other global warming gas are the, let's say, they're the thermometer, the temperature and the thermometer, we have to look at what elements are going to be required to monkey with the temperature, and that thermometer. And that has a lot to do with technology, and the nexus of raw materials, which is the great space we're playing in.

Erik: Robert, in the Smarter Markets interviews, you described electrifying the global economy, not just as a good idea, but the only way forward for global society in order to get through this green challenge that we face. That's a really big deal. And as we discussed in that interview, it's going to require building a whole new electric grid. And as you described, the United States is a long ways behind China in terms of the quality of engineering and advancement of technology in the electric grid. It seems on the surface like okay, this is going to be a fantastic investment opportunity invest in building the grid.

But hang on a second, you and I are talking about how the US electric grid has to be rebuilt, we get it. Most people don't. This doesn't even seem to be a subject of public conversation. So is

there an investment right now in the build out of the electric grid? Or is this just we hope the government gets their act together sometime in the foreseeable future?

Robert: Well, that's an interesting and narrow little question. I'm sure people that are in Texas who just lived through a failure of the grid would tell you that there's something that's going to have to be done about that particular grid, which incidentally, is not linked to the federalization or national electric grid in the United States for strange and bizarre circumstances in the past. Texas' grid is not connected to the rest of the United States. Now, that may be very good for the independence of Texas when it was an independent country. But unless they find a way to winterize their grid and harden against future shock, I think people get to rethink that one from first principles.

So, you know, there have been failures of the grid in the past. New York City was plunged into darkness in a city wide failure, say 20-25 years ago. The electricity in New York is largely hydroelectric power that comes down from Quebec. The Canadians are so kind as to have dammed their lakes and built dams 40-50 years ago, and they pumped that power down electric wires to New York City. There's only one nuclear power plant near the city that is scheduled to be dismantled. So when you start talking about how we generate electricity, how we transmit electrical energy, how we bring it the final mile into your home. Clearly, electrification is the only way to, you know, keep us out of the stone ages.

Whether it's a school or a hospital or an educational institution. Whether it's for the provision of food, energy is fundamental to how we run this planet. And the carrying capacity of the planet is debatable, we have roughly 7 billion people on this little ball of iron and silica hurdling through space. We may go to 8 or 9 billion people in our natural lifespan. And then it may or may not taper off, a lot of the world's great religions still advocate large families. And so it seems like in a lot of developing nations, population growth is still explosive, take Nigeria, for example, quite explosive, or Indonesia, very young demographics and a lot of growth.

So the world is going to look very different in 20 years, as we have a massive increase in urbanization. When I was born in the 1950s, maybe a third of the world's people lived in cities. And now in our lifetime, we're gonna have about 60% of the global population moving to cities, with an ever smaller percentage of people living in rural environments. And those cities, obviously, are very dependent on the rest of the planet for everything they consume.

And let's hope that we electrify them so that the air pollution alone doesn't lead to a massive increase in dementia, heart disease, cancer and other diseases. Because I'd say, clean air is probably the number one human requirement, clean water would rank a close second. And then linked to clean water is good food. And what can be more basic than food, and air, and water. And those three things are affected by the whole energy system. So the whole system has to be looked at cradle to grave, sperm to germ, or womb to tomb. The whole system is coming under analysis so that as a species, we can live in tune with Mother Nature. It's possible. It's doable, and it's achievable in our lifetime.

Erik: Robert, let's talk now about how to make money in terms of investing in this electrification trend. Just so that you don't get accused of talking your book, I'll be the one to make the observation that copper is a huge, huge winner here. Your own company Ivanhoe Mines, ticker IVN is an obvious play. Let's talk now about what's not so obvious. What are the other things that you invest in, if you want to bet on the electrification of the global economy, including probably a rebuild of the US electric grid at some point?

Robert: Well, there are about six or eight elements in the periodic table that are critical to the electrification of the world economy. The first major trend will be lightweighting. everything that moves from point A to point B and transportation has to be made stronger and lighter. So if there's less carbon dioxide or global warming gas involved in getting you from point A to point B. So aluminum and all of the alloys that strengthen aluminum, like magnesium and scandium and lithium are winners. Then those metals that conduct electrical energy are winners and copper is the best electrical and thermal conductor, save for gold and silver, which are too expensive for most uses and electrification.

So copper is an enormous winner along with aluminum. Then come a suite of specialty metals that are critical for a whole host of uses in catalytic converters as we phase out the invalid combustion engine, platinum, palladium, and rhodium. And specialty metals that harden steel and create all kinds of industrial magic like niobium and vanadium. And scandium as an as an additive to aluminum turns aluminum into something like titanium, another very important metal.

So let's say we could identify 10 elements in the periodic table, whose value is certain to rise against the United States dollar, or any other fiat currency. And then we have another series of commodities, which over time, and I'm talking about over a considerable period of time, are likely to be less valuable. And that would be you know, hydrocarbon and coal, hydrocarbon will still have value for plastics and petrochemicals, and specialty uses. And probably once a year, you'll roll out an old internal combustion engine, and get a permit to take it down Fifth Avenue in New York on say, the Fourth of July. But there's gonna be a generation of kids that are about to grow up, who will have never experienced an internal combustion engine. So the world is going to change as a consequence, there's a very safe long term play in playing those electrification medals.

Erik: Let's talk now about not just the battery metals, but the battery technology, I hear a lot of investors saying, look, you got to speculate in lithium, because boy, electric vehicles are coming. They need lithium to build those lithium ion batteries. And I think, wait a minute, every few years, we get an advancement in a new battery chemistry and something's better than the last one. We went from nickel metal hydride to lithium to lithium ion. What comes next? And I know you've talked a lot about nickel in the past, is nickel, the common denominator. That there's some metallurgical or physics reason that the nickel is going to be in the batteries, regardless of what the next chemistry is? Or is there a possibility that the next chemistry doesn't involve nickel?

Robert: Well, first of all, we'll talk about batteries. But let's not forget the hydrogen economy. Because these two massive technological changes are not really enemies. They will travel together in different lanes. But starting with batteries, basically, what we're doing with the transportation batteries, is we're on a super intensive sustained effort to make them more energy dense to make the energy contained in a battery more like gasoline. If we have a gallon of gasoline between us and I light a match, you can see the enormous amount of energy stored in a gallon of gasoline. We'd be in a flash of fire, there would be an explosion.

So as these energies become more energy dense, certain metals and technologies are required. We started with nickel, nickel metal hydride. And the current rage is lithium ion batteries. And yes, they are not really made out of lithium, there's lithium in them. But the predominant constituent in the current generation of batteries is actually nickel. That's a lesser degree cobalt, and then lithium. And we're going to be moving away from lithium ion batteries into quasi solid state, polymer or gel related batteries that will be safer and even more energy dense.

So the holy grail is to make these batteries extremely energy dense and yet relatively safe from the possibility of fire. A lot of people don't know that it's not just wood in your fireplace that burns but lithium burns and aluminum burns and most metals will burn. So you're trying to make the battery more energy dense and yet make it less likely to catch on fire in the event of an impact or a penetration into the battery system. And so the technology is very very rapidly evolving and within five years, we will be beyond lithium ion batteries.

The anode side of the battery will probably evolve from its current generation to Silicon anode or lithium metal anode and the cathode side of the battery will have more and more nickel for a high energy density, the luxury batteries for a Porsche or for Mercedez. For a high quality car will, will be very nickeliferous. It will have some cobalt, not zero, perhaps less, but a lot of nickel. And it doesn't matter whether you call it solid state or quasi solid state, all of the high end energy dense batteries will require nickel.

It will be possible to make a cheaper battery with you know, phosphorus and iron battery. But it'll be an inferior battery for a cheaper car. If you just want short range and you want to run down to the store to pick up a dozen eggs, it's possible to have a cheaper car with a cheaper battery. But since everybody wants something great, most of the pressure is going to be on liquid metal, lithium will have to be mined in much greater quantity than it's mined today. But fortunately, lithium is an extremely common salt in the crust of the earth. Lithium metal is found around the world and numerous deposits. Nickel is a much harder fish to catch. And so we're gonna see a shortage of nickel long before we really have to worry about the physical supply of lithium.

Erik: Where are the investment plays there? Is it in mining companies that mined those metals? Is it in battery companies that engineer new battery chemistries? How does an investor play this advancement of battery technology?

Robert: The battery companies that are getting into actual alliances with the automakers are going to be big winners. On the electrification side, you hear the names of the legendary automobile companies, but they're basically assemblers of components. And the critical component in the electric car is the battery itself. It replaces the internal combustion engine because the electric motor is widely available and extremely reliable. Nidek from Japan is the world's biggest builder of electric motors and Nidek is a great company privately owned.

But the batteries, they're going to be competing technologies. They'll probably be three or four or five industry leaders, and the market will be vast. So for vehicles up to the size of an SUV, better battery technologies will come from a relatively small group of disruptive battery producers, but all of them are gonna need nickel. And all of them are going to have to make their anode out of either silicon, or solid carbon or graphite, or lithium metal. So the technology is converging on those winners that can increase energy density, and yet prevent their batteries from bursting into flames either with software management systems that warn you before a battery is going to fail and has become unsafe, or internally engineered systems to make sure that the batteries don't get to thermal runaway.

Thermal runaway is the term of art about when a battery gets so hot, you got to worry about it bursting into flames, or exploding. That's when it's pretending to act like gasoline. And I can assure you that as we get to energy dense batteries, that's our single biggest concern is safety. Because anything with that energy density is inherently potentially dangerous. So if you want to, you know have room for your kids in the backseat, and a set of golf clubs, you're going to be buying a car with great energy density in the batteries. And those batteries are going to be brought to you by a handful of disruptive technology companies. Now, you can either have a basket or a portfolio approach off those companies. QuantumScape was an early mover with a lot of market reaction as you well know. It was put into a SPAC and had a spectacular run up but there will be others coming to market soon. Probably three or four or five of the better ones. The ones that have a relationship with an automaker, where you can see that they're going to be supplying batteries to a major automaker will probably trade at the highest valuations.

Erik: Robert let's move on from the electrification of the economy and the grid to the actual generation of that electrical energy that we need. We talked in the Smarter Markets interviews about the thorium reactor cycle. And specifically, I've followed Kirk Sorensen's videos for years and years now on the liquid fluoride thorium reactor, which just blows my mind is this thing was prototyped and demonstrated and proven like 50 years ago. So we know it works. At the time it was rejected because specifically it does not create weapons grade plutonium as a side effect of its process of generating electricity. And that's what they needed at the time for the Cold War.

Now that we don't have a Cold War, it seems so obvious to me that somebody ought to commercialize that what really is a 50 year old proven technology of the thorium reactor. Frankly, I would commit my life to that if I had the assets to do it, but I don't. Robert, you do want Why doesn't a guy like you organize a venture to create this thorium reactor, build it in a factory. So you've gotten modular ones, you could ship anywhere and say to the world, look, there's a new source of energy, which doesn't have nuclear proliferation risk, it doesn't result in, you

know, risking any nuclear wars, because it doesn't create the metals that are needed to make the nuclear bombs. It cannot possibly melt down. It's a completely different approach to nuclear. And it's a much better approach. I guess, you said the country of India is doing a lot of research on this. What about commercialization of it in selling it to the rest of the world, it seems to me like it's such an obvious play.

Robert: I think you'd want to do an interview with Laurent Frescaline, my partner, he's a plasma physicist, and he's spent a lifetime in strategic weapons engineering and deep deep knowledge of nuclear fuel and thorium cycles. And you're absolutely correct that it is an accident of history, that we went on the uranium cycle because of its advantage that it produced plutonium, and other materials that were required for atomic weaponry. And the whole regulatory system, the whole governmental system, in most countries is geared to using uranium and the recovery of uranium in the nuclear energy industry.

And any good plasma physicist will tell you that, absolutely, you're correct. The thorium cycle could be developed. As I'd mentioned to you earlier, the Indian government is a world leader in the thorium cycle. And it would be a wonderful thing for humanity. But I think there's still, you know, when you ask me, as an individual investor, what's stopping anybody from doing this are enormous regulatory burdens. And just the inertia of the current industry. You're underestimating the difficulty of getting the American government, which changes frequently, you know, to actually allow the creation of such an industry and the demise of the current nuclear establishment.

That's a really tough road to hoe for one entrepreneur to think about. Clearly, it has to be done at a governmental level. If the Chinese want to develop a thorium cycle, or the Indians want to develop a thorium cycle, or the Americans or the Japanese, if they put their mind to it, absolutely, we could do it. And that's why politics, you know, would be better to move from such stupid issues as whether to wear a mask or not, and focus on the truly important issues. And why don't we just find better ways to generate endless electrical energy for humanity. Without the deleterious effects of the uranium cycle? It's certainly doable. And basically, I violently agree with you, which means I'll beat up anybody that disagrees with us. But there's simpler and better ways to get there from here.

Erik: I know where you're headed, because I've been thinking about this since our Smarter Markets interview, and one of the points that you made is there's a gigantic nuclear reactor, it's called the center of the earth. And it's generating intense amounts of heat, to the point that there are major granite formations that are heated to several 100 degrees Celsius, that are just I don't know how many 1000 feet it is below the surface. But not that much farther than current technology has the ability to mine. And you made the point in those interviews we did on Smarter Markets that all you need in order to deliver the world a safe, completely clean source of unlimited electric energy, is figure out how to drill deeper holes, drill them horizontally the same way that we drill oil wells horizontally today, but at a larger diameter and drill them through very hot rock, the several 100 degrees granite.

If we could drill radiators, as you put it into granite submerged, you don't have to tell me how many 1000 feet below the surface. You could create geothermal electric plants that could supply the entire world with unlimited completely clean, green energy. And all you have to do is what? It's build a better drill bit. Tell us again precisely what's the technology that's needed in order to enable that outcome. And why couldn't we just take existing lateral drilling oil rig technology? It seems like to me it's not that far off. What's the shortcoming? The drill bit can't drill the big enough hole or it can't drill the hole through the hot enough rock? What's the problem?

Robert: We have a Private American unicorn called I-Pulse, which has commercialized non-military applications of ultra high energy pulse electrical power, technologies that heretofore were used only for strategic weaponry, electromagnetic pulse weaponry, and other military applications. So setting aside our private company, and to answer your question, we're all very fond of Mother Earth. But we're not taught in grade school that Mother Earth is, in fact, a nuclear reactor, just like the sun. When you're talking about solar energy that is nuclear that, you know, that's ultimately, nuclear fuel drives the sun, which creates the energy that comes to us as solar radiation. It's obvious to you when you get in the sun, you can feel that heat from that nuclear reactor, the ancient Egyptians called it raw, the sun god.

But what you might not know that at the center of the earth is sufficient remnant uranium and very, very high natural rock pressures due to the gravity pushing on the center of the Earth at the center of the earth is a natural nuclear reactor. Mother Earth is a nuclear reactor at the center of the earth. We think the temperature at the core is approximately 11,000 degrees Fahrenheit. Just about the same temperature as the surface of the sun. And there's enough remnant uranium to cause that fission reaction and the core of the Earth to last several billion years. So in terms of the timescale of human evolution, several billion years is a long time from now before the core of our Earth goes cold, because it runs out of fuel.

So modern, you know, understanding of plate tectonics indicates that there's really almost nowhere in the world. If you drill a hole more than 20 kilometers deep, you don't get below the solid, or what you call a rock or solid floating continents, and you go into the mantle, which is molten. And you see that bubbling up, you know, in how the Alcala in Hawaii, for example, or any volcano, the source of all that heat of the center of the earth, that is our Mother Earth, she is a nuclear reactor. So we can look to the sun god raw for solar energy, or we can just look beneath our feet to our mother nuclear reactor and tap limitless amounts of geothermal energy, it's the cleanest solution, because it you know, the sun doesn't shine all the time and the wind doesn't blow all the time and the tides, while regular are somewhat difficult to harvest.

But the geothermal energy below our feet is always there. Now, the areas along the edge of the continent. So you take from Alaska, down to Chile on the west coast, that rim of fire, or the big fractures like the run through Asia or Japan, you find that when you look at a heat map of the earth, there are very very large areas on this planet where the continental crust is very thin and there are very large rock masses called granites which are solidified molten rock that are not very deep and are very very very hot. In the United States, we have hot, dry granites that are 30, 40, 50 miles across. And some of them are not very deep at all. They're 1000, 2000, 3000,

4000, 5000 feet deep. Quite shallow compared to an oil well, and if they're hot enough to make steam to run a generator, you can generate a limitless amount of free electrical energy with no global warming effects.

And more importantly, with the capability to generate baseline electrical loads because unfortunately, because the wind is intermittent and the sun is intermittent, you need baseline power, you know server for bass demand that could be nuclear could be natural gas as a transition fuel. But something has to provide that electrical energy when the wind is not blowing or the sun is not shining and geothermal is ideal.

Erik: Hang on a second Robert, I just want to understand more specifically, with respect to the technology that we already have in the oil industry, which is the ability to drill down and then turn the drill bit and drill sideways and do these long lateral in the case of oil, it's oil wells. What is the problem with just repurposing those same oil drilling rigs and saying let's go to where some of this hot granite is. Drill down, drill sideways, drill that radiator you've talked about and create the limitless source of geothermal energy. Is the problem that the oil drilling rig can't drill into that type of rock. Is it because of the heat of it? What's the challenge? Why can't we just use the stuff we got?

Robert: No, there's absolutely no possibility to use the current generation of oil drilling rigs. So forget about it. Forget about it. That won't work.

Erik: Why not? What's missing?

Robert: So the way we've drilled for the last 200 years is we put an enormous amount of mechanical pressure on a rotating drill bit. Usually, you use industrial diamonds at the end that bit and it takes an enormous amount of energy to turn that drill steel. And in order to really bend around corners is a completely different way to drill, you need a much cheaper way to drill, you need sort of a robot that can get into hot rock and do the drilling for you, a Pac Man machine that has to be completely reengineered and redesigned. So the electronics in that device would have to tolerate temperatures about 250 degrees centigrade, or two and a half times the temperature of boiling water. And we'd have to use a completely different physical principle, to drill large diameter holes in hot rock, we're quite confident that this is achievable with the current state of human technological development, within a period of say, five, or a maximum of 10 years.

We know how to do it, we're heading in that direction. And we're also seeking and are likely to receive support from one or more governments to achieve that end. Hopefully, the new department of energy in the United States, for example, will take an interest in this obvious solution. But we have another government that is taking a great deal of interest. So what this entails is using electromagnetic pulses to spalt rock, to turn rock into a gas, and to drive a series of devices that to our mind could drive these tunnels through hot rock. And once you've done that, you just inject water into those tunnels make steam, and then recycle that steam when it condenses, after it generates electrical energy into an endless loop and generate free electrical

energy with no you know, with basically no moving parts required, other than the steam generator. So it's the same as a nuclear power plant is. A nuclear power plant generate steam, with a uranium reaction making heat. In this case, we just use the heat from Mother Earth. There's no global warming effects. And we can do it, it's a lot easier than putting a man on the moon, or Mars believe me.

Erik: Now that's one of the things that your company I-Pulse is taking on. Robert, why are you doing this? You said it's a unicorn company. So upwards of a billion dollars of market capitalization. Obviously, with your personal background and you know, accomplishments in your career, it's not like you can't launch an IPO? Why wouldn't you take this company public that's going to invent this Pac Man machine that can drill these large diameter holes that could potentially create unlimited amounts of energy.

Robert: We have a lot of other more immediate commercial uses for derivatives of that technology. We're using that technology for a new generation of geophysical instruments to see water in the crust of the earth or to see copper or gold or electrically conductive metals. That's in the mining division, HPX, which stands for high-powered exploration. We're using those technologies in a new suite of machinery to find new ways to make things out of metals. We're involved in manufacturing with major aircraft manufacturers, major automobile manufacturers, and luxury goods manufacturer.

And we're also working to disrupt the existing hydrocarbon industry to get a lot more oil and gas out of an existing oil well, so the projects that we look at for generating and finding more water from the crust of the earth are generating energy from the crust of the earth are sort of our main dreams. So a lot of the tech billionaires, they like the idea of going to Mars. I like that. I like that idea too. But I think it's even cooler to figure out a way to get infinite carbon free electrical energy for humanity, right here on this particular planet. And so that's something we're focusing on as a very important and achievable industrial dream at I-Pulse.

Now, we really kept it quite private for a long time, but we do have a website now. www.ipulse-group.com and I'm quite findable at ivanhoemines.com. We're working with one of the world's major investor, investment banks and we are kind of planning with staying private and raise more capital or be more public about our efforts. But the good news for you, Eric is we've never spoken about this to anybody to any broadcaster, or news media.

Erik: Well, Robert, I'm sure that a lot of our listeners are thinking the same thing I am, which is what you say makes perfect sense. And frankly, regardless of whether your company I-Pulse figures out this Pac Man machine, or someone else beats you to it, because they've got an even better idea, all it's going to take is for somebody to invent that Pac Man machine. The thing that goes down a few 1000 feet below the surface, drills, large diameter tunnels through very hot granite. So it's got to be a temperature, high temperature tolerant machinery, which adds some engineering challenge. Whoever builds that first can create an unlimited source of geothermal energy to provide as much electricity as we need to run the global economy forever. That's a really, really big deal.

Robert: Well, we violently agree. That means you'll beat up anybody that disagrees with us, you know. The best ideas, the most brilliant ideas are the simplest. So these are the irrevocable facts. Mother Earth is a nuclear reactor, all the energy you need is right beneath your feet. You've experienced it if you went to Japan, and sat at a natural hot spring, in a hot tub, you know, a natural hot tub. There's hot springs all over the world. You can see it in Yellowstone, Montana. For example, in Yellowstone, Montana, that hot rock is right below your feet. You're basically standing on it when you go see Old Faithful, for example. But even in the heart of New York City, if you drill a deep enough hole, there's an infinite amount of heat. So the energy we need, it's right underneath our feet provided by Mother Earth, our friendly mother female nuclear reactor. And we know that this is doable. And quite frankly, we're fully intent on doing it.

Erik: Well, as much as I would love to give you a chance to quote unquote, talk your book and sell your company, I-Pulse, you don't want to do that, because it's private. So what can you tell our investor audience about other ways to play this revolution in geothermal energy because somebody, whether it's you at I-Pulse, or someone else is going to figure this out. And it seems to me like such an obvious solution, that geothermal power generation could provide us with all the electricity that we need. And with that, and the real build out of a completely modernized electric grid, give me something that you're not doing in a private company people can't invest in to help our investors out.

Robert: We're living in an era of an explosion of human creativity. There are two or three Hyperloop companies and they say, why is a train sitting on the surface when you can bore a tunnel and rock? Perhaps, maybe what you want to do is remove some of the air in that tunnel. So you have a partial or full vacuum and let the train go screaming over a rail. Perhaps magnetically levitated at five or 600 miles an hour, it wouldn't bother you underground, and it would use very little energy. And so the Hyperloop concept is just an idea. Definitely, we can do it, you need a cheaper way to drive tunnels underground. That's the same problem.

The Nobel Prize came from dynamite. And the invention of data made it much easier to drive a subway tunnel, or say, the Callahan tunnel, getting from Logan Airport to downtown Boston, or the new tunnel we're gonna put from New Jersey to New York City. Tunneling is a big deal because you're going into Mother Earth. And if you can figure out a cheaper way to tunnel and you tunnel through hot rock, then we're finished with the energy problem. We don't need hydrocarbon anymore. We don't need natural gas anymore. We don't need nuclear power anymore. We don't need solar energy anymore and we don't need wind power anymore. And so the solution is blatantly obvious and focused human technology and intent will achieve it in our lifetime. I am certain of that.

Erik: Robert, I can't thank you enough for a terrific interview. Patrick Ceresna and I will be back as MacroVoices continues right after this message from our sponsor.