

SM140 | 9.23.2023

## The September Sessions | Episode 3

Erik Townsend, Host of Macro Voices and the Documentary Series *Energy Transition Crisis*

**Our September Sessions roll on this week with Erik Townsend, Host of Macro Voices. SmarterMarkets™ host David Greely sits down with Erik to discuss his new eight-part documentary series [Energy Transition Crisis](#).**

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**Erik Townsend** (00s):

The reason you don't work on a farm is because of the energy we get from fossil fuels. And if we could not just replace the fossil fuels, but replace the fossil fuels with an energy source that gives us twice as much energy, that means that we go from our current standard of living to something dramatically better.

**Announcer** (17s):

Welcome to SmarterMarkets, a weekly podcast featuring the icons and entrepreneurs of technology, commodities, and finance ranting on the inadequacies of our systems and riffing on ideas for how to solve them. Together we examine the questions are we facing a crisis of information or a crisis of trust and will building Smarter Markets be the antidote?

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**David Greely** (55s):

Welcome back to the September Sessions on Smarter Markets. I'm Dave Greely, Chief Economist at Abaxx Technologies. Our guest today is Erik Townsend, host of Macro Voices. We'll be discussing his new eight part documentary series, *Energy Transition Crisis*. Hello Erik, welcome back to SmarterMarkets.

**Erik Townsend** (01m 16s):

Thanks for having me back. It's good to be here.

**David Greely** (01m 18s):

Oh, well it's good to have you back and I've been really looking forward to discussing your new documentary series *Energy Transition Crisis* with you. Clearly this is a subject in which we here at Smarter Markets, you're very interested but I wanted to ask you, what got you interested enough to put in the considerable time and effort to make a documentary series of this size?

**Erik Townsend** (01m 40s):

Well, Dave, this started for me back in 2006 or 2007 when I was really interested in knowing whether or not Al Gore's message around climate change was real, or if that was maybe motivated by some of Al Gore's own financial interests. So as I look at that and I learned about first global warming and then peak oil and then what I call peak cheap oil, which is not a prediction that the world's running out of oil. It's just a prediction that that sheep and easy oil, that that's easy to produce and doesn't cost very much. That's behind us. Now oil's gonna get more expensive from here and I really feel like all of the people in the world with their hearts in the right place, the people who are passionate about climate change are the people that society needs the most because They're the ones that want to make the world a better place.

**Erik Townsend** (02m 27s):

But I think they're being misled about how much work this energy transition is really gonna be, what it's gonna take to pull it off and particularly the reasons why wind and solar alone are not going to be enough to do it and I do think there's some conflicted political interests that are misleading people. So the purpose of the docuseries was to try to set the record straight and just say, look, energy transition is super important. Climate change is only one reason that it's important. I think peak cheap oil is an even more compelling reason for it. But mostly what I want people to understand is when you see these pictures of wind farms and solar arrays and you know, happy music that says it's all gonna be fine, it's not fine. We've been working on this for 25 years and at this point, 25 years later, all renewables combine supply less than 5% of our energy needs wind and solar combined supply less than 2% as of the end of 2021,

which is what my docuseries is based on. It's above 2% now it's almost 3% as we speak. Oh boy. You know, that's nothing compared to what we need to accomplish. So we've got a long way to go. And what I'm trying to do with the docuseries is put energy transition in perspective. Why is it important, why are we getting a lot of the policies backwards right now. What do we need to do to fix those policies and what's it really going to take to pull off energy transition?

**David Greely** (03m 49s):

And I really want to dig into that point about it not being fine with you because clearly, you know, you titled your docuseries Energy Transition Crisis, and I wanted to ask you a little bit about that title and the crisis piece. What do you see, given that you followed this for quite some time, you know, going back to Al Gore's Inconvenient Truth and High Oil Prices of 2006 2007, what makes you think that there's the, the urgency of crisis now and the nature of that crisis?

**Erik Townsend** (04m 18s):

There's two reasons. One is that I think an energy crisis punctuated by much higher energy prices, let's say just for sake of argument, the cost of gasoline doubling from where it is now before the end of this decade. I think that's coming before the 2020s are over and the reason it's coming, it has a lot to do with misguided ESG policy and I want to be super clear, I couldn't be a bigger fan and proponent of the letters ESG and what they stand for, environmental social responsible corporate governance. You can't possibly have a better agenda than that, as far as I'm concerned. But I think ESG has gone badly astray. We've turned it into a, a crisis of politics and a crisis of society where I think politicians are trying to divide society. They're telling people climate change, let's blame big oil.

**Erik Townsend** (05m 13s):

Let's scapegoat the big oil industry and we've got to take anything that has to do with mining or oil production, label it as bad, cancel culture on it. Let's let, let's go stand outside the bank and you know, tell the banks that we're going to occupy their lobbies until they stop funding oil and gas projects. Well, that's like stopping breathing to make a point and protest pollution. It doesn't make sense to phase out fossil fuels until we first phase in clean energy to replace them. What we've got are politicians who have failed miserably in their promises to build green energy that are now scapegoating big oil and saying, you know, it's all their fault. Well, what we should be saying is big oil. You guys have got the drilling rigs that we need to really make a geothermal revolution a reality. If we want to make renewables work, we have got to get it at scale.

**Erik Townsend** (06m 07s):

Because right now it's a economy of scale problem. Geothermal is just not economic. The reason it's not economic is the same reason that shale oil and gas wasn't economic 15 years ago because we haven't developed those technologies and evolved them from niche specialized technologies into mainstream everyday technologies, we can justify shale oil wells at half the oil price that you needed to justify them just 10 years ago. Well, why is that because the oil and gas industry took that job of drilling oil wells and made it much, much more economic. Why do we actually scapegoat big oil is the bad guys well because we hate their pollution. Well, wait a minute, are they polluting anything or are they just the drug dealers that are selling the fossil fuels that the rest of us burn to pollute. Well, why are we the ones doing the polluting?

**Erik Townsend** (07m 00s):

Well, because we don't have any other choice. Why don't we have any other choice because the efforts needed to replace fossil fuels with clean energy to date have been abysmal. It's been pitiful, the progress that we've been making. So what I'm really trying to do is wake people up to say we're not making any meaningful progress at building the clean energy that we need to replace fossil fuels. That's a crisis unto itself, but I think the crisis is exacerbated by politicians using this as an opportunity to divide society and say, let's make this about us versus them. We'll take climate and any consciousness about climate, that's a Democrat issue. We're, we're gonna blame the Republicans for it. Whatever it is okay. Look, it doesn't help anybody to make this a partisan political issue. If your beliefs about whether or not climate change is manmade or not, or your beliefs about whether or not energy transition is important, depend on whether or not you're a Republican or a Democrat. That's not science, that's politics and we've got to get off the politics and onto the science and get we the people focused on what it's really gonna take to achieve energy transition and whip the government into line and get them to do the right thing.

**David Greely** (08m 17s):

And in line with getting the government to do the right thing and politicians to focus on making this happen in a way that doesn't lead to an escalating crisis. It sounds like your series is really targeted at the people kind of the broader audience of people who will be

affected by how the energy transition goes, but may not yet be engaged with the nuts and bolts of the issue. Is that the audience you had in mind for this series. Is that who you wanna reach?

**Erik Townsend** (08m 44s):

Yeah the audience that I really want to reach are the people who are already passionate about climate change and who I feel are being misled about the truth and it's not that I'm disagreeing that climate change is important. I think it is important. I just think that there are moneyed interests who've been trying to persuade people that what this means is wind and solar is our whole future and, and carbon credits. I don't think that that's our whole future and I'm not against wind and solar. My attitude on wind and solar is, hey, build all that you want. The more that we can get, the more clean energy that we can get, the better but if you want my opinion on what it's going to take to really pull off energy transition, wind and solar are only gonna be the sideshow. The real story could be in deep geothermal if we really developed that technology further, if not deep geothermal, the fallback is nuclear is ready to solve this problem now, but we've got such a screwed up situation with the public not understanding nuclear. The government policy around nuclear couldn't be more screwed up than it already is and we really need to get the general populace to understand what the issues are so that they can hold their governments to account.

**David Greely** (09m 55s):

Yeah, and some of what you're making me think of is some topics we've talked about on the podcast before of when you look at the arithmetic of the amount of mining that has to be done of the amount of copper that needs to be produced, of the number of batteries that need to be created to affect the energy transition, that is part of the broad conversation of decarbonizing, electrifying and going to low carbon renewables like solar and energy. The arithmetic doesn't add up without a lot of investment and so is that part of who you're trying to reach, those people who they want to progress into a lower carbon, more sustainable future, but they don't understand yet what that requires, what the realities on the ground are to make that happen?

**Erik Townsend** (10m 39s):

Exactly, that's one example that you just cited and what I'm trying to do is take the collection of all the misunderstandings and misconceptions that I think exist in the climate community and you know, again, it's not that I'm disagreeing with any of the other green energy solutions like wind and solar, but what I'm saying is they're not gonna be anywhere close to enough and what's always missing is any accounting of scale. You, you listen to these people say, look, the future has to be wind and solar because wind and solar are nature. It's like, okay, look, do you speak arithmetic. Talk to me in numbers. We used 159,000 terawatt hours of energy globally last year. Where are you gonna get 159,000 terawatt hours of wind and solar from. That's a lot of solar cells and a lot of windmills. Where are you gonna get them?

**Erik Townsend** (11m 31s):

Who's gonna pay for them, where's the land gonna come from, well, we're not really thinking in those terms. Yeah, I know you're not thinking in those terms. That's the way grownups think. We need to get to actually solving this problem, not just talking about fantasies about it. So if you want to get serious, you've got to talk about how much energy do we actually need to build and what happens is all of a sudden things become clear, like these people that are talking about wind and solar as base load energy and they're saying we need to take batteries and put batteries at the windmills of the solar farms so that wind and solar is gonna charge the batteries up and that way we'll be able to use the energy when you need it. That makes perfect sense. If you don't have guys in your network like you have in your network, like Robert Friedland, who will tell you, look, even if you passed a law that just reserved all of the nickel, all of the cobalt, all of the manganese and all of the lithium and said by law they're only allowed to be used for vehicle batteries, you can't use it for anything else, there still wouldn't be enough.

**Erik Townsend** (12m 31s):

We wouldn't be able to make the vehicle batteries we need. So to even have a conversation about using batteries to create base load wind and solar energy doesn't make any sense because we can't afford to allocate those resources. And one of the things as you alluded that I'm trying to get these guys to understand is you can't possibly go on a Saturday afternoon to an energy transition rally and then on Sunday go to the anti-mining rally. If we're going to transition the global economy, we're gonna do more mining than we've ever done before. Now I think we ought to be doing that responsibly. I think we need a combination of legislation and proactive activity within the mining community to say, let's come up with a set of greeny mining rules and procedures and let's, as Robert Friedland has said, let's come up with a separate price.

**Erik Townsend** (13m 24s):

So there's a price on green copper and there's a price on dirty copper and there's lots of people in the world who want to be responsible. We'll give them the price of producing green copper and until that separate price exists, there's no incentive, there's no reason for anyone to want to do the right thing. Well, when Friedland says that all the environmentalists turn on him, they call him toxic Bob because of some accident that happened at one of his mines 30 years ago and they won't listen to him. Well, look, you've got to understand the economics here. If you want to have responsible mining and we better think about responsible mining because we're gonna do a lot more mining in the next 30 years than we did in the last 30 years, not less. If we're gonna do a lot more money, we should do it responsibly.

**Erik Townsend** (14m 08s):

The way to do that responsibly is to get smarter market mechanisms to get price mechanisms into the market in order to make these things possible. I think we, we need to do that across energy, but we're doing the stupidest things, particularly in the nuclear space. The more that I've learned about nuclear energy policy, the more I've realized the government exists to stand in the way of progress in this space and I think there's actually, in the beginning, I think there was a, a devious intention that led to that. I think that in the Nixon administration, there were some big donations from oil and gas donors to help put nuclear out of business. Now that happened 50 years ago. We're still paying the price for that. We need to resurrect all of the good research that Nixon shut down and get the nuclear energy industry back on track.

**Erik Townsend** (14m 59s):

That's the most important thing that we could do for energy transition. But unfortunately right now, the people who are passionate about energy transition have kind of been lobbied to think that anything nuclear is inherently bad. Well, they're kind of right. That old school nuclear, the kind of nuclear reactor that melted down in Fukushima, I certainly don't support building any more of those things but there's new technologies that have never been commercialized, that were invented more than 50 years ago that solve all of the major objections to nuclear energy. Question to ask yourself is why has the US government not done anything when they, they, they, you know, if you're gonna solve a problem which they did solve back in the late 1960s, why would you not adopt the solution to that problem, it was purely political and it's the fact that that hasn't been remedied 50 years later.

**Erik Townsend** (15m 51s):

What I'm trying to do with this docuseries is get people to understand the history of how we got here and hopefully get them to say, wait a minute, this is crazy. We need to get nuclear back on track, but the safe kind of nuclear, not the kind of nuclear that we're still building. We need to get rid of these water cooled reactors, replace them with molten salt reactors. Well, right now it's completely impossible to even propose that to the nuclear regulatory commission, to the point that some nuclear entrepreneurs are actually leaving the United States and moving to Canada because they find that Canadian regulators are easier to work with. We got people leaving the country because they can see that in order to solve energy transition, they've got to deal with a different government. That's crazy. I want to do something to call public attention to, we can't let this continue. We got to do something to get the public aware of how badly we're screwing up energy policy

**David Greely** (16m 43s):

And I want to come back to talk with you about some of these technologies in more detail, but first I want to ask you what's admittedly an unfair question because you've already made, you know, many important points that are in your documentary, the documentary series, I believe it's eight parts. So it's a big series and it has many important points to make but the unfair question is, you know, this is one of those, which of your children is your favorite. Is there one big point that you really hope your audience takes away from this series?

**Erik Townsend** (17m 12s):

Yeah, it's actually the simplest point that I make at the very beginning that almost everyone misses, which is, it took me a couple of years to really get my head around how important energy and energy policy are to our standard of living. When I was in the software business, I was a successful entrepreneur. I thought I understood the business world and so forth. If you told me I was gonna get passionate about oil and gas, I would tell you that you had three heads. That's crazy. I mean, oil and gas, I just mentally I would've associated that with, I don't know, three guys in a across the bench seat of a pickup truck all named Bubba driving across East Texas into the sunset on their way to an oil rig or something, thinking that's the farthest thing away from me. What I hadn't figured out yet, and it's a guy named Chris Martinson who taught me this lesson, is societal complexity.



**Erik Townsend** (18m 04s):

The sophistication of our society around us is a function of the amount of cheap and abundant energy that's available to the economy. So why is it that neither you or I live and work on farms because 250 years ago, everybody had to work on a farm, basically one out of a hundred, 150 people somebody got lucky enough to get sent off to university and become the town doctor. Everybody else had to work on the farm because we just needed everyone's labor, physical labor in order to grow the food needed to survive. What changed that means that we don't have to live that way. It's all about energy and most people will say technology is what changed really technology is just the, the inventions that we use to harness energy in order to use it to make our lives better but if we didn't have energy, and particularly if we were to make the mistake of thinking the solution to climate change is to stop using energy, then we would drive ourselves back into the dark ages.

**Erik Townsend** (19m 06s):

We need energy and we need to promote more abundant energy. We just need to stop using the kind of energy that pollutes the environment and screws us up and the thing is, it's at our fingertips. We could solve this problem with a combination of deep geothermal and nuclear and do it in a completely safe way. We're just not in touch with the technology that's already available to us. But the real issue I want people to understand is the reason you don't work on a farm is because of the energy we get from fossil fuels and if we could do a, not just to replace the fossil fuels, but replace the fossil fuels with an energy source that gives us twice as much energy, that means that we go from our current standard of living to something dramatically better.

**David Greely** (19m 50s):

And thinking about the farm where, where most people live throughout most of history, it's right there in the terminology, right. We, we still talk about horsepower and an engine, you know, a pickup truck being four or 500 horsepower and just thinking about what that literally means really kind of gets to the point of the energy we use. Having that cheap abundant energy creates the power that creates our standard of living and I really think that's an underappreciated point that you've made, that so much of the growth in our standard of living has been driven by inexpensive energy and I think we're used to thinking of our technology you know, you think about Silicon Valley, the world where you came through with software development, you know, we're used to thinking of that information, technology, digitization, the internet. But even there we don't see the energy required to power it, that we don't see the server farms that process our online requests and activities. They're hidden from our experience of the internet. That's just one example and I'm curious, how do you think getting people to understand this point, this big point you're making, how does that change how they would engage with the energy transition?

**Erik Townsend** (20m 56s):

Well, my hope is to get people to realize that the entire human experience has been defined for the last 250 years by throttling our access to energy. I think that there are money interests that were behind that in the 1960s and 70s that the, the big oil basically lobbied in order to get nuclear energy shut down at that time. Whether I'm right about that, that's a speculation that's just my politics it's not really important. But the point I want people to take to heart is whether we go from here toward consuming less energy because we think the way to cope with climate change is to force ourselves to live with less, or whether we use this opportunity as a stepping stone to really take the human experience on planet earth to a whole new level of accomplishment and, and to make it better. That's really the fork in the roads that we're at right now, because we are going to end the age of oil one way or another.

**Erik Townsend** (21m 55s):

It's going to be forced upon us if we don't wise up and wind it down on our own. So as oil ends, we can either do the right thing, which is build enough clean, abundant energy and make it cheap enough to enable another major step function. Just like the Industrial Revolution enabled a whole new level of prosperity and society. We can enable a whole new level of prosperity or we can take ourselves all the way back into the dark ages by cutting ourselves off of energy, by having the wrong reactions to people's concerns about climate change. So it's really, really important to think this through and think through whether we're trying to conserve energy or if we're just trying to stop polluting. There's a big difference there. I don't think we want to conserve energy. I think we want to learn how to use more energy without polluting in the process.

**David Greely** (22m 46s):

It's a really interesting point you make where, you know, as you said, you know, you're seeing the, the age of oil coming to an end regardless of whether it's because it's too expensive to take out to the ground or too dangerous to burn and emit into the atmosphere. I'm curious, you know, you talk with a lot of people in the industry, in government, how do people receive that part that we're at the, what you've termed the, the peak inexpensive oil or peak cheap oil?

**Erik Townsend** (23m 12s):

I generally try to focus on people who are climate skeptics because the climate believers already want to do the right thing. They want to achieve energy transition. I personally think the peak cheap oil argument is even more compelling than the climate argument. But hey, if you want to do the right thing for a slightly different reason than why I would've done it, I'm still your friend. I just am glad that we both want to do the right thing. The people who are skeptics of climate, I try to say, look, this has clearly been politicized, but let me tell you about peak cheap oil because there's a reason that that has nothing to do with all of this climate hysteria, if you want to call it hysteria. There's something that has nothing to do with that, which is I can make an argument that we're headed toward an energy crisis that is going to utterly cripple the economy.

**Erik Townsend** (23m 58s):

It is solvable by getting off of oil, but the time it's gonna take to get off of oil will be decades and it will be a miserable experience. It'll lead to wars, it'll lead to horrible things. The more we can do to get ahead of that, the better. So I try to take that approach and I try to get people to understand, you know, what we need is clean and abundant energy and there's just no reason not to have it. It's mostly political at this point, as far as I'm concerned. We could get there with geothermal and advanced nuclear, but we've got to get our act together and I think that has to start with public awareness. We've got enough awareness of basic climate science now, and frankly, I think it's some misinformation that people have become aware of in some areas, but we've got enough awareness of climate that people know it's important. I think if everybody who knows a little bit about climate science would just learn a little bit about advanced nuclear, they'd realize that we do need to get rid of old school nuclear, but we need to replace it with new school nuclear, not with wind and solar.

**David Greely** (25m 01s):

Yeah, and I want to dive back into this technology point because we've all been accustomed over the decades to see technology as the salvation, you know, and, and we've seen that play out in the oil market over and over where predictions of peaks have been offset by investment into things like deep sea drilling, shell fracking. But it sounds like you know, now it's, you're seeing we need to take that technology, that innovative edge and move it to other sources of energy. Now as you said, you've started your career as a software developer and entrepreneur, so you're familiar with technology and the issues in bringing it to market. I was hoping you could give us a little bit more of your insights into some of these energy technologies, like the newer nuclear forms, like the deep geothermal. What technologies do you think we need to be transitioning towards and what needs to be done to bring them to market at scale, which of course is what enables it to be a game changer.

**Erik Townsend** (26m 01s):

Well, at scale is the critical point that too many people gloss over. So let's definitely focus on that as we go through this. What we need is to figure out where we're going to come up with about 80,000 terawatt hours of clean electric generation capacity. Now if you're using most energy sources, whether it's fossil fuels or geothermal or nuclear, you have to convert heat energy into electricity. And that's a very inefficient process, unfortunately. So you end up losing about half of the heat energy in that process. So we need about 160,000 terawatt hours of heat energy in order to produce 80,000 terawatt hours of electric energy. So start with putting a number on it, because that's what most people don't do. You've got to be able to think in terms of scale. So where are we gonna get this? It's basically building more than twice the number of electric power plants that exist on planet earth.

**Erik Townsend** (27m 00s):

All the power plants we've ever built from the beginning of time till now. We've got to build more than twice that many new ones, but not the same kind that we have now that we already have proven the technology for. We've got to do it with clean energy now. So we're not burning fossil fuels with those plants. What are our options to realistically do that. Wind and solar are the most popular and common. I think the reason that they're so common is because it's hard to find fault with them. And there are faults. The windmills will kill a lot of birds and they're a lot of endangered species that are getting killed off by windmills. You know, it's not the biggest risk to humanity that we're losing an endangered species of birds, but it's a significant risk that that's going on. There's little things going on there, but the real issue with wind and solar is scale.

**Erik Townsend** (27m 51s):

For the last 25 years, we've had a lot of pretty significant government subsidies that are supporting wind and solar. So far we've only been able to build enough wind and solar to supply 2% of our energy needs. It's not going to be enough and the problem with wind and solar, it's not that I'm against wind and solar, it's, it's not that I don't believe in wind and solar, it's just that I do believe in arithmetic

and we need more energy than we're going to realistically get. So my most optimistic vision for where wind and solar could go is I think maybe 35% of our energy supply someday could come from wind and solar. You got to remember that wind and solar are inherently an intermittent energy source windmills don't work when the wind is calm and solar arrays don't work when you know, at nighttime you can solve some of that using batteries to hold the energy, but now you're competing with vehicles for the battery metals and we can't do that.

**Erik Townsend** (28m 46s):

So we can't afford to use batteries there. We got to do something else. There's only a couple of contenders. One is deep geothermal. That's where you drill a very deep, well deep into the, the earth's crust. You pump water down, it's very hot down there. So you, you go down one side of a u-shaped well with water. What comes up the other side is super-heated steam because you passed it through a rock formation that's deep below the, the surface of the earth. That might be as much as several hundred degrees Celsius. Well, oh, okay. There's a thousand degrees Celsius rock at the very bottom of Earth's crust. Why don't we dig all the way down to the thousand degree. Well that would be great. The problem is simply that drill bits melt before you can drill into thousand degree rock. So you can't get the thousand degree rock right now.

**Erik Townsend** (29m 36s):

You can get to 150 degree rock and you can produce geothermal electricity with it. It, that doesn't really do much in the sense that you produce electricity, but it's very expensive to drill those geothermal wells. It's not economic electricity. It sort of becomes economic. In volcano country, you can install deep geothermal wells in places like Iceland, in Indonesia where there's a lot of volcanic activity close to the surface. You can, you can get there, but the cost of drilling that hole is just way too high for this to be anywhere close to economic and for that reason, this whole field is just a niche industry that nobody's really paying attention to and right now, geothermal energy to produce electricity that way, any place other than volcano country, it's just not economic it's not appealing at all. Okay, why do I give it a whole chapter, a whole episode of my series if it's not economic?

**Erik Townsend** (30m 31s):

Well, it's not economic for the same reason that horizontal drilling in hydraulic fracturing went unused for more than half a century. Both of those technologies were proven by 1950. We didn't use them until about 2005 or so because they weren't economic. They were still niche technologies that were super expensive. Once we started using them, the price came down. They cost half as much now as they used to. If we had some kind of, I don't know if it's a government funded thing or, or something, but if we did some big investment in geothermal, I think we could get the cost of drilling these geothermals wells down because it's basically the same problem as shell oil wells. You know, what was the problem using that fracking equipment was super expensive, couldn't justify it economically. Well, as soon as you start doing it at scale, economies of scale kick in and it becomes economic. So I think we have got an opportunity with geothermal there. So why don't we stop there before going on to, to nuclear.

**David Greely** (31m 29s):

That's terrific and I'd love to hear about the nuclear side because I think nuclear, as you said, for, you know, whatever reasons has a, a lot of stigma around it. You say nuclear people think Chernobyl, they think Fukushima, they think three mile island. So what is it about nuclear, other technologies, other ways of implementing it that people could do and feel safe and secure with it?

**Erik Townsend** (31m 51s):

Well, nuclear is already the safest form of energy that we have. But similar to aviation, what that means is statistically, if you look at the number of accidents, deaths and so forth, coal mines kill 820 times more people than nuclear power plants. So it's just a hands down, nuclear already is safest. The thing is that like aviation, you know, plane crashes when something goes wrong, it goes badly wrong and it goes badly wrong in an unforgettable way. Those images of the aerial photography of Fukushima during that accident, I don't think any of us are ever going to forget that. So my attitude toward it is it's already the safest, but it's nowhere close to good enough for me. I think that we should not allow ever again the construction of any kind of nuclear reactor or nuclear power plant that even has the possibility of failing in the way that, that these reactors in Fukushima and 3 Mile Island and Chernobyl failed.

**Erik Townsend** (32m 51s):

The thing is they figured that, I mean, the first power developed from nuclear energy was first demonstrated in 1951. By 1958, 7 years later, they had not only figured out that meltdowns were a major problem that needed to be solved, but they had commissioned the molten salt reactor experiment at the Oak Ridge National Laboratory, which actually began in 1960 for the purpose of saying, look, we got to design a new kind of reactor that's not water cooled, that can't. The problem with water as a, as a reactor coolant is under certain

circumstances that water can actually remember water is H<sub>2</sub>O hydrogen and oxygen. Well, normally the hydrogen and oxygen atoms are bound together with covalent bonds that can't possibly break apart because it takes an incredible amount of energy to break those bonds. Well, guess what inside a nuclear reactor core during a meltdown accident, you got all the energy that you need to break those covalent bonds.

**Erik Townsend** (33m 46s):

They get broken, the water coolant separates into pure hydrogen gas. That's the stuff that the Hindenburg was filled with and that's what blew the roof off the building in Fukushima, the big explosion. Everybody's seen that video, that's the roof being blown off the reactor building because of hydrogen separating during a meltdown accident. Well, they figured all of this stuff out by 1958 and commissioned a program in the 1960s called the Molten Salt Reactor Experiment to say, what if you got rid of water as the coolant used molten salt as the coolant. Instead, take it a step further and get rid of the, the fuel rods that are used in all of our civilian power reactors today. That's what can melt down and when it melts down, it can cause this horrible, horrible accident. Well, why not just get rid of those fuel rods. You can dissolve the fuel into the molten salt coolant so it's circulating through the reactor.

**Erik Townsend** (34m 43s):

And if you, if you want to shut the whole thing down, you can just shut down the, the pumps and the, the whole nuclear fission chain reaction stops and you don't have any meltdown. There are no fuel rods to meltdown. They built the reactor that cannot meltdown because it's designed to completely eliminate that possibility. In 1964, they demonstrated that and turned that reactor on in 1965, the year I was born. We've had the technology since then to solve this whole nuclear meltdown thing that has never ever been commercialized. Nobody's ever sold a molten salt reactor to anybody. They did it in a laboratory. They figured out that they had the solution. The Nixon administration figured out that they had a solution. It looked like not only a solution to making nuclear power safer, but they'd also solved, not completely, but mostly solved the nuclear proliferation risk problem..

**Erik Townsend** (35m 39s):

Nixon administration didn't like that. They fired the guy in charge, they canceled the program, shut it down and threw away the research. That's how political this is. We shut down the nuclear energy industry in the United States in 1971, literally because the best research happened in the wrong state. President Nixon wanted that research money spent in his own state. And I know I sound like a crazy conspiracy theorist to make such an allegation, but you don't have to take my word for it. In my documentary series, I've got a recording of Nixon's phone call with Congressman Craig Hosmer, where they basically make a, a plan and say, we're going to make sure we keep all the money in California, not, not in Tennessee. We're gonna do it over in our state. And they shut down the most important research in the history of nuclear energy because of political favoritism.

**Erik Townsend** (36m 28s):

We, the people need to stand up and say, look, if nuclear energy can't be safe because there's something inherently wrong with it, okay, that's a risk society might have to bear if it's inherently unsafe because the solution to making it safe happened in the wrong state and it wasn't the president's state, maybe 50 years later, it's time to make the public aware of that and maybe we, the people need to demand some kind of resolution to that, that the US government needs to get its act together and start promoting the technologies that our parents tax dollars already paid for that solve these, all of these problems. So I don't think we should build any more nuclear, any pressurized water nuclear reactors. These things are like as much pressure inside of them as a scuba tank. If the, if it springs a leak, all of that coolant water instantly flashes to radioactive steam. The reason it has to be pressurized is that that's the only way you can get the water hot enough in order to do the job that it needs to do. If you use a molten salt coolant, you can get twice as much heat out of the reactor. You produce more electricity with it, it's more efficient, but they're not building them that way. They proved it worked in 1965, why did we give up on the technology that works? I haven't completely figured it out, but we need to get to the bottom of it.

**David Greely** (37m 49s):

Yeah, and it's very curious, as you said it was 50 years ago and do you have a sense in your research of why we've never come back to it, you know, different administrations or even have any other countries explored using that technology?

**Erik Townsend** (38m 02s):

Well, they are very recently, very much so. So here's what happened. You start with the molten salt reactor experiment gets canceled in, or I'm sorry, they fired Alvin Weinberg, the father of the molten salt reactor. Also the guy who was principally responsible for inventing the pressurized water reactor, which is the, the, the one that's commonly used very, very accomplished guy. He comes up with the better reactor. They don't want it for some reason. There's the phone call I told you about, they fire Weinberg at 71. They canceled a



molten salt reactor experiment completely in 73. That was the best research, that was the best kinds of molten or the best kind of nuclear reactors, the ones that would solve all of our energy problems, the ones that would really provide a, an energy transition solution to society. That's where the best research was done.

**Erik Townsend** (38m 52s):

All that research ends up in a children's science museum somewhere near the Oak Ridge Laboratory. I guess they threw it away from the laboratory or, or the, the engineers couldn't stand to see it thrown away. So they found a corner of a children's museum in Oak Ridge, Tennessee. They could hide it in. It sits there for a bunch of years and then whoever's got it decides they have to destroy it because, you know, they don't have a budget to keep it there. This guy, Kirk Sorenson, who's ex NASAs engineer finds out about it, launches a one man effort to save this research from the Oak Ridge Laboratory. So he gets it all scanned in and he puts it on the internet. He says, look, I don't want to save this for myself. He wants to commercialize the technology, get molten salt reactors fueled by thorium, what, what I think is the energy strategy that we should have adopted in the 1970s.

**Erik Townsend** (39m 45s):

Kirk wanted to start doing that in 2011. He produced a whole bunch of videos on YouTube saying, look, we gave up on thorium. We gave up on molten salt reactors. We got to get our act together. This is really important. He makes all these YouTube videos trying to get the US government to wake up and he's saying, I, I scanned in all this research that was thrown away by the Oak Ridge Laboratory. It tells you how to make a much better kind of reactor. Please aren't you guys gonna do something with it? The US government basically ignores him, but who is paying attention is the Chinese government. They download all of the documents immediately and they quietly announce that in China, they're going to take all of these ideas, thorium fuel, molten salt reactors. In 2018, the Shanghai Institute of Applied Physics starts construction on a molten salt thorium fueled reactor.

**Erik Townsend** (40m 40s):

Basically a modern upgraded version of the same exact thing that was built in Oak Ridge in 1964 and they built it from the Oak Ridge research papers from 1964 that they got from Kirk Sorenson's website because Kirk Sorenson was trying to get us regulators to wake up and recognize how badly they've screwed up this policy right now in China. They've just in the end of 2022 they issued authorization for Synap, the Shanghai Institute of Applied Physics to start up that thorium fueled molten salt reactor in Wwe city and Gansu province in China. So China is making fantastic progress on all of the right technology. The US is still completely lost in the dust. Meanwhile, companies are springing up all over the world that have recognized this research and the opportunity to really take advanced nuclear technology in a whole new direction to, to focus on molten salt, coolants, thorium fuel, liquid fuel, do all of embrace all of the best research that's been done in nuclear, it's happening in Copenhagen, it's happening in Canada, it's happening in all over the place.

**Erik Townsend** (41m 56s):

Finally, the Idaho National Laboratory has announced its National Reactor Innovation Center. As far as I'm concerned, it's exactly the right idea. It's a little too little too late. They've got this one woman who seems like just a real sweetheart sitting in an office someplace who kind of makes YouTube videos every so often saying, my charter is to work with private industry to have the N R C actually be useful. I don't see them actually certifying any new reactors and I certainly don't see them inviting any of the molten salt reactor companies to come to their site in in Idaho in order to test their reactors.

**David Greely** (42m 32s):

It's a fascinating story and a, a fascinating technology is one of the episodes of your documentary series devoted to these issues around nuclear and the thorium molten salt reactors?

**Erik Townsend** (42m 42s):

Yeah, it's basically episode six is gonna be the heavy one on thorium. But why don't I give you the, the quick rundown. Episode one is really why energy transition is so important. Episode two is the master plan in order to transition the entire global economy from fossil fuels to clean energy, here's what needs to be done. Here are the steps. So it's point by point. What we need to do chapter three or episode three is my prediction of why we're going to have a oil and gas energy crisis in the late 2020s. Why it's unavoidable and why that's probably going to derail energy transition because that's gonna give climate skeptics a lot of ammunition to say, look, climate policy is causing energy, prices too high. We got to go back to polluting. Forget about climate. Screw that, you know, we can't let that happen. So I think it's really important to try to get public awareness out.

**Erik Townsend** (43m 34s):

So episode three is all about my prediction of why there has to be a global energy crisis around oil and gas before the 2020s is out. Episode four is all about deep geothermal, why it would be an incredible godsend if we could make a breakthrough. But until we get that breakthrough, unfortunately I don't think geothermal helps. Episode five, six and seven are all about nuclear. And the way I broke it down, as I said, look, we can't sing the praises of nuclear without first making the criticism. So episode five is almost entirely an anti-nuclear episode. It basically says, look, forget about the, the phony baloney arguments you hear about nuclear just doesn't feel good because it rhymes with nuclear bombs. There's actually a lot of really good criticisms. There's a lot of things to be really worried about. They worried about like hydrogen separation. So I explain all of the, the negatives, all of the criticisms, which is basically meltdown risk, hydrogen explosions, weapons proliferation, and nuclear waste management. I cover all of those things. The fifth episode is all about the pros and cons, in particularly the cons, what could go wrong and what are the problems that we still have left to solve. Episode six is about advanced nuclear technology, breeder reactors, thorium, fuel, the things that actually solve all of those challenges but those solutions have never been adopted Just now, just in the last couple of years. We have startup companies that are beginning to adopt them. So I start to talk about what some of the companies are. I put some company logos up on the screen just to show investors where the, the opportunities are to invest in this stuff. But particularly what I want people to understand is I think small modular reactors are going to be the main solution.

**Erik Townsend** (45m 17s):

That is if there's one sort of secret sauce to all of this, look, nuclear energy could solve our problems, but not the way we used to build it. If you go through spending more than a decade of cost overruns, bankruptcies, and before you actually finish the nuclear power plant, and as far as I can tell, that's the only way anybody's ever built a nuclear power plant. You end up with ridiculously expensive electricity that doesn't solve anything. We need cheap, affordable, abundant electricity and the way you do that is with a nuclear renaissance that is not about creating an opportunity for general contractors to rip the public off with all of this graft that occurred in the first nuclear age. We need to get our act together and do this efficiently and cost effectively. The way you do that is you manufacture all the nuclear reactors on assembly lines in factories the same way you build airliners today with the same quality standards.

**Erik Townsend** (46m 16s):

You've got to have absolute top possible quality control, and you've got to make lots and lots of small modular reactors that will be the workhorses that really solve this energy transition problem. We got to be able to do the same thing for the nuclear reactor that Henry Ford did for the automobile. That's what episode seven is all about. That episode eight is basically just by prescription tying all of that together, saying, here's a plan for what it would take to use a combination of wind, solar, a little bit of geothermal, and mostly a nuclear renaissance. The nuclear renaissance is a societal transformation. It's not something that any policymaker can decide. There is no way for this planet to go nuclear right now until people get through their entirely legitimate concerns. They, they are very scared of nuclear for very good reason. They need to learn that there was very good reason to be scared of it.

**Erik Townsend** (47m 11s):

There still is good reason to be scared of some of the nuclear plants that are still operating because of the aging technology they have. But the new technology, even in the generation three plus pressurized water reactors that are being built today is perfectly safe. We should be building as much of that as we possibly can. I don't think that that style, the old style of nuclear where it's a giant nuclear plant is going to be the way that we economically solve this energy transition crisis. I think we're gonna be better off with an army of small modular reactors, but the big ones are not unsafe anymore the way they used to be. The big ones are perfectly safe. There's no reason not to build them. I just think the, the small ones are gonna be the more cost-effective way to actually make this transition happen.

**David Greely** (47m 53s):

Right and making the transition happen. It takes technology, it also takes money, and you're well known as an investor. You're the podcast host of macro voices. I wanted to ask you, like, as you look out at this, on the one hand there's the what can we do for ourselves, our species, our world as a whole, but there's also the mindset of how do you get the investment dollars into the technology so that it can be built and installed and functional to solve some of these problems and I'm curious, you know, as an investor, what mindset do you take when approaching this and looking for opportunities to get investment dollars into these technologies or to help the energy transition?

**Erik Townsend** (48m 34s):

That was a major motivation for producing the docuseries. I feel that the people who get it, who understand this energy transition challenge and what it really takes and who understand nuclear and deep geothermal and where the opportunities are, I'm certainly not the only one. There's lots and lots of us who, who, who get that picture or none of us are well healed enough to make a difference and you know, there, there's lots of people that are running a hundred million dollar funds that you know that that's small potatoes in terms of what's necessary. Any one of these tiny little nuclear companies that's got a brilliant idea for a molten salt cooled thorium fueled reactor, I, if you want to just approach a regulator and say, we want to get just the, the little baby version of that reactor, the one megawatt test version, we want to just get that approved.

**Erik Townsend** (49m 24s):

You're probably looking at 250 million quarter billion in regulatory expense just to get your prototype approved and it's at least a billion if you want to get to the point of approval to build a modular reactor that you can actually sell to people to make energy with and even if you get to that point, if you're talking about thorium fuel, well now you've got a, a situation where there's no country on earth that has any regulatory framework for a thorium fueled reactor. So, you know, is that presumably it's illegal until they decide it is legal. You know, you're gonna have to, to deal with regulators in order to get that approved. There is a very urgent need for a large, large, very well financed actor to recognize the incredible opportunity that exists here and I think it probably needs to be a big sovereign actor, and I hate to say it, but the Arabs are the most obvious targets.

**Erik Townsend** (50m 24s):

And I just say this in the sense of who's got the enough money. If you wanted to really change the direction of this, what you'd have to do is say, okay, the nuclear renaissance that needs to happen is not really set to happen because what it should happen on is advanced nuclear technologies. It should be molten salt, it should be thorium, it should be liquid fueled reactors, it should be all the cool stuff. The US regulators, the European regulators are so stuck in bureaucracy. What if a country like Saudi Arabia or United Arab Emirates were to say we want to be in the energy space for the long term. We're strategic players in this space. We want to control advanced nuclear. So what we're gonna do is we're gonna acquire these companies that are doing molten salt reactors. because that's the kind of reactor that works in the desert.

**Erik Townsend** (51m 08s):

You don't need to have a, an ocean or a big river in order to, to supply cooling water. So very strategic for the Arabs to think about that. Would it make sense for them to acquire a couple of companies or acquire an entire industry and then offer to that industry look, you know, we're a sovereign government. So your problem right now, if you're Copenhagen Atomics, if you're thon, if you're, if you're seaborg any of these other companies that are trying to prototype molten salt reactors that are fueled by thorium, there's no regulator on earth that's ready to permit that. If you've got an investor who wants to invest in your company, who also happens to own their own country, and by the way, a country with a great big desert where it's easy to, to just say, say, you know, take a few thousand acres guys and have your nuclear test facility.

**Erik Townsend** (51m 56s):

Just keep it out of the way. Make sure it's downwind from Dubai so that if you have an accident, it doesn't blow into, into disrupt the, the tourist activities. You know, I'm, I'm, I'm joking. Obviously they would, they would be very careful in how they'd go about this. But I think you could see a sovereign actor say, we can recognize that where energy has to go after the oil age is nuclear. The US has got the, the opportunity to be the leader in this. They've got the best research, but they're dragging their feet and not doing anything. Let's seize this opportunity. Now, China has already done that. China took all of the liquid fueled, thorium fueled nuclear reactor stuff from Oak Ridge. They've actually built it. They're, they're ready to turn their reactor on. It's, it's actually something they've built. I think you're gonna see a trend where other countries, and I think the obvious actors are UAE and Saudi Arabia to say, okay, we're going out of the oil business because we're gonna be forced out of it.

**Erik Townsend** (52m 49s):

We got lots of cash, let's invest in getting into the long-term energy business. They say they're doing that. But if I look at least what's publicly available, the only actions I see them taking are doing things like hiring the South Koreans to come and build a nuclear plant in Saudi Arabia. Okay, that's not being in the energy business, that's hiring other people to come build an energy plant for you. Being in the energy business would mean acquiring the companies that are actually doing this stuff. Well, I talk to the CFOs of the companies that are doing molten salt reactors and so forth because I'm investing in those companies. They're not getting any, at least they're not telling me about, they're not getting any Arab inquiries. So it hasn't happened yet, but I think that what's going to happen is more and

more countries around the world are gonna see the US is screwing this up, and they're gonna seize opportunity to do what we're not doing. And I hate to see us not doing it, but it seems like that's the direction it's headed in.

**David Greely** (43m 50s):

Well, I want thank you once again, Erik, for sharing so much of your time with us today, and there's so many ideas and insights that you've been discussing with us and are in your documentary series. Just before you go, I was hoping you might be able to pull all these ideas and insights together for us. Like if you had a put it in a synopsis, a summary, a takeaway for our listeners, what would that be, what's the arc to your story?

**Erik Townsend** (54m 00s):

I think the arc to the story is every human being on earth has a right to understand what their government is doing around the issue that affects our quality of life more than anything else and, okay, what's that issue. Well, first I want them to learn that that issue is energy policy. What our governments decide around energy policy has more to do with our quality of life and whether we all have to work on farms or not than anything else. So it's really, really important and we're screwing it up really badly. What I try to do in the docuseries is to just lay out the history of how it got to be this way, what I think needs to be done and I think it's about public awareness. You know, since an Inconvenient Truth came out in 2006, we've got a huge amount of climate awareness now.

**Erik Townsend** (55m 28s):

Not everybody really understands what needs to be done, but people have woken up and said, whoa, this is a big deal. We're not gonna just lay down and ignore this. We're gonna insist that governments do something about it. What I think we really need to do is let go of that obsession with climate change because that's something that not everybody agrees on in favor of an obsession with energy transition. Because even if you don't believe in climate change I do believe climate change is real, by the way. But even if you don't believe it, peak cheap oil is just as good of a reason. And so I think it can become a unifying strategy where regardless of whether you're a climate skeptic or a climate crusader, we can all agree that we still need to transition to cheaper, more abundant, cleaner energy and the docuseries is four and a half hours of me saying that in more words than we had time for here.

**David Greely** (55m 52s):

Well, thanks so much, Erik. Really glad you put it together and thank you for stopping by and sharing it with us.

**Erik Townsend** (56m 00s):

Thanks so much for having me, Dave. It's my pleasure.

**David Greely** (56m 09s):

Thanks again to Erik Townsend, host of Macro Voices and the documentary series *Energy Transition Crisis*. We hope you enjoyed the episode. Please join us next week, week when our guest will be Daniel Yergin, Vice Chairman of SMP Global and author of the bestselling book, *The New Map: Energy, Climate, and the Clash of Nations*, as well as the Pulitzer Prize winning book, *The Prize*. We hope you'll join us.

**Announcer** (56m 29s):

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**Announcer** (57m 18s):

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