PLEASE NOTE: This transcript has been auto-generated and has not been fully proofed by ISEOF. If you have any questions please reach out to us at info@thegreatsimplification.com.

[00:00:00] **Art Berman:** We've got something like eleven and a half million barrels of oil and refined products offline, and that's roughly eleven percent of global supply. That's a gigantic deal. We are going to be feeling a pronounced crunch in which gasoline, diesel prices are at levels where a lot of people just can't afford to fill up their tanks, which is why July starts to look like a very difficult time here in the United States.

[00:00:31] An event like this can force humanity to use less energy, and I think that that is probably the most obvious outcome that's going to happen from this war.

[00:00:48] **Nate Hagens:** Today I'm joined by repeat TGS guest, expert on oil and geology, and my friend Art Berman, for a deep dive on the data surrounding impending oil shortages as a result of the Strait of Hormuz closure, as well as the subsequent cascades of complexity risk for modern civilization. Art Berman is a petroleum geologist with over forty years of oil and gas industry experience.

[00:01:15] He is an expert on US shale plays and is currently consulting for several ENP companies and capital groups in the energy sector. In this conversation, uh, recorded just a few days ago, Art unpacks his recent claim that the US war on Iran may be the biggest blunder in human history, especially as more and more of the world reaches the point where the last pre-war shipments of crude oil exiting the Strait of Hormuz region arrive.

[00:01:43] Art walks us through why the United States is not as insulated from these supply shocks as many believe, and extrapolates the data to describe just how severe shortages in the near future might become, especially with diesel.

More than gasoline, diesel is the main fuel powering industry and transport, and its increased cost will be passed along to you in nearly everything you buy in a store or restaurant or have delivered to your door.

[00:02:12] Above all, Art and I discuss these events in the larger backdrop of a civilization on the precipice, which he and I have been dis-discussing and studying for years, um, decades, and what this moment might mean as a turning point towards the downslope of the carbon pulse. As Art said in this conversation, we always live in interesting times, but we're now approaching more interesting times than usual.

[00:02:41] I hope this episode provides some clarity on what might lie ahead. With that, please welcome Art Berman. Señor Petroleo, bienvenidos back to the show.

[00:02:54] **Art Berman:** Gracias, Nate.

[00:02:56] **Nate Hagens:** Uh, that's my nickname for you. Uh, Art Berman, uh, welcome back. You've been on the, um, The Great Simplification many times. Um, I'm looking forward to a 19-hour, uh, podcast with you to discuss what's going on, uh, with the oil markets in Iran and the Strait of Hormuz and, and such.

[00:03:15] No, I'm kidding.

[00:03:16] **Art Berman:** Me too.

[00:03:16] **Nate Hagens:** So it is Wednesday, May 6th at 9:08 AM Central Time. I, I think it's important to timestamp this conversation because, uh, three hours ago, um, oil was down $15 a barrel, and now it's down $6 a barrel, uh, because of possible breakthroughs, uh, and a truce and a ceasefire, and then Iran saying no.

[00:03:50] Between the time we record this and next week when it is released, who knows how many other news announcements there will be. Let's just start, um, there. Uh, you know, this war, um, in your framing, uh, is the most consequential military, geopolitical, and economic blunder in modern history, you told me in an email.

[00:04:17] So can you walk us through what brought you to that conclusion, and what do you mean by blunder in that context?

[00:04:23] **Art Berman:** Well, the, the, the most obvious thing is that before the war, there were all kinds of problems, as there always are and have been in the Middle East, but shipping was open, and now it's not. To me, I mean, the war has been a negative, and the effects on the global economy are so unbelievably terrible, um, we're just getting started with them, that, I, I mean, I, I think this is, like, the biggest blunder in possibly in human history.

[00:05:02] But, but certainly it is the biggest military blunder that I know of since Napoleon decided to invade Russia in 1812, which led to the end of the French Empire, led to his exile. Uh, I'm not suggesting any of those things will happen. But yeah, I mean, it's just a, it, it's, it's just a, a, a gigantic mistake from every perspective imaginable.

[00:05:28] But mostly it's a, it's a blunder based on energy blindness and a failure to grasp system implications. And, and so that's, that, that, that's really, you know, th- that, that's like the worst blunder imaginable in my, my book.

[00:05:49] **Nate Hagens:** Well, you know I agree with you. Um- On, on that. Although these things tend to then create opportunities and phase shifts for different ideas and conversations and responses that aren't, uh, anticipated, uh, in advance, and, and maybe we'll get to that, uh, a little later.

[00:06:09] So, um, you've been on the show many times. Um, we go way back talking about the importance of oil, the importance of energy, the importance of systems. But for maybe, um, to anchor the scale for our listeners today, how many barrels per day flow through Hormuz on a normal day, and what fraction of global trade does that represent?

[00:06:34] And, and unpack that just briefly.

[00:06:37] **Art Berman:** For oil and refined products, it's roughly 21 million barrels a day on a normal day before, uh, the war.

[00:06:49] **Nate Hagens:** Which is exactly the amount of oil the United States consumes per day, by the way.

[00:06:54] **Art Berman:** It is very close to exactly that amount, and that doesn't include, uh, liquefied natural gas, which is another very s- significant energy export.

[00:07:07] There are other things that we'll get to, fertilizer, helium, sulfuric acid, et cetera, but let's just keep it simple and talk about oil for right now. So 21 million usually makes it through. As of today, pretty close to zero is getting through. Um, the only oil that does appear to be getting through is Iranian oil.

[00:07:33] So, you know, not doing so well there if, if you're the United States. And of that 21, about 10 10 million barrels a day of Persian Gulf oil, which is to say oil from Saudi Arabia, United Arab Emirates, Iraq, et cetera, is reaching the market by other means. So there, there are bypass pipelines, three of them to be specific, that are somehow managing to get oil, uh, out of the region without going through the, the, the Strait of Hormuz.

[00:08:13] So if you take the twenty-one and, and the, and the nine point five and, and do the arithmetic, uh, you know, that means that we've got something like eleven and a half million barrels of oil and refined products offline, and that's roughly 11% of global supply. So that, that's, that's, that's a, a gigantic deal.

[00:08:35] We've never had that mu-- that percent of global supply offline. And, and people always will talk-- take us back to previous oil shocks, and that's, that's good and that's important, but, but w-we have to, we have to be able to compare apples and apples. I mean, if we're looking at, at oil shocks in, you know, 1979, 1980, the world used a lot less oil back then.

[00:09:03] Uh, so we have to be able to normalize those numbers one way or another.

[00:09:08] **Nate Hagens:** And how does this compare in magnitude to the economy, um, from the 1979 o-oil crisis versus this one?

[00:09:17] **Art Berman:** It's 100 times greater when we're looking at, at rate, and rate is always critical. So I look at how much oil was lost how fast. And we look at previous oil shocks, and what we saw was that a lot of oil and a big percentage was lost over some period of time, like 12 months, 18 months, 24 months.

[00:09:42] In this particular case, we lost it all literally in a day or two. And depending on how you do the arithmetic, and I've done it a number of different ways, um, on a daily loss basis, it is 99 times greater than the 1978/1979 oil shock, which was the Iranian Revolution, the Iran-Iraq War, which was the biggie.

[00:10:11] And you can calculate it other ways if you like, and you can get down to as low as about 65 times. So that's, that's, that's the lower limit.

[00:10:22] **Nate Hagens:** Why does it not feel like that? I'm sure it feels like that in Asia, um, and Africa, and maybe Europe. How can you describe that?

[00:10:31] **Art Berman:** There are leads and lags in, in, in every system that we talk about.

[00:10:36] And the lead, the leads in this case are when did the last tankers that made it through the Strait of Hormuz, when did they reach whatever their ports of call were? And the answer is, depending on where you are in the world, they already have or they just did. And so in places where they already have, which includes places like East Asia or Africa, they're already feeling the pinch.

[00:11:11] In places where they just did, which includes the United States, we don't feel it yet. Now, we can layer into that, well, who has production of their own, inventories of their own that provide a buffer, if you will, and that varies quite a bit across the world. But speaking as Americans, no, we don't feel it at all yet.

[00:11:37] **Nate Hagens:** I know in California, I was talking to one of our staff last night, and, and gas is $8 there, so we're feeling it to some degree.

[00:11:46] **Art Berman:** Right. Um, and, and gas and diesel are more expensive where I live, and I'm, I'm sure they are where you live. But we're, we're not experiencing, um, shortages, and we're not experiencing, uh, any kind of critical gaps in, in supply.

[00:12:06] **Nate Hagens:** Uh, will we experience shortages later this year?

[00:12:09] **Art Berman:** Oh, absolutely. Um, um, um, and not so much later this year.

[00:12:14] **Nate Hagens:** Even if there is a truce and, and this war ends, we're gonna have shortages?

[00:12:19] **Art Berman:** Absolutely.

[00:12:20] **Nate Hagens:** Can you explain why you're so confident in that?

[00:12:23] **Art Berman:** Yeah, because we're-- we, we've drawn down most of the available oil on water, oil that, that I just talked about that's already in a tanker somewhere.

[00:12:37] Uh, and we As a world, at least a Western OECD world, we've, we're drawing down our strategic reserves as quickly as, as is physically possible. That works out to be about two million barrels a day. So the, the key is not how much oil isn't moving through the, the Strait of Hormuz yet, but how much do we have in our savings account, basically.

[00:13:04] I mean, that's what we're talking about.

[00:13:06] **Nate Hagens:** So this is like y- you, you are living off a, a trust fund and treating it as if it were renewable. Income. But at some point, you, you get to the bottom, and you think in our, in the United States, you expect that's gonna happen in the next few months irrespective of, of what, um, the, the peace, uh, results in, in Iran.

[00:13:29] **Art Berman:** Well, and, and, and it's not, and it's not just me. I mean, there, there are all kinds of other people that follow this who I respect and I consult and I follow online and read their reports. And some of those select group of people, actually one of them, uh, thinks that we're gonna be at zero storage in the United States by July.

[00:13:57] I think that's probably an exaggeration.

[00:13:59] **Nate Hagens:** What would happen if we're at zero storage or even close to that?

[00:14:03] **Art Berman:** Uh, the world ends. I mean, that, that, that's, that, that's like a really scary outcome. That, that means that you, you know, that, that it's like you ran out of gas in your car. You know? You, you... Everything comes to a stop, and until you can find a gas station or walk to one and get a can, you're, you're, you're dead.

[00:14:23] I mean, you can't go anywhere.

[00:14:24] **Nate Hagens:** Okay, what's your base case then? Forget about the one person who said we're gonna be at zero storage. What, what do you think is the base case?

[00:14:32] **Art Berman:** I think by July, which is not very far off, that we are going to be feeling a, a pronounced crunch in which gasoline, diesel prices are at levels where a lot of people just can't afford to fill up their, their tanks.

[00:14:53] **Nate Hagens:** And, and is this gonna happen even if the war ends today or soon?

[00:14:59] **Art Berman:** Yes. Uh, uh, absolutely, Nate. So there are several hundred oil tankers that are just parked inside the Strait of Hormuz. Okay? So now if, if suddenly there was, you know, peace broke out and, and, uh, you know, Trump and Arakchi and whoever else, you know, decided to have a big party and they're g- they're best buddies and, and the Strait of Hormuz is wide open, all the mines are gone, everything's cool.

[00:15:31] **Nate Hagens:** Which I think is unlikely, but, but keep going.

[00:15:34] **Art Berman:** Yeah. Uh, it's more than unlikely. It will take two to three months before any of those tankers arrive at their por- at their destinations.

[00:15:48] **Nate Hagens:** So during that two to three months, there is no-- Well, you can't bring up production that quickly, so the only thing you can do is continue to draw down your buffers and your storage.

[00:16:01] **Art Berman:** Which is why July starts to look like a very difficult time here in the United States. Now, there are other complications, and that i- those are, again, everything's fine, strait is open. Those tankers, it takes them, like, believe it or not, I mean, many days, if not weeks, to get into the queue to go through the strait.

[00:16:27] I mean, they're all over the place. They need to reposition themselves. And once they do get through, then it takes them a long time to show up where they're going. So okay, so we got one tranche of tankers of several hundred and several hundred million barrels, but now we got the problem of all the production in the Middle East that's closed.

[00:16:50] They shut in. All right? How long does that take to reopen and get back online to some level of, of previous production? Uh, months probably. Now, the part we didn't talk about is, okay, everybody's happy and having a big party, but there's still mines in the Strait of Hormuz. Those have to be removed. How long does that take?

[00:17:16] Weeks? Months? I don't know. Um, and, and it's not just a simple matter of, you know, Captain Smith says, "Oh, great. It's open. Let's go." Well, Captain Smith has owners, and he needs insurance, and there is no insurance right now. So legally, he can't drive his boat, and the, the people that own that very expensive tanker that's loaded to the gills with, you know, millions and millions of dollars worth of crude oil, they have to say, "Okay, we think it's safe to go now."

[00:17:54] So there, there's, there's a million little pieces that, that have to somehow come together in a good way before that oil starts moving, and, and

then we have to be able to refill it when those tankers are gone. So that's, that's the best case. So my view is, in the best case, we will be screwed through the rest of this year no matter what.

[00:18:26] **Nate Hagens:** Screwed being significantly higher gas, diesel, et cetera, prices and the downstream effects of those.

[00:18:32] **Art Berman:** Because the supply is simply not available. Or available in much lower volumes and therefore at much higher prices.

[00:18:41] **Nate Hagens:** I agree with that. Um, but help me understand, um, forward dated oil prices are up- Mm

[00:18:48] twenty some dollars from when the crisis started, whereas front month is up, like, fifty dollars. So it seems like January twenty twenty-seven out to January twenty twenty-eight, um, are not really pricing in a long-term crisis here. They're in the upper seventy dollars, which is higher, but not disaster.

[00:19:12] Why do you think that's not such a clear signal, uh, of, of, uh, all clear?

[00:19:18] **Art Berman:** There are two markets. There's a financial market, which is the futures, and there's a physical market, which is what we call spot. So if, if I wanna buy a barrel of oil today, that's the physical market, and that barrel of oil, on average in the world, is gonna cost me, like, a hundred and forty to a hundred and sixty dollars.

[00:19:45] It's gonna cost me more in some places, maybe a little less in others. So that's... Some people say, "Oh, well, that's, that's the true price of oil 'cause that's what you have to pay today."

[00:19:55] **Nate Hagens:** Wait, a hundred and forty dollars today? Futures right now are at ninety-five next month.

[00:20:01] **Art Berman:** That's what I said. That's a financial market.

[00:20:03] That's not- Okay ... the same thing. Okay. Okay? So if you look at Brent, for instance, the price you're looking at is a contract that expires in late July. That's not today. So, you know, we just, we just started May. So that's May, June. That's three months in the future. That's what that price says. All right? So you know at least as well as I do that financial markets discount everything in the future, right?

[00:20:33] **Nate Hagens:** Yeah.

[00:20:34] **Art Berman:** So now the question is, if Brent is at a hundred and ten today and the physical market is a hundred and fifty, is a hundred and ten a reasonable discount three months out? Now we can have an argument about whether we think that's reasonable or not.

[00:20:51] **Nate Hagens:** But people that are buying physical oil today, May sixth- Yeah

[00:20:57] are paying roughly a hundred and fifty dollars. And from that, in order for them to make profits in the refining, turning it into all the six thousand products that come from a barrel of oil, that is going to be, uh, a higher gasoline and diesel prices than ninety-five dollar, uh, WTI would suggest.

[00:21:16] **Art Berman:** That is right.

[00:21:17] And, and while we're on that subject, there's another, there, there's another complication, and that is refineries themselves. So a refinery has to make a profit. And if it has to pay $150 for a barrel of oil, then the only way it can make a profit is if it sells its products for, for more than that. So it has a margin that it has to achieve.

[00:21:44] And, and if it can't achieve that, then it's gonna cut back on its refinery throughput because it's not making any money, regardless of what the price of oil is. And so when, when a refinery cuts back on its throughput, we have the same kind of problems that occur when an oil field closes production.

[00:22:08] There's, there's all sorts of leads and lags and potentially damage that occurs along the way.

[00:22:14] **Nate Hagens:** I've been so busy, as you know, uh, the last month on, on various things. But when you were speaking there, I had a thought that I really haven't thought about recently, is if this crisis continues, which you and I think is, uh, fair odds, um, that this isn't gonna stop.

[00:22:33] And even if it did stop, as you said, it takes a while for, uh, those mines to be removed and the tankers to arrive and all the things. But this, this places such a, a huge stress on society that I wonder how much government intervention, um, there will be with refiners and other things. And you mentioned the word rationing earlier.

[00:22:59] I mean, we could have a real interesting summer, uh, Art.

[00:23:03] **Art Berman:** Yeah, we, we, we al- well, we always have interesting times, don't we, Nate? But, uh, you know, this particular summer and the rest of this year will be, um, will be especially interesting because you and I and, and a lot of our, our colleagues have been imagining when something like this might happen.

[00:23:29] And back 20 years ago, I think we, we, we thought it would happen sooner than later, but now it is happening.

[00:23:36] **Nate Hagens:** I have so many questions for you, Art. Um, and I- let me ask you this. So the concept of peak oil- Mm-hmm ... um, that at some point in the future there will be a maximum of, uh, petroleum that humans extract, and from that point it will decline after.

[00:23:55] Mm-hmm. Let's just outline what the various, uh, variables are with respect to this blunder, this military blunder, how that might affect the, the future slope of oil. I can think of, number one, it's higher prices, so there'll be more drilling. Uh, number two, uh, higher prices, so more demand switching, uh, less affordability.

[00:24:24] Number three, and this is a big one, is I, I think the global, uh, um, rising tide lifts all boats, um, dynamic where all the countries cooperate towards GDP and everything. We're, we're gonna switch to energy security, and so there's a game theory math where the East, uh, and the North are going to, uh, have different arrangements versus the West and the South than we have in the past.

[00:24:54] And I've likened this to the superorganism kind of calving in two. And so all, uh, all of that changes the shape of the future supply of, of oil, and it becomes above ground factors are now going to matter as much or more than geology and technology. What are your thoughts on all that?

[00:25:16] **Art Berman:** Yeah, many, for sure.

[00:25:17] Um- The, the first is we go back to the 1970s, the early 1980s, and the phenomenon you just described, where oil price gets high enough that that stimulates a lot of drilling and a lot of new oil is discovered or developed. And usually, or in, in that case, what happened was we ended up with too much oil.

[00:25:44] Yep. And, and, and, and we, you know, it took some, some time to work through that. Well, we're not in that Kansas anymore. Um, you know, it's not

like we've exhausted all the supply that's out there in the world. But for the most part, there hasn't been a heck of a lot of what I would call exploration going on in the world in this century.

[00:26:07] Um, back in the 1990s We were, uh, going great guns in the deep water in the Gulf of Mexico and West, uh, West Africa and off the coast of Brazil. And, and we were finding all kinds of new, new oil, albeit at, you know, very expensive and, you know, many, many thousands of feet of water, but we were finding new reserves.

[00:26:32] Um, well, we don't really know where those are anymore. Now, I'm not saying there, there is... there are no new big reserves. We found some pretty big reserves off of, uh, Guiana, uh, in South America. There have been some, you know, some, uh, Brazil has found some fairly large reserves, uh, relative to what we've been looking for recently.

[00:27:00] You know, there's some big fields that have been discovered off of Namibia, but, but compared to what was available or what we were finding in the 1980s, I mean, this is, this is a drop in the ocean. And, and, and just like back then, just because you discover it doesn't mean that you have it. I mean, it takes a long time to bring those fields online.

[00:27:24] So that, that, that's the first problem. Uh, I'm not saying that we're out of oil, 'cause we're not. But we have a whole lot less available to us in big accumulations, as far as I can tell, compared to forty, fifty years ago. So just because oil price gets high doesn't mean that all of a sudden we find a whole lot more oil.

[00:27:48] We might, but I think the odds of that are much lower.

[00:27:51] **Nate Hagens:** I wanna, um, let you finish your answer on this, but I have to interject, uh, here. There are a lot of people, well, I've read some people anyways, believe that AI will help us find more oil, uh, and find more energy, and that energy is gonna soon be abundant, and we don't have to worry about any of this.

[00:28:14] And I think in the markets, that belief is, uh, more prevalent than yours and my biophysical viewpoint. What are your thoughts on that?

[00:28:24] **Art Berman:** Uh, bluntly nonsense. Uh, I mean, I mean, the oil industry is among the most technologically advanced industries anywhere in the world. I mean, the imaging technology that the oil industry, the gas industry uses is equal to the medical industry.

[00:28:48] We're using basically the same technology. Hmm. And it's been that way for twenty years The industry that I used to be part of, I'm, I'm still doing a little bit of consulting in oil and gas, but most of my work today is, is, is, is wider boundary, as you would say. But we've been using what people call AI in the oil and gas business for 20 years.

[00:29:15] Neural networks, machine learning, I mean, call it what you will. Um, this has been standard fare for a long time. And so the, you know, the, the question I, I, I ask, would ask to those people that expect miracles is tell me what we're gonna be doing different with AI than what we are– We're,

[00:29:35] **Nate Hagens:** we're gonna increase the, the ultimate, um, uh, estimated, uh, recovery rate of these fields by a one or 2%, which ends up being a huge amount.

[00:29:48] Something like that is what I've read.

[00:29:50] **Art Berman:** And that's been the bedtime story for the 50 years I've been in this oil business. It's always something. You know, we're gonna find some magic fluid that we put down there that somehow gets us another percent or two, or we're gonna inject CO2. I mean, it's always something, and it never quite works out.

[00:30:09] That doesn't mean that it never will. It's just that it hasn't so far.

[00:30:14] **Nate Hagens:** No, I– I'm well aware. So, so getting back to the question, uh, what does this do to the concept of peak oil? Uh, I guess it's a two-part question, the timing of it and then the ultimate decline rate of it. Uh, can you speculate on that? And I personally think the majority of this, um, is going to be the new geopolitical relationships that ensue from this military blunder.

[00:30:37] **Art Berman:** I totally agree with that. And so the Persian Gulf, it's, it, it, it's not going to go back to the way it was before. The confidence is gone. The... Whether that is for, for, you know, for shipping people, insurance people, production people, I mean, the idea that that was a pretty safe place and a good place to do business is gone.

[00:31:09] So right away you've got a big damper– Yeah ... on what's gonna happen in the future.

[00:31:14] **Nate Hagens:** You're adding risk premia to everything involved in that chain.

[00:31:18] **Art Berman:** And that's the other... You know, now I– let's go back to the reality of whatever peace there may be in the, in between Iran, Israel, and the United States. So, um, just this week, uh, we had, um, Project Freedom, which was going to be, uh, Trump and Hegseth's escort service through the Strait of Hormuz.

[00:31:47] All right? That lasted two days. Nobody wanted to be escorted because it's too dangerous.

[00:31:54] **Nate Hagens:** Yeah.

[00:31:54] **Art Berman:** And so what did Iran do? Iran said, "Okay, you guys have an escort service. We're gonna lob a few missiles at the United Arab Emirates at their loading port of Fujairah," which is on the other side, the, the good side, if you will, of the Strait of Hormuz.

[00:32:14] And all of a sudden, you know, the, the, the, the narrative was stolen. The escort service was no longer the talk of the town. It was, "Oh my God, Fujairah's on fire." So now Trump said, "Okay, we're done with that. We're... That, that, that's over." So, I mean, Iran has planned for something like this for a long time. Yeah.

[00:32:41] And they are very good at using this, you know, drones and, and, uh, you know, these special little missiles that go directly to ships. Uh, by the way, there's a big oil slick off of Karg Island this morning according to the, you know, the satellite imagery. We don't quite know what that's from. Um, but probably they hit something.

[00:33:06] So they- they're, they're, they're in control. And, and, you know, they can very cheaply, um, create havoc o- further havoc on what's already a very chaotic situation.

[00:33:22] **Nate Hagens:** So I guess segueing back to my or- original question, do you... What do you think the one-year, five-year, 10-year, 100-year, uh, looking back to this moment, what did this do to the carbon pulse, uh, and humanity's metabolism?

[00:33:41] Did it allow us to increase our metabolism, or did it probably, uh, stop it i- in, in a heart attack sort of way or something in between?

[00:33:51] **Art Berman:** Yeah, it's a lot closer to the, to the second. Um, you know, you and I have both called this a world-changing event.

[00:33:58] **Nate Hagens:** Yeah. There's, there's no way we're going back to the way things were two months ago.

[00:34:02] Just it's not

[00:34:03] **Art Berman:** ever

[00:34:03] **Nate Hagens:** gonna

[00:34:03] **Art Berman:** happen.

[00:34:04] **Nate Hagens:** No, we're

[00:34:04] **Art Berman:** not. Yeah. No, we're not. And, and for a lot of people, when they hear that, that's a scary thing. Oh my gosh, you know, I mean... Um, and, and, and, and I admit that, um, that uncertainty unsettles me also, although probably not quite as much as other people because I see opportunity in a world-changing event.

[00:34:30] I mean, you and I and many other people, colleagues included, uh, you know, it's, it, it's easy to, to get into a criticism of the path that, that the human species has chosen or has been chosen for us to be on here certainly in our lifetimes. We've done this wrong. We did that wrong. You know, we should be doing this.

[00:34:55] We ought to be doing this. Why don't we have policies? Why don't we do blah, blah, blah, blah, blah? Okay, I'm, I'm not really interested in, you know, in going down that rabbit hole right now. But an event like this requires an adjustment whether we participate in it or not, and that can be a very good thing.

[00:35:17] That can do what no policies can ever do. It can force humanity to use less energy, for instance, and we can have a 90-minute conversation about all the pluses and minuses that are involved in that. But that would be a very big deal, and I think that that is probably the most obvious outcome that's going to happen from this war.

[00:35:46] I agree. And it was gonna happen anyway.

[00:35:48] **Nate Hagens:** Yeah.

[00:35:48] **Art Berman:** It's just that the war accelerated the process.

[00:35:53] **Nate Hagens:** I agree. I think the war, uh, shortened the runway to what I refer to as the great simplification, um, because we're gonna have to reduce our complexity of our systems. Probably this is going to accelerate de-globalization in, in many, many ways, and it, it just feels like emotionally in the conversations I have and reading the news...

[00:36:19] I mean, you and I know that the Titanic hit an iceberg metaphorically, and yet the band is still playing and drinks are still being served up on the upper decks. Uh, and it's, it's fascinating to see that and to feel it in slow motion.

[00:36:36] **Art Berman:** S- I think that's a normal human reaction, that as long as, as, as the music's playing and, and the drinks are flowing, there must not be any problem.

[00:36:47] **Nate Hagens:** Yeah.

[00:36:48] **Art Berman:** I'll know it when I see it, right?

[00:36:50] **Nate Hagens:** Yeah. Well, we're seeing it in slow motion in the US with rising... I mean, we're 50 cents away or so from all-time highs in gasoline prices. Sure. But other countries are facing it now, like big time. Mm-hmm. Right. And every week that goes by, this is worse for the Global South, much worse, and, uh, I mean, I don't see that in our news either.

[00:37:13] But, um, you and I live in the US, so I-let me get back to one of the other things that you've helped me understand. Um, you see all these charts that the US is Setting record oil exports, um, and we're not even an oil export, um, order. We import, like, over six million barrels of crude, uh, the last couple years.

[00:37:40] So can you help me understand what is really going down? Are we, uh, are we a net oil exporter, importer? What, what, what is the story there?

[00:37:50] **Art Berman:** So the United States is a net energy exporter.

[00:37:56] **Nate Hagens:** Okay.

[00:37:57] **Art Berman:** Not a very big one. So net obviously is the difference between what we export and what we import. And so when I say we're a net exporter, that means that we export a little bit more than we import on balance.

[00:38:14] Okay, so what does all that mean? Well, that's, that's crude oil, refined products, natural gas, natural gas liquids, coal, electricity, all the things.

[00:38:25] **Nate Hagens:** Okay.

[00:38:25] **Art Berman:** All right? And, and how do we end up with knowing that we're a net exporter? Well, because we, we convert all those things to a common

unit, whether it's joules or British thermal units or barrels of oil equivalent, and, you know, and anybody can, you know, look those up and do that conversion.

[00:38:46] What that does is it says it's all the same, that the end use of coal is not any different in that calculation than the end use of natural gas or oil or electricity. And of course, that's not anywhere near true. But that's what, you know, that's what you have to do. You have to normalize all the inputs.

[00:39:10] And so when we see the answer, it's a statistical answer. It's a derivative. It's actually a derivative of a derivative. Um, and we say, "Oh, great, you know, we're, we're in good shape here. We're a net energy exporter." It's true, but it is deeply misleading because not all forms of energy are equal. They're not equally valuable.

[00:39:35] They're not equally useful. They're not equally fungible, okay? So that, that's where the whole idea breaks down. And, and so we can do all this chest-beating, "Aren't we great?" Well, okay, let, let... I'll, I'll, you know, what, what's, what's a lawyer say when he just, you know, says, "Okay, I'll give you that. I'm not gonna fight you on that."

[00:39:54] Okay, well, okay, we're great. Now what? You know, what, what, what happens next? So when we deconstruct it, what we find, and, and you just mentioned it, is we are a net oil importer, and I'm not a partisan oil guy. It's just that oil is the most important piece of the energy package because it is got the highest energy density And it is the easiest to move around physically through the system.

[00:40:32] You don't need pipelines. You don't need to cool it, uh, you know, two hundred and eighty some odd degrees below zero. I mean, you just, you know, you, you put it in a refinery, it comes out the other side, you dump it in your car,

uh, you know, you put it in your, in your, in your heater. You do whatever you need with it.

[00:40:49] That's why-- I mean, you've called oil pixie dust. Uh, there, there's a reason, and it's got a lot of negatives to it in the way of emissions, and I'm not minimizing those for a minute. But it is the most magical source of energy that humans have ever discovered. And, and it is the, you know, I don't know what the percentage is, but I'll make up a number.

[00:41:13] You know, it's probably at least fifty or seventy-five percent of the reason that the world is, at least on paper, much more prosperous than it was a hundred years ago. Now, not that all those other things don't contribute, too, but oil is the master resource. And so when, when somebody says, "Well, we're a net exporter of energy," I say, "Well, that's great, but we're a net importer of oil."

[00:41:39] That makes a big difference to me 'cause oil is kind of in a different category.

[00:41:44] **Nate Hagens:** So break that down. Um, we're a net importer of oil. Um- Right. Unpack that.

[00:41:50] **Art Berman:** Yeah. So we export on average about four million barrels of crude oil and condensate per day. And we import on average, when I say on average, that's like, you know, a twenty, twenty-five average number per day.

[00:42:05] And somebody says, "Oh, well, I heard we just exported six million barrels a day of crude oil last week." Yeah, yeah, we did, but, you know, that was an extraordinary week. We import six and a half million barrels of oil a day. Now, we used to import a whole lot more. We, we didn't use to export hardly any, I mean, in my lifetime, in your lifetime.

[00:42:27] **Nate Hagens:** So this is a, this is a dumb question. I, I think I know the answer to it, but some, uh, I mean, I think you should explicitly say it. Someone might be thinking we export four million barrels a day and we import six and a half. Why don't we just net that out and just import two and a half?

[00:42:44] **Art Berman:** That's exactly right.

[00:42:45] **Nate Hagens:** But why don't we do that?

[00:42:47] **Art Berman:** Why don't we do that? Because the oil that we export is different than the oil that we import.

[00:42:52] **Nate Hagens:** Right.

[00:42:53] **Art Berman:** Okay? And again, now we're back to utility. What's it good for? Okay, now, I just got done saying that it wasn't very many years ago, ten to be exact, that we didn't export any crude oil to speak of.

[00:43:09] All right? We had to pass, we didn't have to, we, we had to pass an act of Congress to lift a ban on crude oil export that was put in place after the oil shocks of the 1970s. I think Gerald Ford was the president at the time. And it was a bipartisan unanimous vote. "Yeah, yeah, yeah, we, we can't ever do this.

[00:43:29] This, you know, we can't have this again. We can't have the lines at the gas stations. Terrible." All right. So we had to lift that in 2016 because we had all these shale producers that were producing more oil than we could use in the United States because it wasn't the right kind of oil. Okay? And when I say it's not the right kind of oil, I don't mean it isn't good oil.

[00:43:58] It's just that most of the oil that we produce in the United States is what's called light oil, okay? Which means oil is a product that gets naturally cooked by being buried in the earth, okay? And so when it's been buried deeply

and heated for a long time, you, you cook off a lot of the heavy stuff, and you're left with a very light kind of a, a, a, of a, of an end product.

[00:44:32] You know, sort of like when you, you know, when you, when you, uh, you know, when you, when you put alcohol in a, uh, in some sort of a, of a stew and, and you, you heat it, you know, a lot of the alcohol boils off. Well, you know, or, or, you know, my wife will then she'll reduce some lightly distilled mixture by adding something to it.

[00:44:52] Well, I mean, those, those are reasonable analogies. But the bottom line is that the kind of oil that the United States produces on balance is good for certain things. It's great for producing gasoline, 'cause gasoline is kind of a light product. It's great for producing petrochemical feedstocks, plastics.

[00:45:16] Those are light products. It's good for natural gas liquids. It's great. It's really great for all that. And back in the 1940s and the 1950s, the US was largely oil independent because the main use of refined products was gasoline. I mean, nobody drove a diesel car you know, in the 1950s. There, I mean, trains were starting to run on diesel.

[00:45:42] Some of them still ran on coal. So as long as you have a gasoline economy, US oil is great. But around the 1970s, the people who run the refinery said, "Well, you know what? Right now, the big, the big cash product is diesel and jet fuel I mean, when I was a kid, I remember getting on an airplane and asking the, the flight attendant, uh, "Is this a jet yet?"

[00:46:09] Because I knew they were coming. "No, we're not there yet. You know, we're-- It's still a propeller plane." "Ah, darn, I wanted to ride in a jet." So of course, now you can't hardly get on a passenger plane that isn't a jet. So our needs have changed. We're using more diesel and more jet, so refineries changed accordingly.

[00:46:27] **Nate Hagens:** So we have to, I think you've said this in other, uh, appearances on TGS, we have to import heavy oil to pair with our light oil so that our- Right ... refineries can produce the entire spectrum of product that they were designed for, and that the society is currently wanting and paying for.

[00:46:48] **Art Berman:** That's exactly right, and, and, and it's not as simple as we just mix them together.

[00:46:54] You know? It, it's not a blend. We-- They actually have to go through different parts of the refinery.

[00:47:01] **Nate Hagens:** Well, see, this is the other aspect which, as you know, is one of my Four Horsemen of the 2020s. Um, we talk about- Complexity ... energy shortages. Sorry? I was

[00:47:10] **Art Berman:** gonna say complexity is one of them, right?

[00:47:12] **Nate Hagens:** Yes. We are a net energy exporter, but we're a huge importer of complexity because these barrels are barrels, but the whole system is a Rube Goldberg machine that can have, uh, very, uh, unexpected shortfall risk when something goes missing.

[00:47:33] So we are importing a bunch of oil, and we're exporting a bunch of oil, but that's all to fit, uh, the demand of the products that are in our refineries. Couldn't we build new refineries that, um, are targeted just for what we have domestically and maybe with Canada? Or that takes a lot of, um, capital and, and lead time and confidence in policies and administration, so I'm guessing the answer is likely not.

[00:48:03] **Art Berman:** Well, let me just say, first of all, that the technical name for the kind of refinery that we have here in the United States and around the world, it is called a complex refinery. That is its official name.

[00:48:16] **Nate Hagens:** I didn't know that. Wow. It

[00:48:18] **Art Berman:** is.

[00:48:19] **Nate Hagens:** Okay.

[00:48:19] **Art Berman:** Yeah. Okay, and so before I answer your question, we, we take the, the light oil And put it into, we heat it up and put it into what's called a, a refining tower, where the various different fractions come off at different temperatures.

[00:48:39] You know, the gases and the gasoline and the naphtha and et cetera, et cetera. The stuff, the heavy stuff, we have to-- Some of it, the stuff from Canada, since you mentioned, uh, it's, it's so heavy that it has a lot of solid junk in it called bitumen. We can't put that in the same part of the refinery. We have to put that in a separate part of the refinery that goes through a catalytic converting process, a, a hydro, uh, uh, you know, a, a hydro coking.

[00:49:12] I mean, the-- There's a whole separate part of, of the refinery that effectively upgrades that tarry crap into the kind of product that we can then start to extract diesel and jet fuel from. So we don't, we don't mix them together. That-that's not the way it works. And so we've, we've got a very complicated, complex situation going on to yield us the products that we need.

[00:49:40] Now, your, your question, maybe you have another one before I answer that, but- Well, I have like

[00:49:44] **Nate Hagens:** seven more, but please go.

[00:49:45] **Art Berman:** Okay. Please

[00:49:46] **Nate Hagens:** keep going.

[00:49:47] **Art Berman:** I'm sorry. So, so your question is, can't we just upgrade or modify the design of these refineries to make it just right and okay?

[00:49:57] **Nate Hagens:** Yeah.

[00:49:58] **Art Berman:** And the answer is no. You cannot get from something that which it doesn't have to start with.

[00:50:07] You can't make diesel from light oil because it doesn't have the necessary-

[00:50:12] **Nate Hagens:** Right ...

[00:50:12] **Art Berman:** components to make the diesel.

[00:50:14] **Nate Hagens:** So if we want diesel as a society, we have to import oil, full stop.

[00:50:21] **Art Berman:** Yeah, absolutely, from somewhere. And, and three-quarters of the oil that the United States imports is from Canada, which ought to be a good thing, right?

[00:50:30] I mean, they're our neighbor- Right ... they speak the same language, uh, et cetera, et cetera. Except we have a situation in which our president decided to piss off everybody in Canada and their prime minister because, well, because. I don't wanna get political.

[00:50:46] **Nate Hagens:** Uh, this is a dumb question, but please, uh, enlighten, uh, me and, and the viewers.

[00:50:52] Um, how important is diesel right now to the United States economy? Um, I know in the local gas station here, there are diesel pumps that farm equipment and such, uh, um, uses, but, but how important is diesel to the US and the global economy, and what is a global diesel balance right now?

[00:51:16] **Art Berman:** Diesel, in a way, is the global economy.

[00:51:21] Diesel runs all the ships, all the trains All the trucks, all the agricultural equipment, all the mining equipment. There, there are more things that diesel does, but that's enough.

[00:51:36] **Nate Hagens:** Yeah. Right.

[00:51:36] **Art Berman:** And, and, and those, those uses don't have scalable substitutes, at least, you know, s- not, not in, not in the near term.

[00:51:48] So you're stuck. If, if you don't have diesel, you can't move anything. You can't mine anything. You can't, you can't do v- very much of anything. So your economy comes to a screeching halt if you don't have diesel.

[00:52:00] **Nate Hagens:** So where is the global diesel balance? Uh, s- today's May 6th, roughly early May, and what would a meaningful deficit look like on the ground?

[00:52:10] **Art Berman:** Ask people in, uh, in Singapore.

[00:52:13] **Nate Hagens:** Why?

[00:52:14] **Art Berman:** Well, because they're already feeling the shortage. They don't produce any petroleum of their own, so they're 100% reliant on imported oil, and as with the rest of Asia, East Asia, almost all of it comes from the Middle East, and they're just not getting any. So I mentioned, you know, $150 a barrel for crude oil.

[00:52:37] Uh, I don't know what the current spot price is for diesel in Singapore, but the last time I checked it was $210.

[00:52:45] **Nate Hagens:** $210- It's probably more ... oil equivalent.

[00:52:48] **Art Berman:** Yeah. If you wanted to buy 42 gallons of diesel in Singapore, it costs you over $200.

[00:52:53] **Nate Hagens:** Right.

[00:52:54] **Art Berman:** Right. Okay? So that tells you everything you need to know. Um- Yeah

[00:52:58] and, and if diesel is costing over $200 and you need it to run your, you know, all of your transport and your mining, if you have it, and agriculture, which you do, then you, you're in deep trouble 'cause you can't make a, you can't make a margin on that. I mean, I think you've, you've talked about oil as being the hemoglobin of the economy.

[00:53:18] For me, diesel is the barometer of the economy. That, that ordinarily... So w- so when, when gasoline prices get high, you and I might say, "You know what? I'm not gonna, I'm not gonna drive today," or, "I'm gonna only fill my tank halfway." Okay, so my, my, my-- our gasoline demand is elastic. Diesel demand is quite inelastic because you can't do anything without it.

[00:53:47] And so what happens is, is that you pass on the price of more expensive diesel and it shows up in all the products until people stop ordering the products. And, and so when diesel finally decreases in abundance, then you know your economy's in trouble.

[00:54:08] **Nate Hagens:** You know, as we've been talking, I, I'm trying to reflect, um, in a wider boundary perspective.

[00:54:18] You and I have known each other for a long time, and we're Buddies. We're, uh, we're friends and we're colleagues 'cause we research and talk and look and correct each other and, and help each other with charts and stuff. It's been really jovial, uh, over the last 15 years or so because we're, uh, we're, we're solving a puzzle of the human ecosystem.

[00:54:47] It doesn't feel jovial to me now. Um, I, I mean, because the conversation we're having right now makes so much sense to me because it rhymes with all the conversations we've had in the past, yet it is not the conversation that the movers and shakers and decision-makers and planners, uh, and risk experts and others in our society are having.

[00:55:11] And yeah, the, the timeline between, uh, hitting the iceberg, which was this, um, you know, un- unintended consequence of the Israel-Iran war and the US is involved, it's going to show up in our world, um, very soon. And so the-- I mean, this is so serious and, um, I wanna be my gregarious Midwest, uh, golden retriever Sasquatch self, but this no longer feels like a, a dress rehearsal sort of situation.

[00:55:50] And of course, the future is a probability distribution, and as you said, we're going to have responses and this is an opportunity. But there's been a phase shift in our own analysis and our own observation of this situation.

[00:56:04] **Art Berman:** Totally right. And, and, and I just wanna, uh, I just wanna make a point to viewers and listeners, and that is, I mean, this isn't just what Art Berman thinks.

[00:56:16] What all the people that are, other than me, are saying, the only difference is how bad will it be and when does it get that bad?

[00:56:28] **Nate Hagens:** Yeah.

[00:56:29] **Art Berman:** Nobody who knows anything about energy, and oil in particular, is jovial right now. So this, you know... I'm not, I'm not giving you a, a, an extreme perspective.

[00:56:41] **Nate Hagens:** No, I realize that.

[00:56:43] **Art Berman:** Well, I know you do. But I'm not sure that everybody who's listening and watching, you know, maybe they say, "Well, you know, that's Berman. I mean, he, you know, he's, he's way out there." Uh, and, and, and maybe I am sometimes, but, uh, in this particular case, I, I think I'm, I think I'm representing, uh, uh, you know, like in the middle of a cross-section of different perspectives by people other than, than me who also study this full time.

[00:57:11] It's very serious. It's grave.

[00:57:14] **Nate Hagens:** Yeah. So, uh, Rory mentioned, and I think you've said this, uh, as well, uh, and, and others because it's, uh, demonstrable, we've lost around one billion barrels of production from the homeostasis that existed before this crisis, and lost supply does not come back. Mm-hmm. Um, but I, I looked at a, a recent one of your, your PowerPoints you shared with me, and your base case has traffic in Hormuz normalizing, but not until December of this year.

[00:57:48] Mm-hmm. And you expect Brent falling back into the low 100s a barrel by 2027. How, how do you reconcile those two, uh, views?

[00:58:00] **Art Berman:** Well, it, it, it falls back into the low 100s, and then it climbs back. Okay. It doesn't get as high as, as it probably will, um, in, in coming months. But back to a comment you made before, um, these are, these are probability distributions.

[00:58:16] **Nate Hagens:** Yep.

[00:58:17] **Art Berman:** There's no historical precedent for me to credibly give an outlook or a projection. No.

[00:58:26] **Nate Hagens:** Well, you can, but with a huge error band, of course.

[00:58:30] **Art Berman:** W- well, we just don't know. I mean, we've never been here before.

[00:58:34] **Nate Hagens:** Yeah.

[00:58:34] **Art Berman:** And, and so anything that I say or put in a graph, I know when I put it in a graph it, you know, it looks concrete, but, you know, it's still got hair all over it because, uh, because we, we, we just don't know.

[00:58:45] But, uh, you know, I, I think the base case i- is, you know, it, it... I, I think it's a little optimistic, but, but it, it's still pretty, it, it, it's pretty frightening. Uh, you know, we could talk about the adverse case if you like, but it doesn't matter. I mean, the, the, the bottom line is that what, what the case reflects is that we are going to be with constrained oil supply until we stop using oil-

[00:59:19] **Nate Hagens:** Yeah

[00:59:20] **Art Berman:** basically.

[00:59:21] **Nate Hagens:** That, that's a major statement.

[00:59:23] **Art Berman:** We're not going back. You know, we're not going back to 2025. We're not going back to oil being 70. I mean, you know, there might be a day when it's $70, but on a monthly average, we're not going back there.

[00:59:35] **Nate Hagens:** Personally, uh, and again, this is part of my distribution, I think we're not done militarily there, and we're gonna hold off until after Trump meets with Xi, uh, which I believe will be, um, May 14th, which when this airs, that will be tomorrow.

[00:59:51] Um, but I, we haven't returned any ships. We're still building up military capacity, and I think it's ill-advised. But the, the military aspect of this is not over, and any future military disruption from this point makes the scenario that you're discussing worse, um- Yeah, I mean, probably worse anyways. And then we haven't talked about China and Russia and, and how they're, uh, integrated in all this.

[01:00:20] Do you have any thoughts there?

[01:00:21] **Art Berman:** I saw a chart this morning that Kepler, uh, posted. Kepler is a, a, a very high credibility organization that tracks tankers and oil flows and prices all around the world. Um, I think everybody has a lot of respect for Kepler. And, well, I'm sure somebody doesn't, but in my community, everybody does.

[01:00:49] Uh, we don't always agree with them, but they're... W- we take them seriously. Um, Kepler published a graph this morning showing the most likely couple of family of curves for Hormuz traffic, and their best case is it'll be at 40% of normal by the end of the year and into next year.

[01:01:11] **Nate Hagens:** Well, even if it's 100% of normal, we're gonna have product shortages in the US this summer.

[01:01:17] So at 40% of normal, The Great Simplification, uh, will have started for a lot more of the world.

[01:01:25] **Art Berman:** Well, and, and the point is, is that, I mean, their, their graph stops at the end of 2027, but it's a flat line. Yeah. And so as long as, as long as this situation, whatever the military escalation becomes, uh, Iran has no intention of opening Hormuz because that's its leverage point– Yeah

[01:01:49] for the whole world. And so what, what Kepler is implying is, you know, buckle up, people, because we could be at 40% or 50... I don't know what the right number is. It could be 60. It doesn't matter what it is. We are going to be at seriously more constrained volumes of flow through Hormuz for as far as, as, as Kepler can forecast.

[01:02:14] **Nate Hagens:** Okay. So let's just say that, that that's possible. Let me run, uh, into a different area. Uh, Vaclav Smil, um, has argued, um, credibly in my opinion, that cement and steel and plastics and ammonia are the four pillars of modern civilization. Those are all created and distributed with oil, so this isn't just gasoline and diesel, but it's so many things.

[01:02:44] But, uh, steel and cement are already declining, and fertilizer is, is flat, and plastics are below their peak. Mm-hmm. Hormuz aside, and then you could add that in, Art, do you think we're already past the peak of the global material economy and the financial layer just hasn't caught up to the, the physics of the molecules yet?

[01:03:11] **Art Berman:** That's certainly what the data suggests. So I mean, I, I made that chart months before anything was, was happening in, in, uh, in the Persian

Gulf. And what that chart shows is that, um, we are, um, in varying stages of, of, of, of peak, uh, plastic fertilizer, cement, and steel. Now, not all of them. Plastic is still growing a bit, um, whereas steel and cement and fertilizer are declining.

[01:03:50] But I, I very much agree with, uh, th- there's, there's very little that I don't take seriously that Schmeel says, because he's kind of the, the grand master. You know, he's the Gandalf of, of, of, of energy. And if he says he thinks this is true, um, it's probably supported by data. And, and so if you think about it, um, cement and steel, to stop there for now, there can be no growth without cement and steel.

[01:04:28] I mean, go... You know, I- look at any construction site in your town or nearby town, and what you're gonna see is a lot of cement and a lot of steel, including the equipment that the cranes that, that put that up. So, so that's a problem. If, if you look at, at your car, whether it's an EV or not, the great percent, the great m- volume, majority of the volume of that vehicle is steel and plastic.

[01:05:04] If you go to a hospital or a doctor's office, the medical industry is one of the leading consumers of plastic. You don't have plastic, you got no healthcare. You know, forget about baggies and, you know, all the other things that, that we care about.

[01:05:20] **Nate Hagens:** Well, you have healthcare. It just looks radically different than the current system.

[01:05:24] **Art Berman:** Well, well, that, that's a good point. Fertilizer, y- you can't possibly support eight and a half billion people without fertilizer. So I mean, Smeal has very good reasons for calling these the four pillars of civilization, and if only one of the four pillars is flat or declining, then civilization is on shaky ground.

[01:05:50] And what I just described is that three of them are

[01:05:53] **Nate Hagens:** declining. Have been declining for five or seven years or so.

[01:05:56] **Art Berman:** Yeah.

[01:05:58] **Nate Hagens:** Yeah.

[01:05:58] **Art Berman:** So that's a serious thing

[01:06:00] **Nate Hagens:** Bring in renewable energy, which I refer to and you do as well as rebuildable because the sun and the wind are renewable, but the solar panels and the polysilicon and the steel and concrete needed for wind turbine bases are at best rebuildable.

[01:06:22] What does Hormuz and the situation unfolding in the Middle East portend for renewable energy?

[01:06:31] **Art Berman:** The knee-jerk first reaction is, oh my gosh, you know, we better, you know, we better get as much renewable energy as we can because clearly petroleum and natural gas are unreliable. So from an energy security standpoint, forget about the environment.

[01:06:53] There's an awful lot of people right now that are thinking we better, you know, we better really go full bore on renewable energy because it's the only thing we can count on. All right. Well, there are a lot of problems with that. But before we go there, as you just said, you can't make a solar panel or a wind turbine or an electric car without fossil fuel inputs, not least of which are steel and plastic.

[01:07:28] But more important, you're just trading one dependency for another because there's an awful lot of critical minerals that go into all of those products of which, you know, things like copper and lithium and cobalt are just some that I

know how to pronounce and don't have 16 syllables in them. But they're all controlled by China.

[01:07:52] So you don't want to be dependent on the Persian Gulf. Okay, I get that. So now you're dependent on China. And I'm not, that's not a partisan statement that China's bad. I'm just saying it's, you're dependent on someone else is what it is.

[01:08:09] **Nate Hagens:** You watched my, frankly, that's going to come out in two days from this recording where I mentioned locally here, the Boundary Waters canoe area has just been opened up for mining.

[01:08:20] So in order to Be more sustainable and solve climate change, we have to destroy our current wilderness in order to mine for nickel, copper, and, and, uh, uh, cobalt to help the energy transition. So it's a mess.

[01:08:39] **Art Berman:** Hey, you know, just, just on a personal note, um, I spent my first summer in what was then called the, the Quetico Wilderness Area.

[01:08:48] **Nate Hagens:** No, there is... It, it's the same thing, it's just that Quetico- Yeah ... is across the border in Canada. Yeah.

[01:08:53] **Art Berman:** Right.

[01:08:53] **Nate Hagens:** It... They, they adjoin

[01:08:54] **Art Berman:** each other. That was, that was 19- 1965.

[01:08:57] **Nate Hagens:** Holy cow.

[01:08:58] **Art Berman:** One of my good friends had his driver's license, and I didn't, and somehow or other we persuaded our parents to let us drive to Ely, Minnesota– Yeah

[01:09:08] in his jalopy. Uh, you know, rented a bunch of canoes and freeze-dried food and spent three weeks out there fighting bears and all kinds, you know, portaging. Yeah, I can't belie– it's... Yeah, now, now they're gonna mine copper. Or, or mosquitoes

[01:09:22] **Nate Hagens:** as big as bears. Um–

[01:09:24] **Art Berman:** Or flies, black flies.

[01:09:26] **Nate Hagens:** Yeah, black flies. Uh, that's, that's my, one of my heavens.

[01:09:31] Um– Yeah ... and so it's– Beautiful place ... it's unfortunate that the Superorganism hungers. Uh, but this is a problem here, because I think the majority of the leaders in the environmental movement are just looking on the upslope and focusing on climate and emissions, and they're not looking at the downslope and how we're gonna have to protect local and regional, um, environmental areas when all this stuff becomes less available from places overseas.

[01:10:03] **Art Berman:** Energy security or security is gonna trump everything else. That's the way– Yeah ... the Superorganism, it's the way humans are, right?

[01:10:12] **Nate Hagens:** Well, it's, it's... People are already in Europe, uh, burning trees, uh, because of– Right ... what's happening in Hormuz, um, for, uh, heat and power and such. So one other thing I wanted to ask you, not particularly, uh, connected to, uh, the Hormuz situation, but, um, we're seeing AI demand for hyperscalers and data centers and energy surge, and one of the things you've

called to my attention is US electricity has grown, uh, continually, but the amount that is dispatchable– Mm-hmm

[01:10:53] has actually fallen, uh, over the last– Right ... 20 years. And, um, you, you talk about something called the interconnection queue as something be– being important. Can you explain why this is, is all important and why you're, um, talking about it?

[01:11:09] **Art Berman:** Sure. So dispatchable energy just means it's available on demand You know, it's like a, a dispatcher in a, in a, you know, in a, in a, in a, in a cab company.

[01:11:22] You know, you want a cab, you call the dispatcher. The dispatcher dispatches the cab because the cabs are cruising around. They're available. The, the problem with renewable energy is that it's not dispatchable, or it's not dispatchable all the time. It's dispatchable when, when the sun is shining and the wind is blowing, and it's not dispatchable when it isn't.

[01:11:46] And so short of having all kinds of forms of backup battery and whatever, there's a shortfall. And so all of, all of the growth in US electric power over the last probably 10 years, it's all been wind and solar, which is not dispatchable. The dispatchable power is declining, and most of that is because of coal.

[01:12:12] Now, a lot of people don't know this, but the US coal production industry is dying. I mean, US coal production has decreased to levels that are just astonishing. And, and, and people who think that, well, you know, it's gonna come back need to look at a graph of, of, of US coal production. Uh, I'm not saying it couldn't come back, but there's absolutely no evidence to suggest that it is.

[01:12:41] **Nate Hagens:** A lot of the viewers of this program would think that's a good thing.

[01:12:45] **Art Berman:** Um, and, and, and it's, it's certainly a good thing for emissions and, and health in general. But it's not a good thing if you're a data center guy and you want a whole lot of electricity or need a whole lot of electricity to power your data center.

[01:13:02] So where are you gonna get it from? And so the, the, the point that, that I made to you, I think earlier this morning in an email, was that when the so-called hyperscalers, the, the folks that are building all these data centers, when they, you know, when they kind of let it out that, "Oh my God, you know, we're gonna be expanding electric power demand in the United States astronomically, or at least, you know, we're gonna get into growth," they didn't even give the renewable guys a call because it, it, you know, it's like, it's like light oil if you need diesel.

[01:13:42] It's perfectly fine electricity. It's just it's not fit for purpose because it's not dispatchable. And so when, when the, when the data center guys were looking for, are looking for power, they immediately jump to natural gas and, and, and to nuclear because that's dispatchable.

[01:14:04] **Nate Hagens:** And natural gas plus batteries I've, I've read.

[01:14:07] **Art Berman:** Well, there are guy- there are some people that are using, you know, like jet turbine engines You know, you ca- you can't get a, uh, a, a natural gas turbine for five years. They're back-ordered, and they're all from China, by the way. But maybe you can find a few old Boeing engines you can s- you know, you can stand up next to your, your, your data center.

[01:14:28] So this is, uh, you know... So, so here we have all these people that are, you know, that are, uh, feeling very good about the, the increase in renewable

energy, but the first real need for electricity, they didn't even get a call. And I don't say that to criticize renewable energy, it's just if you can't use it for the biggest increase in US energy demand in forty or fifty years, that's telling you something right there.

[01:15:02] Now, you asked about these interconnection queues and, and, you know, that's a, that's a ten-dollar word, but, but basically what it means is that if I wanna build a, an electric power plant of any kind whatsoever, doesn't matter, coal, natural gas, renewable, before I can go on with it, I have to provide the local grid operator with a report which explains how my new generating source is gonna affect his grid.

[01:15:41] And so it's, it's, it's sort of like a, you know, an environmental impact study, if you will. So I'm gonna submit it, and then it's gonna come back and, and they're gonna say, "Well, you know, these are all the things you need to fix because these are not acceptable to me." And so what, what it, what it gets down to is, is that all of the capital that we hear about, you know, available for various kinds of electric power is somewhat irrelevant unless it gets through the hurdle of the interconnection queue, unless somebody says on the other side, "Okay, as soon as you build this, we will accept your energy."

[01:16:26] **Nate Hagens:** This gets back to the importance of the difference between power and energy.

[01:16:32] **Art Berman:** It's a rate.

[01:16:33] **Nate Hagens:** Yeah.

[01:16:34] **Art Berman:** Just like the rate of decrease in oil supply in Hormuz. And, and so power is energy per unit of time.

[01:16:49] **Nate Hagens:** Yeah.

[01:16:50] **Art Berman:** And energy itself is a very nice thing to have, but If you don't have enough of it to keep your, you know, your, your YouTube TV going or your flashlight operating at a high enough intensity to see what the hell you're doing or, uh, you know, you run your...

[01:17:10] Well, I mean, it, it's power that you need. It's not energy that you need. At least in our society, in our civilization–

[01:17:17] **Nate Hagens:** Yeah ...

[01:17:18] **Art Berman:** we value power.

[01:17:20] **Nate Hagens:** And, and one of the open questions is, um, animals value power, um– Mm ... and could our knowledge of the maximum power principle writ large, um, alter our future culture so that we can live more with intermittent, we do work when the sun, uh, shines and the wind blows, but not, uh, all the time, twenty–four/seven.

[01:17:46] We're actually headed in the opposite direction with data centers and, and ten to 15% of our electricity going in that direction, uh, in the next five years or so. But it's possible.

[01:17:59] **Art Berman:** It's possible with fewer people or with, with lower intensity activities. There are always trade–offs.

[01:18:07] **Nate Hagens:** Yeah.

[01:18:07] **Art Berman:** And so people... The, the, the...

[01:18:09] I think the problem that, that I see with well-intentioned, uh, you know, good people who want a better world is that they, they, they want a better world without having to give anything up, and that's just not the way the physical world works. You know, it's not a, it's not a value judgment. It's not a moral statement.

[01:18:34] That's just the way that the physical world works.

[01:18:37] **Nate Hagens:** No, I mean, I, I agree with you, uh, but there are a lot of people that also want a better world, and they have very little to give up left. Um- Yes ... and so that's a demographic as well.

[01:18:48] **Art Berman:** Sure it is. But the, but I, I guess, I guess the point I'm trying to make is that somewhere along the line in all these things we're talking about, what seems inevitable or unavoidable is that growth has to take a hit, not because we voted and agreed that it should, although that would be nice, but because we d- w-we're just not gonna have a choice.

[01:19:16] **Nate Hagens:** I fully agree with that, and the thing we haven't talked about, um, is that we paper over some of our biophysical claims with more money and more debt- Mm ... which ends up making the problem worse in the future. So I think when we have a problem, when, when you j- you just said growth takes a hit, I don't think growth is going to take a hit until growth is over.

[01:19:41] Um, because that big step down, uh, is a doozy. Once growth cannot support the maintenance of financial, uh, uh, debts extant, then we might have a cascade down like a 1930s sort of thing, and we might grow again from that level.

[01:19:59] **Art Berman:** Mm-hmm.

[01:19:59] **Nate Hagens:** But I think that's the logic of my entire platform here is at, at some point the global throughput of approximately 20 terawatt continual

power and the resulting material, uh, um, copper, lithium, cement, all the things, we're close to the peak of that now.

[01:20:21] Um, and what does society do, uh, in coming decades in, in response to that is, is... remains the central question.

[01:20:32] **Art Berman:** And, and I think we also agree that it's, it's not what society does or chooses to do, but what is done to society that's probably going to be the, the story to follow.

[01:20:46] **Nate Hagens:** Tell me more about that. I mean, I, I think we aren't going to choose and vote to change this.

[01:20:52] We're gonna have to respond to what happens. But what did you mean by what happens to society?

[01:20:57] **Art Berman:** Right. So what I, what I mean by that is, is that... I mean, let's just, you know, zoom right in to where we started with the Strait of Hormuz. Okay. That if any of the scenarios I'm talking about are even close to right, and given the big error bars, it seems unavoidable to me that we're going to get back to anywhere close to the amount of oil that we had available to us three months ago.

[01:21:29] **Nate Hagens:** Yeah.

[01:21:30] **Art Berman:** And we can argue about what percentage we're gonna be, we're gonna be down. That's gonna have immediate implications for the metabolic throughput of our entire civilization. And so, you know, you talk a lot about, uh, you know, degrowth is what we should do and post-growth is what we're gonna do. It's the same logic.

[01:21:55] Yeah. There, there are a lot of things we should have done but didn't for one reason or another, and now it's gonna be imposed on us. And one way that it gets imposed on us is by just not having the materials available. But I think there's another way, and that is the Earth is a system, and at some point we get the revenge of the ecology.

[01:22:21] That we, we don't want to think about the fact that all of our wealth comes from nature. And as we are continuing to degrade nature, that there comes a time Is a lag there for sure, where nature simply cannot provide not only what we need, but can no longer regulate the stability of the system. And those are, those are, those are terrifying thoughts

[01:22:54] **Nate Hagens:** But from a macro metabolic level, this might be a reprieve on nature in that regard, the hormones situation.

[01:23:05] **Art Berman:** Let's hope. Let's hope.

[01:23:07] **Nate Hagens:** Yeah. So, um, in the interest of time, uh, 'cause I know you have other, uh, um, engagements today, I will move to some closing questions. I am surprised to find out it's been over a year since you were last on the show. You were on a reality roundtable with Michael Every and Isabella Kaminska in March of twenty twenty-five.

[01:23:31] Um, so let's not wait another fourteen months to have you back on. Okay. But let me ask you this. What have, what have you changed your mind about since that last appearance on the program?

[01:23:41] **Art Berman:** So forever, or almost forever, I had this idea that I think a lot of us do, that, uh, the agricultural revolution came along and it created a surplus, and then we had the surplus and, you know, that created growth and all

sorts of things emerged from that, and then we got to cities and, you know, et cetera, et cetera.

[01:24:05] And, and, and, and I think all of that on some level is true. But since we're talking about a war today, um, wish we weren't, what's changed for me geopolitically is that I think an awful lot of that story of surplus is a story about war. And I'm surprised to hear myself say that, but, but I really do. And, and, and I mean, nothing I say is, is, is original.

[01:24:44] Um, if I'm good at anything, it's, uh, synthesizing what other people say. But, but Peter Turchin, uh, really, uh, blew me away when he, he gave a lecture, I don't know, maybe it was six months or a year ago, and, and he made that, he made that statement. He-- In fact, he said, he said something to the effect of, "Farming provided the calories, weapons set the pace, bureaucracy turned energy and war into lasting power, and religion made it easier for people to accept."

[01:25:20] And that's almost a direct quote.

[01:25:23] **Nate Hagens:** I have to have him back on the show too. I, I hadn't heard that quote. That's pretty potent

[01:25:28] **Art Berman:** And again, you know, I'm not, I'm not saying that... I'm not asking people to agree with me, um, or, or even saying that I 100% agree with that. It's just, it, it, it, it rips me out of my, you know, my contextual anchors.

[01:25:44] **Nate Hagens:** I, I actually do agree with that quote, but I don't know that that- Okay ... is who we have to be in the future. But please continue.

[01:25:51] **Art Berman:** So where I've gotten to on that is, is that the surplus story back, you know, thousands and thousands of years ago, while true, sort of like the

US being energy independent or a net energy exporter, it doesn't completely hold up when you look at it.

[01:26:11] And, and we've talked about before that, I mean, you know, the reality is, is that the lives of most farmers back 5,000, 6,000, 7,000 years ago wasn't too great. It was, it was a pretty darn hard life. Uh, you had good years, you had bad years. But it, it, it, it w- it was far from stable. And, and, uh, Luke Kemp was on your, your platform twice, and he said a lot of things that, some of which I agreed with and some of which I didn't, but I think the, the thing that he, he pointed out that I most valued and appreciated was his concept of, of lootable surplus- Yeah, me too

[01:26:58] lootable supply.

[01:26:59] **Nate Hagens:** Yeah.

[01:27:00] **Art Berman:** That was, that was, that was a good one. And, and I, I would take it a step further and say that it wasn't so much that, you know, that what I have was lootable by my city state or my elite, but that, but that war made entire polities lootable. That the principal method of economic growth for the last 5,000 or 6,000 years has been looting, has been appropriating what other states have through warfare.

[01:27:44] And so we talk about, you and I and, you know, some of our colleagues, we talk about, you know, group, group selection and all these kind of, you know, nice-sounding discussions about cooperation. But, you know, cooperation with whom?

[01:28:04] **Nate Hagens:** Yeah.

[01:28:05] **Art Berman:** I mean, I've heard you ask a number of experts on this show, uh, well, you know, what would happen if there were an alien invasion?

[01:28:13] you know, wouldn't that somehow unite humanity? I think all of them have told you, "No, Nate, that's not gonna happen." Not that the aliens are not gonna happen. Yeah. But no, that's not the way it works. But I, I, I, I'm kinda with you on that. But, but here's... Yeah, so, so what happens is, is that people cooperate within their polity, within their state, 'cause they wanna survive and they wanna get ahead.

[01:28:40] But I, I think, I think the point that Turchin has really gotten me to think about is that, is that cities came together because people needed protection. Yeah. I mean, you've talked in a few of your Franklys about soft feudalism recently. Well, I mean, a city is nothing more than a castle with a bunch of serfs around it that got big.

[01:29:08] **Nate Hagens:** Yeah.

[01:29:08] **Art Berman:** And, and so when, when humans mastered the horse and got good enough with metallurgy to make bronze weapons, you know, you put a, y- you put a guy on a horse with a bronze and later an iron weapon, and man, that's gonna disrupt the hell out of your civilization, and you're gonna need protection, and you're gonna move into a, you know, a, a castle when, when they come, and eventually into a city.

[01:29:37] And, and if you're, if you're... I mean, so war, to take Luke's idea, I mean, war elevated looting to scale.

[01:29:49] **Nate Hagens:** And it begs the question, are we, can we be more than killer apes, um, uh, y- going forward? And again, this gets back to that Dark Triad episode and the Frankly I did after that. Humans are better than we think- Hmm

[01:30:05] but humanity is not. Um, humanity is what we see unfolding in Hormuz and Israel and the US and Iran and Russia and China and, and all the things, and it does rhyme with what you've just said. And in a wide boundary sense, we look at human wars, World War I, World War II, uh, the, the various wars. But in a wide boundary sense, all of it is a war against nature, uh, especially the last couple centuries, is humanity as a whole versus, uh, the stability of the Holocene and the functioning ecosystems of planet Earth.

[01:30:42] Um, so yeah, those are, those are deep, um, observations, Art.

[01:30:47] **Art Berman:** So moving to the end of the book, or near the end, and reading the chapter on fossil fuels and the Industrial Revolution, uh, the, the, the story that, that I like Is, oh, well, you know, we, we, we greatly increased our, our productivity because we had much higher energy density fuels, and so we could do a lot more and, and that expanded the economy and, you know, at least some of us got more prosperous, et cetera, et cetera.

[01:31:16] But following on what you just noted, what fossil fuels really powered was war. I mean, the wars of the 20th century were industrial scale enterprises.

[01:31:34] **Nate Hagens:** And as, as one example, they're, they're cutting flights in Europe because the jet fuel has to be used for the US military in the Middle East, and they're not shipping it to European nations, as one tiny example.

[01:31:46] **Art Berman:** And that brings us, I think, almost full circle to our brief discussion about AI, because I believe, and I think you probably agree, that for all the, uh, you know, the warm and fuzzy things that we might say about AI, um, it's gonna find us more oil or cure disease or, you know, God knows what else, AI is fundamentally a military tool.

[01:32:19] Surveillance and weapons. I, I don't like to hear myself say that, but I mean, that, that, that is kinda what it is. I mean, you... I, I think I, I, I created a map in one of my posts not too long ago that just shows where all the data centers of the world are, and, uh, it won't surprise you to know that the biggest cluster in the world is right around Washington, DC.

[01:32:45] Yeah. And that's not because people in Washington, DC are worrying about, you know, medical breakthroughs. Right? I mean, that's just, that's just not the way it's gonna work. So, um, uh, you know, I, I don't want... Uh, and, and I, I guess the final thing that I wanna say on that is that if there is a, a disturbing message to take from the Iran war, it is that warfare has changed.

[01:33:18] Drone warfare has, has completely disrupted the way that we think about things and, and the, the war that we're talking about right now, in a way, can be seen, I think, as, you know, maybe the last gasp of, of the old order, you know, fighting with aircraft carriers and jet fighters and all of these things. And on the other side, you got a bunch of guys, you know, with, with little joysticks and, you know, flying drones and ASBMs and all this kinda crazy stuff.

[01:33:55] So we're, we're, we're in a different world now

[01:33:58] **Nate Hagens:** We're, uh, approaching, uh, time limits here, but I have so many more questions. Uh, I mean, just on that, you've seen further and further attacks into Russia, and Putin is under incredible pressure to retaliate, and Russia also has a lot of energy, and that is part of the mix here.

[01:34:20] Um, and the Ukraine–Russia thing is four years on, um, still unfolding, and it's because what you said, drones have changed, uh, the, the game board. Allow me, uh, as your friend and colleague to answer my last question for you. What have you changed your mind about since your last appearance on TGS? Yeah, you, you just gave a big, uh, epic answer, but you've become a lot more

philosophical, and you send me quotes, uh, every couple days from Alfred North Whitehead, and you read McGilchrist, and you're, you're becoming a little bit of a philosopher in addition to a geologist and, and petroleum expert.

[01:35:05] And, uh, it's the softer side of, of Arthur Berman, um, and, and I appreciate it.

[01:35:11] **Art Berman:** Well, thanks for that. And, and I, I, I, I probably would not have given as, uh, concise an answer because I'm incapable of it. But, but I, I, I agree with that. And, and, and I guess the, you know, the... Where I will leave it is the philosophical, metaphysical side of me does not despair, even though what we're talking about is incredibly gloomy a-and even depressing.

[01:35:44] Because what, what I, what I, what I take from all of that is that, you know, we humans have a remarkable capacity to surprise the hell out of ourselves and almost, you know, spontaneously change the way we see things. When things get dark, that's when things can change. That's when humans can be our best humans, I think.

[01:36:14] And, and, and if war forces us to do that, I'm not in favor of war, obviously. But, uh, whatever, whatever puts us there, I think is, is on balance... I won't just say a good thing because there's a lot of suffering And a lot of pain that goes along with it. But change is not easy, and it's not... And it is painful.

[01:36:36] Uh, but, but change, change is what is needed, and getting people's attention is what is needed.

[01:36:43] **Nate Hagens:** Final question, Art. If you had to give, uh, someone listening to this conversation one thing to do or to watch for as this all unfolds later this year, what might that be?

[01:36:55] **Art Berman:** That's a, a very difficult question to answer.

[01:36:58] I, I, I would watch for,

[01:37:03] for what,

[01:37:07] what Simon Montefiore calls, um, you know, a, uh, uh, a, a, a mo- a momentous shift that I think that, you know, my sense, and this is not data-driven, it's just a sense, is that people around the world are kinda... They, they... We, we, we've reached a limit of how much we're willing to be lied to about, how much we're willing to be played, and how far we're willing to go.

[01:37:45] Now, that's gonna translate very differently in a lot of different situations. Um, and that, that can very easily be taken as, "Oh my God, you know, it's, it's, it's mass disorder." Uh, that's what's gonna result. But again, I mean, when, when people get, get to reach their limit, you know, that's when real change can occur, and so that's what I'm looking for.

[01:38:12] I'm looking for, you know, for, I mean, uh, and, and I, I don't have a political, uh, you know, dog in this f- fight or race, as we say in Texas. You know, I don't know that much about Orban. But okay, you know, here's a guy who, uh, all of a sudden one day he's out. It doesn't mean Hungary is, you know, is utopia. But something happened over there, okay?

[01:38:38] And, and, and, uh, and net, that, that, that's... I think that's kind of a good thing. And, and I... So I'm watching for, you know, for, for when it is that all of these patterns and trends that people talk about, and, and Turchin is one of the best, you know, about his elite overproduction and all of that. But, uh, you know, when do we actually see, uh, that translated into action?

[01:39:05] And I'm looking for that

[01:39:07] **Nate Hagens:** Art Berman, thank you, uh, for your time today and for your continued, um, yeoman's work, uh, week in, week out, uh, trying to make sense of, uh, the global more than human predicament, and it's good to see you, my friend.

[01:39:21] **Art Berman:** Likewise, Nate. Thanks for having me on again.

[01:39:24] **Nate Hagens:** If you'd like to learn more about this episode, please visit thegreatsimplification.com for references and show notes.

[01:39:32] From there, you can also join our Hilo community and subscribe to our Substack newsletter. This show is hosted by me, Nate Hagens, edited by No Troublemakers Media, and produced by Misty Stinnett and Lizzy Sirianni. Our production team also includes Leslie Batlutz, Brady Heyen, Julia Maxwell, Gabriela Sleiman, and Grace Brunfeld.

[01:39:56] Thank you for listening, and we'll see you on the next episode