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Meet Hugo Kruger: A Diverse Energy Sector Experience

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tom: My guest today is Hugo Kruger

Hugo: thanks for having me back. So, um, I suppose to myself, I'm originally from South Africa. I actually stay in France at the moment. I am. civil engineer by qualification, and I've did my master's in nuclear, the construction of nuclear sites, and I've worked on various infrastructure projects.

So I've worked on the construction of France's nuclear new builds. I've worked at the international fusion reactor, thermal fusion nuclear reactor ITER, and I've worked on offshore wind actually, one of your favorites. Um, and I've worked on oil and gas, another one of your favorites. So I've worked all over the energy sector.

I've got a sense of how much these projects cost, what they take to, uh, to build. And I'm also a YouTuber like you, I'm active on Twitter. And I also like telling people that the world has not stopped burning coal. Um, so that's about me.

tom: Okay. So you have really a wide exposure to all sorts of different energy sources, huh?

I'm impressed.

Hugo: Yeah, I actually have a background in coal as well. I worked [00:01:00] for a cement company and part of the coal industry, they make what one could call fly ash. So if you burn the coal, you have the ash and that ash you're using concrete and it improves the various properties of concrete. But one interesting fact about it is when they built a Hoover Dam in the 1930s, they used some of the water of the dam to keep the concrete cold because it was its hydration, of course, cracking.

But if you use the ash from coal. Uh, in concrete, it doesn't do that. It controls the heat of hydration. So, yeah, I worked on that as well. So, um, I've, I've worked all over the energy sector and I suppose that gives me a broader, um, energy and electricity understanding of energy.

tom: All right.

## Exploring Climate Skepticism and Personal Anecdotes

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tom: Another thing I wanted to throw out is you actually have a personal relationship with Richard Lindzen, right?

Hugo: That's right. Yeah. So Dr. Vincent stays in Paris for about six months of the year. His wife is French as well. Um, so yeah, he's here sometimes and I go over there. They always invite me and my wife over to have [00:02:00] tea and coffee. And, um, we talk a lot about climate. My wife thinks we are crazy because she thinks that we're discussing the same, uh, The same topics all over all the time, but I still find it interesting.

So he's, he schools me a lot on the novice stokes equation and on, um, I've just, um, you know, basic stuff of climate and what is, um, bogus critique of climate and what is good critique. So for example, if you were to come with him saying there is no greenhouse effect, he just thinks you're nuts. Um, he just thinks that's, and he explains very quickly why, because he will say they don't take into account the convection of gases, for example.

So don't even come with that stuff. What his critique against climate is, generally speaking, is even if you accept everything the IPCC says, there's nothing to worry about, because it's a few degrees over a century or something. So it's just, it's just a blown out of proportion issue. That's fundamentally Richard's critique.

## Debating Climate Crisis Narratives and Public Perception

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tom: So were you skeptical of the climate crisis narrative kind of always, or did [00:03:00] you learn stuff from Linsen that made you more skeptical? No, I was,

Hugo: um, it's actually started when I was working at ITER, um, I didn't know much about it. Um, and I remember we were having a conversation one stage, uh, myself and a few scientists there and, um, somebody brought up climate for whatever reason.

And I just said, I think it's nonsense, like sort of instinctively without knowing anything about it. And it provoked a religious like response. From this, uh, this person, and that was very strange to me because that same person a few minutes ago could debate whether, um, inertial confinement or magnetic confinement is the best way to do fusion.

And nobody knows the answer to that. Frankly, nobody even knows if

fusion is going to work. If it's economically viable, you can debate that within nuclear fusion, but you apparently CO2 is the control of the planet.

tom: So, so as you bring it up in this day and age, uh, maybe this year, is it still the same that people think you're [00:04:00] nuts and it's all a religious response?

Or has it shifted at all lately?

Hugo: Uh, no. I would say for, so I'm in my thirties, uh, for people in my generation, there's about a 50 50 split between those who are brainwashed and those who have never heard anything about this subject. They just didn't care. They don't, so, you know, for them be like, okay, who cares?

Or that's what the experts say, and then you get. the religious type of people. Um, so that's pretty much what it is. I would say among engineers, there's more skepticism in general than among scientists. Now, I don't know if it's because engineers do a lot of verification and cross checking. And, um, I mean, one of my friends who's in finance used to tell me that, um, engineers think they can do everyone else's job.

And that's probably part of the problem. So I tend to find engineers tend to have more skepticism than science. And then, um, the problem you find in France in particular, and this is probably true in the UK as well, is that within the universities, um, the [00:05:00] universities are like. overtly promoting green science, right?

So, um, you would study sustainable development, you would study green energy, you would study, you know, ways to save the climate. So by the time you are in that qualification, I would assume that you have to accept the doctrine, the doctrines of the green religion, otherwise you just wouldn't be accepted, right?

So it's very difficult, I think, when you're in that position to say all of this is nonsense.

## Insights into Energy Policies and Global Perspectives

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tom: So I have a list here, a partial list of people you've interviewed, and I'm impressed. Richard Lindzen, Will Happer, Judith Currie, Tony Heller, Patrick Moore, and Noam Chomsky. Yeah, I've actually,

Hugo: I've actually interviewed a few more people.

So another thing that I interview people on is propaganda and geopolitics, and I'm quite heavily involved in the, um, debate in Iran and Israel and things of that nature, because my wife's from the Middle East. And I've been to Iran twice as well. And also, uh, Wade Ellison was on your channel. [00:06:00] And also just people that's not climate related, uh, like Dr.

Piers Robinson, who, um, questioned the Syrian, uh, chemical weapons attack. And when I asked, he's expert in propaganda, but more war propaganda, I would say. And when I asked him, what is your view on climate? He would say, he doesn't know anything about it, but it strikes him like, um, climate has got the same characteristics as war propaganda.

Okay, which is a very interesting observation. And I find it very interesting that they tend to be people on more the political left side, because it's very strange to me, I don't know why your politics should inform you, your position on climate, but in the US, it's particularly the case that it tends to be more democratic issue than the Republican issue, right?

Where actually, the people I've interviewed on opposing the wars tend to be more on what I would call the left hand side of the view. So they can see through the war in terror, but they can see through the stuff in the Middle East, but they don't question the climate narrative because that aligns with [00:07:00] ideology, right?

And I would say it's almost the same critique I would throw to Republicans is that, yeah, they can see this as nonsense, but then when it comes to saying, should the governments, you know, fight terrorism as if what is a terrorist, can you even define and things of that nature, they tend to go along with that.

tom: Do

Hugo: you

tom: think it is becoming a less right versus left and more, uh, elites versus the working people? A lot of my guests have said stuff like that. I'm hoping that's what's happening.

Hugo: Yeah, I think there's a lot of truth in that. It's also that I think part of the left wing became the establishment. And it's, it's very interesting that I think it's, it's mainly because of Silicon Valley.

Um, you know, in the past in the US in particular, you used to have these oil, uh, robber barons, if you will, oil. And so you could say, okay, they opposed the climate stuff because there's a business interest in opposing it. Right. But then you had the Silicon Valley

Oaks in the nineties. Coming to prominence because of the internet, they were more on the political left.

And it's [00:08:00] almost like they accepted the climate religion. So I would say that in the last, if there's been a big change in the last 10 to 15 years, it's mainly that they've taken over the levers of power.~ I mean, I, I, I find a guy like Elon Musk very interesting in this because he tends to be, um,~

tom: ~Oh, I'm sorry. That sentence just cut out. You're totally cutting out right now. ~

Hugo: ~Yeah. ~

tom: ~Yeah. Yeah. If you want to re say that sentence, maybe. Yeah. ~

Hugo: ~So I say,~ I find a guy like Elon Musk interesting because if I look at his background, he tends to be more Silicon Valley type. And as far as I know, he's always sang along with the climate stuff and it's pretty much in his business interest to do so because he's selling electrical vehicles, right?

Although he's sending rockets to Mars with, you Presumably not electricity, but the fossil fuels. Um, but I find people like that interesting that, um, they tend to be the establishment nowadays, and they have a business interest in perpetuating the climate narrative, even though I think if you really press him, I'm not sure he believes it.

I think you'll be very skeptical of it. I mean, I've never heard him. I've heard him a few times saying we need a carbon tax and this and that, but I've never really heard him. Expressing the views on it. And I would guess that's a lot. A lot of this has [00:09:00] got to do with money, but it's sort of like you have to be part of that club to accept this type of narrative.

tom: So are you in a camp that says that Elon Musk is doing a great thing for free speech and you're kind of a fan of his or are you still deeply suspicious of what's happening with him? I'm

Hugo: deeply suspicious of many people these days. So that's a bias I've got. Um, look, I would say Twitter is definitely more open since he's taken it over.

But I know he's also censored a lot of people who tend to be critical of, um, you know, the, the US wars in the Middle East in particular. But on the climate stuff, he's allowed people to say pretty much what they want. And I think that's been by and large a good thing. So it's sort of like he selects his people.

views that are also unacceptable. And that is, I mean, but if you take a free market approach to that, you would say that's fine because that's his business. And if he owns the business, he can censor people, right? That's generally what I would say. There will be other platforms.

tom: Uh, have you kept track a lot of what the [00:10:00] RFK Jr is saying and are you a fan of him?

Or what do you think of him?

Hugo: No, well, um, his views on Israel in the Middle East is pretty much US foreign policy. So I've been quite astonished at that view that he would take that, which is pretty much, he sings along with whatever's going on over there. And his views on climate has been do a free market, which I found interesting.

So he sings along with the narrative, but actually the solutions he proposed to it seems to be more Republican like. That's about all I figured out about him. And then on the vaccination and the COVID stuff, yeah, he was very skeptical about it and rightfully so. And so was I, for what that's worth.

tom: Okay.

The South African Electricity Crisis: A Coal Conundrum

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tom: So on your podcast, on your sub stack, you seem to be kind of digging into all sorts of different rabbit holes. And are you having to self censor yourself a lot to stay on YouTube or how's that going?

Hugo: Um, so I'm on various platforms and I think that is how I leverage against it. So I write for mainstream, um, [00:11:00] newspapers as well.

So I've written for Newsweek, for example, I've written for QDate in Australia, which is relatively new, I read for Unheard, um, I write in South Africa for Independent Online. Who allows me pretty much to say whatever I want to the editors, very much free speech, um, very much open to free speech. And that's also because I tend to write those views for free.

And I think it helps circulation a little bit. So they don't get too much about it. And then the deal I have of them is I put that on my sub stack. So my sub stack tends to be a hub for a lot of views. One thing that I took a lot of interest in recently was the electricity crisis in South Africa. Even though I don't stay in the country anymore, I obviously care about it.

And I was just wondering what the hell was going on. Why do we have running blackouts? Because as a child, I did not have running blackouts. And now we do have them. And it's very interesting. The reason for this is the government walked away from coal. Um, they did not maintain the coal fleet because they thought they could burn, they could build renewables [00:12:00] faster than the coal was decaying.

And if it actually just maintained the coal fleet, we wouldn't have had blackouts. And it seems they finally started doing maintenance and it's been since last year, it's almost ended the blackouts because they actually fixed the broken coal stations.

tom: Really? I didn't know that. I saw that you were on TV talking about ESCOM.

You did like a nine minute segment, I saw. And, uh, so do you think that's sinking in with the public in South Africa, that we need coal to keep the lights on?

Hugo: Yeah, so, um, burning coal is not a controversial view in South Africa. Um, the African perspective is, We need energy. And whatever we do, we don't care about the climate at this point in time.

And that happens to be the Indian view as well and the Chinese view. Um, so the, the, the climate thing is pretty much a Western narrative. And then there are some elites within South Africa who buy into it. Um, but yeah, the, the South African public, I think, has woken up to the fact, I mean, the government's own data now says that, so they can't deny it.

[00:13:00] The government did an investigation onto what is wrong with ESCOM. ~And the report, they got Germans to tell us what this ~

tom: ~up, uh, you're cutting out that sentence, maybe say it again. ~

Hugo: ~No.~ So they got a German expert group to tell the South African government what was wrong anyways. And, um, so these international experts, And they came to conclude that it's government procurement regulations that actively blocked maintenance on the coal fleet.

So because they did not maintain coal, I mean, we actually hit our, our Paris climate targets because we had blackouts. So the coal fleet went down. Um, but yeah, basically they didn't maintain the fleet. It's that simple. Government didn't do maintenance and we have blackouts. And now that they're fixing the coal, the blackouts seem to be ending.

What a surprise.

tom: Yeah. So I was reading, I don't know, a few years ago, there was load shedding. Were they scheduling

Hugo: events where

tom: you wouldn't have power? Yes, they

Hugo: were, they were scheduling it every few hours of a day. And there was one stage where they had two to three hours of power. I think last year it was six hours a day sometimes.

So it was really horrible. And then the engineers started raising their voices [00:14:00] and we were looking at this stuff and we're like, we could not believe what was going on because I had. An idea that it's lack of capacity, we didn't build enough power stations. Now there's some truth to that because the population was growing faster than we could supply.

But Eskom has about 50 gigawatt or 50, 000 megawatts of installed capacity. At this stage, 25, 000 is working. So if half your units are not working, that's not because you didn't build enough. That's because you didn't fix it. And the reason South Africa has blackouts is very simple. The government didn't do maintenance.

There was no maintenance budget.

tom: So that's super interesting. So you're saying they're doing it now. Now they're fixing the plants and now, uh, no, no more blackouts pretty much. Huh?

Hugo: Yeah, pretty much the, well, it's, it's, it's, uh, it's, it's no, we're not out of it yet because we don't have a safety margin. So it can still go one or two hours a day, but that's pretty much what happened.

They also built some rooftop solar. Solar actually helped a little bit [00:15:00] and the ESCOM was losing its monopoly, but basically they had a national monopoly. And that's one reason. The other reason is the government passed laws that prevented ESCOM from building new power stations. Okay. Um, and the, the reason for this was, is they wanted to privatize ESCOM.

So then they said the Department of Minerals and Energy would, in the meanwhile, allocate capacity. But they never carried ahead with the privatization. So we had this weird system between national, it was like a transition phase, but we've been in transition since 2008. The other reason is they imposed a tariff and they said the price of electricity shall be this low.



So Eskom was basically selling electricity at the bare bone. And when you do that, you eat into your maintenance budget. So, so they were price fixing us into blackouts.

tom: Yeah. And certainly you would think that businesses in South Africa, they would want the lights to stay on rather and pay a little more for maintenance, right?

[00:16:00] That's what they want.

Hugo: Yes. And this is the joke of it. So the, the joke was, if you just increase the price, just markets, right, there'll be fat in the system and business will be like, why don't we buy those call stations and we fix them. And actually the government has been offered this a few times that private investors say, look, this thing's profitable.

We just have to put some money into it, fix the coal stations. And we have 20 to 30 years of almost monopoly, but the price of electricity was kept artificially low so that nobody wanted to invest into South Africa. So this is a good example of how price controls leads to shortages. And unfortunately the regulator has not given up the power to set prices, but now the price has gradually increased to a point where it's com is recapitalizing and, you know, surprise, surprise, when you increase prices, again, there's investment and maintenance and things start working.

## Global Energy Trends: Coal's Dominance and Future Prospects

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tom: So what do you see looking ahead, maybe 30 years in South Africa? Do you think they're going to put up a more coal fired power plants or? Nuclear is going to make a [00:17:00] resurgence.

Hugo: I think the next one is natural gas. We are the only G20 country without natural gas, which is so there's a good potential in Mozambique.

So Mozambique and, um, is it Namibia? The two countries next to us are all exploiting the natural gas at the moment. And that is telling our politicians. You guys have been lazy. Because our neighbors that are poorer than us are doing it. Um, so I think the natural gas will first come before anything else.

I would like for us to build one more nuclear station, but nuclear takes 10 years from the time of planning it. Um, coal itself, um, if I look at coal worldwide, it is sort of slowing down. It's still increasing, but it's relatively slowing down. So I don't know if, because coal is also lots of capital expenditure.

Gas is just more competitive in many ways. So I, I think natural gas for the future and then some renewables as well. Africa's got good sun and the winter and summer peak is the same. So you don't need as much backup. So it'll be something between solar and, um, and [00:18:00] natural gas.

tom: All right. I was just reading up on some of your sub stacks and tweets about, I think you said Japan still is using quite a bit of coal to keep their lights on.

And in, in India, over 1 million people work in the coal related industry, something like that. So around the world, a lot of coal still being used. Yeah. Yes, and

Hugo: more coal is being planned in India. Um, Indian coal, by the way, is dirt cheap. So I was looking at prices the other day, um, to build a nuclear power station, the best price you will get is about 3 a watt or 3 billion a gigawatt.

Coal is 750 million. So coal is a quarter of the price of nuclear. So if you care about cheap electricity, You would build more coal, especially in countries without water, because to balance intermittency new renewables need either natural gas or water. So yeah, the renewables make sense in the Amazon. It makes sense.

We've got the Colorado river Africa's water dry. India doesn't have a lot of water. [00:19:00] So what are they going to do? They're going to build more coal and I will not be surprised if coal. Okay. I'm going to say very controversial might win the net zero race because maybe just coal plus carbon capture makes sense.

I don't know.

tom: Uh, do, is there any problem with actual pollution from coal in India? Like IC O2 isn't, but how about other, uh, anything else that, look,

Hugo: they, they, you still, so coal, you need to make a distinction, right? You, you get subcritical and you get super critical and you have old stations, new stations.

So a lot of people would say China's building new. That's not really true. The Chinese are upgrading their existing stations with better stations. So if you look at your thermal efficiency, a coal plant, historically speaking, if you had 100 gigawatt, 1000, 100, 1000 megawatt, 1 gigawatt, you get about 300 megawatt out.

So it's 30%. But supercritical coal is 45 percent and it's cleaner. So by just cleaning up the coal process, you get more energy out of it. [00:20:00] And that seems to be what the Indians and the Chinese are

doing. And that's also what the Japanese are doing. And the Japanese are saying they're going to keep the existing coal fleet and they're just going to clean up the process.

When you start doing that, you get more electricity out of it. And that might be the strategy for countries that have a lot of coal.

## Environmental Policies and Their Impact on Global Energy

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tom: What do you think is happening in Germany? Are they going to keep their lights on over the next 10 years, or what changes are they going to be making, do you think?

Hugo: Well, um, Germany is a problem.

It's difficult to make sense of Germany because you've got all these interconnectors in Europe, right? So you sell electricity and stuff, so you can't just look at Germany in isolation. If you look at the European Union, the biggest supplier of electricity at the moment is nuclear. mostly from France and Sweden and things.

Then coal is also quite high still in Europe, but it's mostly on the eastern side. Um, the Germans have phased out the nuclear. And they're keeping their coal and their gas plants idle, basically. So they're not burning more. So everyone will [00:21:00] show these graphs. Germany is not burning more coal. We are all lying.

We're all denialists. That's true. But they are putting their plants on idle. Now, if you run an idle system, It only runs for a few weeks of the year. The price of electricity goes through the roof during that period, right? And people can go and look on, um, Bloomberg. There was an article the other day where they showed that the German coal plants are going out of business, but the government wants them to be on standby.

And this is the problem. So they, they've got a, Suppose a market in Germany where you trade on the marginal price of electricity. Now, marginal price is not marginal cost. Marginal price means how much do I need to sell it at to make my money back just to recover my costs for the whole year, right?

Marginal cost is basically my operations and fuel. And the German government is telling the coal plants, you will not make a profit on your coal plant. So they intervening into the electricity market. And that means taxes on one end, debt on the other side. So it's very difficult to [00:22:00] analyze the German system.

To actually make sense of it. But thus far, the Germans have not in

the last 20 years, they have not decreased the fossil fuel capacity. They have only shut down nuclear and they've replaced coal with natural gas, but they might not be burning the gas. Now you've got these massive capital expenditure. And then the question is who pays for that?

And that's going to be taxes.

tom: Okay. How about, um, in the UK? We had these pictures of people dramatically blowing up coal fired power plants. Do you think, uh, what, what do you think? Are they going to be building new coal plants or what are they going to do in the next 10 or 20 years?

Hugo: Well, one of the base technologies for the UK would be coal because coal is excellent during extreme, uh, uh, um, cold and extreme temperature.

And you see, the, the, the Europeans didn't shut down their fossil fuel plants. They kept them idle. They mothballed them. So, if the weather and solar doesn't work, Europe still has fossil fuels. The UK destroyed it. [00:23:00] So what do you do? That is your secure safety of supply. That's your reliability. What does that mean?

Natural gas or imports from France? Now I'm sitting in France. I'm saying thank you to the UK because you know, France is just making a killer bucket of this. But for the UK itself, they have to decide, do we want more natural gas or do we want coal? And I do think that Um, if the planet is really going to get colder and not warmer or whatever, I do believe coal will make a backup.

I think that there's some things that coal can do in an electrical system that is very difficult to replace. And the reliability criteria, I mean, it's, it's, it smells cold.

## The Role of Coal and Nuclear Power in Energy Reliability

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Hugo: Not even nuclear can do that. So I, even in France, by the way, and France still has coal plants. When the nuclear fleet wasn't properly working, the French opened the coal power stations.

So coal remains the backbone of a reliable grid. Nobody wants to admit it, but it's there. So I do think coal will still be there, but it's questionable what percentage of the electricity mix will be coal.

## France's Nuclear Power Journey and Challenges

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tom: Would you say that France is the [00:24:00] success story for nuclear power around the world? France, they play.

Hugo: Yeah. Yeah. It's pretty much, I mean, France. Um, but it's, it's a bit difficult to sell the solution to the US public because France did it all through massive state planning. It was a central state planning in, uh, the, what was called the Mesmer plan. So in 19, um, after the 73 World crisis, Charles, the Golden pm er was the, uh, I think it was first minister of Prime Minister at the time, um, basically decided, well, well, they, they realized France was highly dependent on imports from the Middle East.

And they argued that oil means the US will dominate us, because the US was just so big in oil. So we wanted to be independent of the US. And then they decided to go nuclear. So France had a mass build throughout the 1980s until the early 90s of nuclear power. And that was successful. But even the Mesmer plan had some failures of nuclear.

So nuclear struggles to get costs under control. And towards the end of the French plan, you will see there was also a slight increase, [00:25:00] but because the government was basically bankrolling it. It wasn't a private investment and that's always been the critique against the French one And that's why they say that will never work in the u.

s Because the u. s is not going to accept that level of state intervention intervention in the economy, basically

## Debating Nuclear Safety Standards

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tom: Okay I think you've said elsewhere that there's various levels of safety you could build into these plans You could try to make them infinitely safe at an infinite expense and you got to draw the line someplace What are your thoughts there?

Hugo: Well, I mean, it's the question about nuclear safety in general, is that, so I was in Ramzah, Iran, um, last year, where the background radiation is 250 millisieverts, that's more than you find at Chernobyl, that's more than you find in various nuclear plants. So the question is how much extra safety haven't we added to it.

And if we accept that our designs are too conservative, too safe, then we need to cut the safety budget of nuclear. But now how do you get that. to be sold to the electorate, because that means the NRC's [00:26:00] budget has to be cut in half, or how does that work? That's never going to fly politically speaking, but I do believe that we are overdoing nuclear safety.

Um, for a good example of this is Three Mile Island. It killed nobody, but based on Three Mile Island, they implemented passive safety systems. Chernobyl did not have a containment building. Armenia still has a nuclear plant without a containment building. They realized in Armenia that the reason for that is it was a failure of procedure.

Because Chernobyl was an idiot operator, you know, in the procedure. So the Armenians just said we're not going to repeat the same mistake. So that no redesign and when Russia just invaded Ukraine, Armenia, I mean, a lot of people complain about Germany being dependent on gas. Armenia still has nuclear power.

So the Armenians were not affected by Russia, geopolitically speaking, and you can argue that is because they did not follow the strict safety criteria that we [00:27:00] implemented after Chernobyl.

tom: Okay.

#### Radiation Exposure: Myths vs. Reality

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tom: And you are kind of a fan or you agree with the work of Ed Calabrese, right? That a small exposure to radiation might be more healthy than zero exposure.

Do you agree with that?

Hugo: It might be good for you. Yes. There's good evidence on this. I mean, when I was in Ramsar, um, you see children playing in background radiation. Okay. It's high level radiation. There's water streams that is full of radon and nefarious rocks. Um, people are bathing in it. You know, people who go to hot spas are healthier or hot spas are radioactive.

So it's clear that a little bit of radiation might be good for you. And that's basically his thesis, is what doesn't kill you makes you stronger. So it might, it's like a suntan, you know, a suntan burns you theoretically speaking in your tan, and that protects you against more UV radiation. So his thesis is basically that is a generalized rule for all radiation.

And if we accept that, we basically accept that maybe we can relax our safety standards a bit. [00:28:00]

tom: Can you say those numbers again? You already said them, but there's a certain number of, what, millisieverts that you can be exposed to in a nuclear plant. And these people are living lifespans of 80 or 90 years exposed to how much more?

Hugo: to 200. So nuclear plants about 20 or 25 millisieverts a year. Ramsol is 250. So it's 10 times as much as a nuclear plant. And there's a lot of people saying you can even increase that by another factor. So you increase it by 10, 20, 30 times. I don't know, but we know that our safety standards are way too conservative and public exposure is like one millisieverts.

Which is just ridiculous, because that's less than background in the U. S. And there's another interesting statistic on this. So the U. S. did a lot of nuclear bomb testing in Nevada after World War II. Utah, which is next door where the Mormons stay, has some of the highest level of background radiation in the U.

S. But it incidentally has the lowest level of cancer. So we have plausible evidence. I mean, it's obviously correlation causations like the climate, right? [00:29:00] Um, but we, we have this plausibility to the hypothesis that radiation might treat cancer. And some radiotherapists actually believe this. So a little bit of it is actually good for you.

Do you

tom: have any thoughts about, uh, taking a chest x ray, for example, or for flying, let's say, uh, 20, 000 miles a year at 30, 000 feet? Uh, is that safe, those two things?

Hugo: Yes, it's safe. It's, it's, it's probably good for you. We know that airplane, I've, I saw statistics saying that airplane pilots have less radiation in the background and, um, less cancer, sorry, than background, than the background population.

And the interesting one is you get pilgrims, people who go to, um, Fukushima and they basically, uh, you know, cry about this so called disaster that killed nobody from radiation, by the way. But in the airplane flight to Japan. They would get more exposure than they would get at Fukushima. Wow.

tom: Okay. Um, I think Ed Galbraith was saying that there's this whole idea that exposure [00:30:00] to radiation gives you mutations, but they took bugs and they exposed them to just unbelievable levels, and they could not make the mutations happen.

Do you have thoughts on that at all?

Hugo: Yeah, so what he's referring to is Edward Muller's, uh, so called Nobel Prize in the 1930s or 40s. And basically this guy shot fruit flies of a high dosage of radiation. And then he said, there's a few mutations where he couldn't even get replication on those flies.

But then he said, okay, aha, we have some mutations at high levels.

And he drew a straight line down and he said, we must have it at low levels. And that is the bogus theory that underpins much of modern radiation safety standards.

tom: Yeah, that's the LNT, right? Linear, linear, linearized ratio.

Hugo: The ratio is linear as opposed to a J shaped or a U shaped curve or an adaptive response.

There's various ways of saying it. But, I mean, if you think of it, nothing in nature is a straight line. There are very few things that's a straight line. So why would biological systems have a straight line response to [00:31:00] any of this? I mean, sort of asking why would climate systems have a straight line response to CO2?

tom: Is that still the mainstream narrative though, that LNT is real? That's it still?

Hugo: It's absolutely. I mean, I asked this, I'm sorry, I work in a nuclear industry again, and I asked this for our safety officers and I said, well, can't we reduce safety? And like they will, they will threaten me, like no ways you're being irresponsible.

So there's, there's a certain fixation on safety. I remember I asked one of the, the highest safety person, I said, well, isn't there, um, you know, shouldn't we reflect on this? And they would say, look, if we just, if we reduce our safety in France, that's the end of our, of our nuclear fleet in France. So that, that is so fixated in the nuclear safety authority.

I mean, it's, it's very difficult to even get them to talk about it.

## The Future of Nuclear Waste Management

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tom: It's about, is there any hope that in the next 40 years, this is going to change this craziness?

Hugo: Well, the, what I would hope would happen is, so they talk about small modular reactant, private sector stuff. And I [00:32:00] hope that various countries will have various interpretations of this.

So there's good evidence to suggest the Chinese knows this already. Because China's building nuclear plants at a remarkable rate, and they've got different ways of treating decommissioning. So their argument is we decommission a plant and we only take the high dosage waste away because that's dangerous.



We need the rest. So that's sort of accepting there's a threshold without saying it. Okay. And some countries are doing that already. But the other consequence of this thing would be this, if we accept there's a safety threshold, it means that nuclear waste is nothing to do with it because we're talking about this dangerous, lots of waste.

Well, if we accept it, the case to a safe level, it means it's not the hundreds of millions of years. It means the solution is just put it in a hole in the ground. That's it.

tom: Yeah. I don't know what the level of exposure is, but you'd think it might be way, way less than that.

Hugo: Yeah. So I mean, plutonium and cesium is still radioactive, maybe a hundred or [00:33:00] something years or 200, but it will not be hundreds of millions of years because that's based on the assumption can never get safe.

I mean, if you think of it, radiation decays. And the more it decays, the less dangerous it becomes because the half life is, is, is because it's less radioactive, right? But the safety standard says it's always dangerous because of this linearity thing. So it means that after a certain amount of years, it'll be safe.

And we just work, we have to work that out mathematically. We say, okay, keep it in a hole for 200 years. That's it. There's nothing else to do.

## Recycling and the Economic Viability of Nuclear Fuel

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tom: So is it correct that a lot of waste that's being stored in the U. S. right now could be reused as fuel still or no?

Hugo: You can, but the problem is it's too expensive.

It's just, I mean, the price of uranium is dirt cheap and the price of nuclear fuel is like 5 a megawatt hour. So why would you want to pay 10 just to recycle for the sake of recycling? I mean, by the way, that's true of recycling in general. People who want to recycle glass. I mean, that's a joke because sand is [00:34:00] everywhere.

So it's a question of, is it economically viable to do so? And for most recycling, it isn't even plastics. So the best solution to plastics would be to burn it to get a little bit of fuel out of it and, or just put it in a hole in the ground. But that is not acceptable to the environmentalists because I mean, they, they want us to have the circular economy, which thermodynamically doesn't make

sense.

And it's the same argument with nuclear waste. Yes. Nuclear waste is there. There's a lot of it. Most of it is low dosage waste, which includes stuff like gloves and just stuff that was used in nuclear plant. There isn't much you can do about it, but if we accept that after a certain level it's safe, it means the only solution is basically put it on a truck and take it to Nevada or wherever, and just leave it there.

tom: So is there any sort of an order of magnitude rule of thumb about, uh, if you're trying to power your lifestyle using nuclear powered electricity for 50 years, how, could you put the waste inside of like a gallon jug or something? Or [00:35:00] I've heard like a coffee cup can power your lifestyle for a long time worth of waste.

Hugo: Yeah, I've heard something like a Coke can is enough for your life, for per person or something.

tom: Okay.

Hugo: I'll have to verify. But it's something small anyways. That's per person. But okay, with a lot of people, you can say maybe it's small. And then I don't know if they distinguish between high level waste and low level waste.

Most of the stuff is low level waste, which most people won't even think of as waste. It's not homosyptom waste.

## Exploring Alternative Nuclear Technologies

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tom: Do you have any thoughts on Cal Abel's work on, is it Natrium, I think? On nuclear power.

Hugo: Yeah, I said different type of reactor. They claim it to work. Um, my view of nuclear reactors is still the only one that we know that works.

Economically speaking, is the pressure water reactor. But there's lots of people who've talked of different types of nuclear reactors gas cooled reactors nature reactors. So you will, I think it is things of that nature and maybe. Maybe it'll work, but at the moment, um, for nuclear to be economically viable, it still has, it first has to build the [00:36:00] reactor and then sell it.

And then you have to out compete natural gas. And I'm really a heretic on this, but I think the energy of the future is coal and natural gas. Okay. It's not fusion. No, fusion is not economically viable. Um,

there's good enough studies showing it's more expensive than fusion. It sounds nice, but it's just too expensive.

And this other thing, I mean, we think of nuclear as energy density, which is okay, but you have to think of it like an economist. What do I pay for it? And there's an optimal level of energy density and fuel density, and that optimal level tends to be natural gas at the moment. So, unless you can solve the other issues, because the fuel is only a small percentage of your entire cost of a nuclear plant.

Concrete is not going to get cheaper because it's nuclear. Steel is not. So safety drives a lot of it. Fear drives it. A lot of it is just materials. We don't know how to control the temperature at a certain level. Uh, at an economical viable level. And that's why nuclear might be [00:37:00] more expensive, even though it sounds like it shouldn't be.

tom: So, do you have any thoughts about over the next 100 years, what's the smallest application for nuclear power on its own to power, maybe, what, uh, your house, for example, anything that small, or it has to be a bigger application? So, NASA

Hugo: at one stage had a small, like, tin can reactor, if I remember, um, and theoretically that was 8 or 10 kilowatt, and that should power your home for a year.

The problem is when you go smaller, you increase your level of enrichment and the military is not going to like going to like that. So that that's generally been the reason why it went bigger, because if you keep the gap at 20 percent enrichment, I think, um, pressure water reactors is 5 percent and gas coolers, 10 percent enrichment.

So that's acceptable. But if submarines are 60%, that's 80 megawatts. So you can think if you go even smaller, smaller, you might come to a problem where we might have people with. close to nuclear bombs in their home. So that might not be acceptable. And I know [00:38:00] the U. S. has this right, Second Amendment right, which is the right to weapons.

I don't know if that extends the right to enriched uranium.

The Hydrogen Economy: A Fantasy?

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tom: Okay, switching gears here, I think you just posted on your sub stack a whole lot of thoughts about the hydrogen, proposed hydrogen economy. Do you want to talk about that a bit here?

Hugo: Yeah, I think the hydrogen economy is total fantasy. Um, the, of

the, the principal reason being that even though hydrogen has a high energy by, by mass.

It is a very low energy by volume. And the issue is not creating energy. It is transporting energy. So the translation would be if you have an aeroplane that's in hydrogen, it means that you have to kick out one third of the passengers or one third of the cargo. So it's either a small one, so it's an airplane for the rich.

That's not going to work. The U. S. So the amount of hydrogen pipelines in the world is like 5, 000 kilometers. In the U. S., you have a few million [00:39:00] kilometers of natural gas pipelines. Now, imagine if you have to replace those infrastructure with infrastructure that's economically inefficient, that is one third or three times as big.

Okay. And then hydrogen leaks. Hydrogen also has a problem where it's got a low ignition temperature. So it goes boom very quickly. So you have to really keep it well pressurized. That's expensive. That's takes lots of energy. And then the other one, which is my favorite is hydrogen is actually greenhouse gas.

Okay. So even if we're going to change everything, we still going to not solve global warming. Presumably that's a problem. So it's, it's a dead on arrival, head, brain idea, making hydrogen make sense. The only place in the world where hydrogen has made some sense is next to where it's consumed, because it's used as industrial feedstock.

So what I have proposed is we use all the excess energy from renewables, because we have a lot of, you know, cheap electricity now, um, you know, when we don't need it.

## Synthetic Fossil Fuels and the Future of Energy

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Hugo: [00:40:00] So I've proposed that we use this to make fossil fuels, synthetic fossil fuels. Which is an economically viable idea. It's called the Fischer Tropsch process.

You're going to have to make hydrogen at a place of consumption. So you basically have a, uh, a rod in the water that zaps a lot of water. It might use a lot of water though. And you can mix this with coal. Okay. Or with CO<sub>2</sub>, and then you can make fossil fuels for aviation. So if you believe in some circular economy, I mean, it's not green, but you can make synthetic fossil fuels by just using the excess energy from renewables.

But I'm not sure if the environmentalists are going to like that idea.

tom: And do you see that that as something that might be happening a hundred years from now, that they'll be using wind turbines to make fossil fuel?

Hugo: Well, yeah, I mean, if you, first of all, um, I don't think we, I mean, a hundred years, maybe say a thousand years, because we're not even close to running out of natural gas and coal and stuff, but presumably that we ever run out of fossil fuel.

So it's just too expensive to extract. It might become true [00:41:00] that synthetic fuels replace it. So in South Africa, one third of our petrol comes from coal, decassification. It's an energy intensive process. And actually we, the flagship companies called Cecil, they were actually using renewables to make cheaper fuel from coal, which they won't tell you.

They're all green, but they're making petrol for the cars. So it might be true that You know, creating fossil fuels in the future is a viable economy. I mean, what are you going to do with all the solar panels that we just put all over the world? I mean, that energy is wasted and I suggest we use it for something constructive, which is not to make hydrogen, but to make fossil fuels.

tom: I mean, would there be an economy of 2, 000 years in the future where you use the energy from wind turbines to make fossil fuel to make more wind turbines and that works? I don't know what the thermodynamic

Hugo: efficiency of that process is, but yeah, I mean, plausibly you would make fossil, you would use it with coal, because I think this is a lot of coal reserves, but you would make, or let's assume there's so much carbon we can't breathe.[00:42:00]

Then carbon capture might theoretically become economically viable. And then you would probably suck it out of the air. with water that you desalinate, which is also not environmentally friendly, that you add the water with and then you combine it again to make fossil fuels. And that's how the airplanes will go.

So that seems to be plausible.

tom: Uh, do you have any sense of business as usual?

Global Coal Reserves and the Myth of Fossil Fuels

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tom: How long are the coal supplies or all the coal after we find all of it, how long that'll last?

Hugo: So I looked at statistics of country wise basis. So I was looking at Iran the other day, they call, they've got enough gold for themselves for a thousand years.

South Africa is enough for the 500, 600 years. And we don't really know because we have a lot of deposits that aren't discovered yet. The U S I think something like 20 percent of your electricity is still from coal and you're not far away from running out of it. Um, and the same is true of, of natural gas and natural gas.

We've got a few hundred years. And then also solar has gotten cheaper. I mean, not to bash renewables all the time. So there's no shortage of energy. Um, you know, you might just have a bigger gas plant in the [00:43:00] evening until we solve the battery problem, but there's no shortage of energy.

tom: Do you have any thoughts on the whole issue of hydrocarbons and whether they all came from organic life or some of them didn't?

Hugo: So I read Tommy Gold's book, The Myth of Fossil Fields, uh, which is quite an interesting one. And his theory has been that, well, I mean, he basically asks, like, if you look at Titan, Jupiter's moon, I mean, that's obviously not organic. So how did the fossil fields get there? And then he says, well, how did they get here?

Why is there two different processes? And that's basically the theory. So the theory that he's got is that life on earth started in the deep hot biosphere. ~And that's, we are actually the thermodynamic ~

tom: ~I'm sorry, that last sentence is cutting out. Can you say that again? ~

Hugo: ~Yeah, so~ Tommy Gold's theory has been that life on Earth is actually the thermodynamic decay of fossil fuels.

The counter argument to that would be, wherever fossil fuels, particularly coal, has been discovered, and oil, is in shallow deposits close to the Earth's surface. So that has to be a decay from, um, plant and animal life. That's the counter narrative [00:44:00] to that. Then the question remains, what about natural gas?

Because some natural gas is clearly abiotic and some isn't. And then you also have, uh, cases where some oil wells, um, often they drained it empty, it actually generated. And the theory is, can this be lost forever? And are we just extracting faster than the rate of nature's producing work? I don't know. So anyway, this is the, the two arguments.

I, I don't have a strong view on that, but I know both sides of it.

tom: Okay. Um, any other points you'd like to make before we wrap this one up? This has been very interesting.

## The Real Debate in Energy Economics

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Hugo: So I would say this, um, I looked at the price of electricity. I actually want to give a presentation, but I'm going to summarize very simple.

So for electricity, you have transmission, you have distribution, and you have generation. In France, I pay about 25 euros per month. Okay. In the US, I think Texas is 17 to 20, but let's say I pay 30, which is what the Germans pay. Only 10 or 10 euros a month is actually electricity. [00:45:00] 20 is transmission and distribution more or less.

So all this debate about whether solar is cheaper, whether wind is cheaper, whether coal is cheaper, is fighting over 10 to maybe say 20 a month. It's nothing. So I see it as like one major distraction over nothing. It's a nothing burger. It's similar to the CO2 issue where we're fighting over a few things of, you know, of a degree and stuff.

And I think at the end of the day, this is a form of subliminal marketing. They're making you focus on something which is totally unimportant. So is it possible to run the world's economy on renewables? Probably it is. I don't want to know if I want to live in that economy. But should we be fighting over PPMs of CO2?

No. Should we be fighting over our electricity generated? No. It is true. I think Texas at this point is generating a lot from renewables, but they also have a lot of fossil fuel standing idle for when they don't work and California just put a lot of expensive batteries, but at the end of the day, you're fighting over a very small amount for you and me.

For those of us who live in [00:46:00] an industrialized world. So I think all of this is in a certain sense, just a waste of time. You know, it's not worth having these fights. And then I, I just look at amusement at the amount of people who protests and to, you know, are in the street and this is their cause and they want to change the world over what 10, 20 you're being hoodwinked.

You're being scammed. Okay. Uh, anything else?

## Concluding Thoughts on Energy Narratives

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Hugo: No, I think that's it, Tom. I think, uh, yeah, I'd just like to thank you for your podcast that you've been doing and for the movie that you've made. I found that very interesting and I hope we continue pushing back against the narrative. I just find it fun. People can follow me on Twitter.

They can follow me on Substack and, uh, yeah, I think it's important to challenge dogma and authority because then the rulers know that they are being humiliated and that's how you, you know, stop them from abusing their power.

tom: Very good. Yeah, I can tell you're having fun with it. I enjoy it. I enjoy that you are having fun with it.

So, we'll talk to you next time. Hugo Kruger. Bye.

Hugo: Thanks, Tom.