

The Great Simplification

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[00:00:00] **Nate Hagens:** Greetings. Today we are re-releasing a previous Frankly from July 2023, over three years ago, on a topic which is just as relevant in 2026 as it was then: why oil is the economy. In this fundamental video, I unpack concepts that are critical, in my opinion, for understanding the role of oil in our modern global economy, including the maximum power principle, Kleiber's law, Jevons paradox, as well as historical patterns of what happens to powerful nations who lose access to cheap and abundant energy.

[00:00:39] I recorded and aired this well before the Strait of Hormuz situation, but that situation is now accelerating the key points made in this video, especially as existing oil stockpiles and storage continue to make new lows with no end in sight for this war. I hope this re-release will present some helpful reminders for those of you who watched it three years ago, and for those of you who have not, I hope you'll find some novel insights, for this unfolding moment, which I think is a phase shift for our civilization.

[00:01:16] Lots of new Franklys and podcasts coming this fall, including Charles Eisenstein next week. With that, let's get into it. Okay. It is with some trepidation that, I arrive at part two in this Just Stop Oil series. After these next two videos, you may subscribe and then hit unsubscribe. A word of caution, or a word of authenticity.

[00:01:44] I am not, in these next two videos, advocating for what we should do. I am trying to observe and describe our situation. It is my deep belief that describing the constraints of our situation eventually will inform better decisions, better plans, better preparation, and, I don't know if Nora would chastise me for saying this, but better emergence.

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[00:02:13] okay. So last week, briefly, we looked at the systemic implications of the serial refining of oil, and that if we suddenly didn't need gasoline, we would still need roughly the same amount of oil because of the power and relevance of the middle distillates and the asphalt, bunker fuel, plastic precursors, et cetera.

[00:02:38] Today, I'm gonna explain why, at least for now, oil is the economy. and what I'm gonna talk about next week is ten pathways to post-growth economies, which would use less oil and fossil fuels. So today is gonna be a little bit of a long reflection. I g- hope I can remember everything. I'm gonna start by doing a whirlwind recap of the importance of energy, and particularly oil, to our societies, and then I'm gonna talk about ten systemic inferences.

[00:03:25] Okay, here we go. Energy is incredibly important in nature. Those organisms that have an energy surplus of their expense versus the income, have evolutionary advantages. This is throughout the animal kingdom, and it also applies to human systems. There's something called the maximum power principle, which Howard Odum, the PhD advisor of some of my PhD advisors, called the fourth law of thermodynamics, which is that organisms and ecosystems in nature self-organize around the ability to degrade an incoming energy gradient.

[00:04:06] For instance, trees will grow the correct amount of leaves to maximize the energy degradation of the sun. One leaf wouldn't be enough, and a billion leaves would be too many 'cause they would shade, so the maximum power is in between, and this happens throughout the natural world. What ends up happening is there is a biological relationship between the mass or the size of an organism or an ecosystem and its energy throughput or its metabolism.

[00:04:39] This is called Kleiber's law, and the metabolism is roughly the mass to the three-quarter power. Doesn't matter if you're an insect or a mouse or a blue whale, this rough biological scaling law applies at all scales. lo and behold, the

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same scaling law applies to the whole total human system, the global human economy en masse together, where all countries, grow their energy consumption about to the three-quarter power of their size Okay.

[00:05:14] Energy and humans. We need energy for absolutely everything in our economies to move, to create, to invent, to refine, to deliver, to maintain, to repair, to dispose of. Energy is required for everything. There is, in fact, a 99% correlation between energy and GDP and around 100% correlation between materials and GDP.

[00:05:40] So our material, our GDP footprint is very tightly linked with more energy and more material use. If we consider electricity, those places in the world that have no blackouts or brownouts but 100% connectivity or very close to it have the highest GDP per capita. Once you just have even 1% or 2% of brownouts or blackouts, your GDP per capita drops substantially.

[00:06:09] Access to available energy 24/7 has so far in our society been incredibly correlated with economic success. So many listeners of this program know that we are living in this couple 300 special period where humans are drawing down ancient carbon, some might say from the maximum power standpoint, we are liberating ancient carbon productivity from the Earth tens of millions of times faster than it was sequestered.

[00:06:41] Tony Barnosky at Stanford showed that the total animal biomass has increased 700% in the last 300 years. This isn't because of technology, it's because we liberated this productivity from under the earth, and most of that increase is farm animals and humans. But we have seven times the mammalian biomass on the planet now than 300 years ago.

[00:07:11] So it's not just energy, it's energy combining with machines. So I've said this many times, the amount of work in a barrel of oil is 11 years of my work, but I

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can do work two and a half times more efficient, my muscles to the actual job than fossil fuels, so you have to handicap that by, 40%. So it works out to around four, four and a half years of human labor being replaced by a barrel of oil.

[00:07:42] We use 100 billion barrels of oil equivalent of coal, oil, and natural gas per year, which roughly is around 450 billion human worker equivalents. And I've done some tweaks on the math. It's actually closer to 400 billion, but, you know, it could be 100 billion or it could be a trillion, depending on the boundaries of the analysis.

[00:08:04] I cannot, even with a thousand other people, push a fully loaded semi-truck over Pikes Peak in Colorado in the middle of winter, but I can create presentations and spreadsheets, and duck houses that, that oil might not be able to do. So we have incredible amounts of machines in the Earth. In the human economy, the average American has 40 devices plugged in twenty four/seven in their houses, drawing down energy.

[00:08:39] We are surrounded by machines, and we don't even think about that because they're all powered by pretty cheap energy. But if you think about the unique period we're living in, where we add more and more primary energy to the global economy every single year, if you look at just the additions every year of coal, oil, and natural gas, not the baseline that we started with, but the additional fossil carbon we're adding to the economy, in effect, we're adding around five billion or four point seven billion average, during the last decade, human worker equivalents every single year to the global economy.

[00:09:20] I suspect that heterodox economists in the future will look back and say that this addition of more energy every year actually explains much of Solow's residual, which is the mystery of productivity that describes our wealth. So we are adding machines and the energy to power them on top of the human workers that exist every year.

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[00:09:44] So for now, oil is the economy. This is a logarithmic chart showing that the correlation on the bottom between oil consumption per nation and the GDP, per nation is around a point nine six R squared. Oil is incredibly special in its energy properties. It's very dense. It's liquid at room temperatures.

[00:10:08] It's transportable in pipelines and ships. It's like superhero juice that we can store in barrels and burn and refine and turn into things when we need them. Finally, in a review It's not oil that is the problem with the world economy. It's the energy and emergence that we self-organize in an economic system that optimizes profits.

[00:10:35] Profits are linked to energy, and 82% of our energy is fossil carbon. So what ends up happening is as we grow our economic system, we add nodes, little new subdivisions and new relationships between America and Indonesia and all different kinds of connections are added to the system. As we add nodes, the number of connections requiring energy increases by the square of the nodes divided by two, as a rough guess.

[00:11:07] So if we add ten new nodes in some subdivision, ten squares is a hundred, divided by two is fifty. Well, the right answer is forty-five. We add forty-five new nodes in the system-- I mean, new connections in the system, each of which require energy to maintain and traverse and transport in the next iteration.

[00:11:28] So you can extrapolate this to the global economy, which is growing continuously, creating transportation routes, shipping routes, air routes, Amazon truck routes, etc., all demanding energy. So from this perspective, global human culture is effectively not that it was anyone's choice, not that anyone wants this to happen, but global human culture is acting as an energy dissipating structure where oil, in effect gasoline and diesel, are the hemoglobin that's transporting goods and services through the arteries and veins of a global system.

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[00:12:11] Oil is not the problem. Oil is in service of this energy-hungry global transportation system. Okay, so what are the systemic inferences for this little brief overview of oil and the economy? First of all, we live in a system with an exponential monetary system pulling the entire thing forward. We create money with no tether to underlying resources and with no interest, so there's a compulsion of the entire system to grow.

[00:12:48] Irrespective of climate change or technology or efficiency, our economic system will continue to destroy the Earth if it is based on growth as the objective tethered to money, tethered to resources. As we eat down the high quality, low entropy energy and materials, not only will the scale of the human economy grow, but the percentage of our economy allocated to the energy and materials sector will also grow, shown here by an Ouroboros, a snake eating its tail and getting not only larger, but taking a larger percentage of the Earth.

[00:13:36] You can see this in the Jevons paradox, literature, and graphics that we do continue to get more efficient every year, about one percent more efficient in using resources, yet the global consumption of energy increases. Since nineteen ninety, we've increased energy efficiency by thirty-six percent, and yet globally, we've increased our consumption by sixty-three percent.

[00:14:03] Next point, we don't look at our situation in terms of systems. We recognize that climate change is an urgent problem. We recognize that the environment is a problem. So we take little micro snapshots of this picture and try to remedy them, like outlawing natural gas and propane stoves in New York or outlawing, allowing, internal combustion cars.

[00:14:33] Referenced last week, that's not going to directly reduce oil consumption. So a focus on electric vehicles as a response to climate is kind of like having a personal trainer focus on bicep curls, while you have a cancer

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diagnosis. Bicep curls are a good thing. They could help the future. Electric cars are cleaner.

[00:14:57] they use less energy, but system-wide, they are not a response to either climate or energy depletion. Next point, what about peak oil? peak oil historically, actually has never been about running out of oil. It's about the phase shift in human economies that happens once we start to lose those additional, fossil workers added to the human system instead of the last hundred years where they've been increasing every year.

[00:15:33] this chart shows-- it's based on Rystad Energy. My friend Art Berman made this chart. It shows, in fact, that peak oil did happen in two thousand and eighteen, at least so far, but we're still growing the total liquids, but it's not really oil, it's natural gas plant liquids, which, have less BTUs and can be used for plastics and things like that, not directly in cars.

[00:15:58] But we, decline by about a quarter, in the next thirty years It's not that we're running out of oil, it's we're running out of high quality, affordable oil at scale enough to power this system and its financial claims. So the issue with peak oil isn't oil collapse, it's financial collapse. The relevance of oil decline as we continue to paper over our finan- our energy, claims with more and more money the world over.

[00:16:33] and we can't print energy. We can only extract it faster with more money. So this little inflection here between the red lines and the yellow-- the white line is when all of a sudden we can't extract enough energy to maintain, particularly oil, to maintain all of the musical chair financial claims on the system.

[00:16:57] This is quite relevant on why oil decline is important. Another point is getting back to the maximum power principle. In nature, waste is actually

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evolutionary selected for. We don't run things purely at a hundred percent efficiency. We don't run things purely at using all the energy at the same time.

[00:17:22] We run things right in the middle, which is the part where the maximum amount of work can be done. This is called the maximum power principle. What that means is that humans and our aggregate system not only cares about energy and energy efficiency, but time. It's the amount of work that we get done, which is why many of the technical challenges of autonomous vehicles or lots of electric vehicles run counter to our own internal primate, disposition to get neurotransmitters in the moment.

[00:18:00] I want to go see a baseball game, and have fun the whole time. I don't wanna stop for two hours and charge my electric car, even though that would be saving energy and being better for the environment. So until we change the inner tech in our minds on how we get our basket of evolutionary neurotransmitters, maximum power is going to have a big say on sustainability and our energy use. Another point, there is a social discourse where we try to integrate climate, equity, and growth.

[00:18:45] But the reality is that there is no overlap between these three circles. We do have net zero, and kind of a global wealth transfer, convergence from the Global North to the Global South is the vocal part of, where these three circles overlap. But if you optimize for one of these things, the other two you can't optimize for, and this is a real problem that we're trying to optimize all three of those things, and all three of those things are really relevant.

[00:19:20] people are-- a lot of people within and between countries, this economic system is not working for them. They are squeezed out, and yet we need the economy to function to allow goods and services and stability, and any carbon, additional emissions is, counting against our carbon budget, and we're already kind of well past what the sustainable, stable levels could be.

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[00:19:47] Now, in the future, there could be overlap of these three things. We could have a better climate than the default. We could have some sort of growth in information and other things, not material growth, and we could have basic needs and wellbeing as a, a, a baseline for people. But right now in our current discourse, there's Gutierrez at the UN and many other people are giving lip service to how we optimize these three things at once, and I don't think we can. Oh, another thing, and I'm-- I, I had someone look at a draft of this, and they're like, "Dude, you don't wanna say that because you're gonna look like an apologist for the fossil fuel companies."

[00:20:30] I am certainly not that. I left Wall Street because I cared about climate change and the environment, and for the last twenty years, I've been working on this. I have to observe and describe what I see. There is a meme in the news that what is happening to climate is the fault of fossil fuel companies.

[00:20:48] Certainly, they, like many other companies, obfuscated the facts in order to grow their profits. It is not the fault of the people at Exxon what is happening. It is the shareholders of Exxon and Google and General Electric and Home Depot, the shareholders are optimizing profits. Profits do not have an environmental component in today's day and age.

[00:21:15] I did a video three years ago for Earth Day. You should watch this section on why fossil fuel companies are not to blame. But effectively, the meme is that there's five trillion dollars of subsidies that go to fossil fuel companies. That is bunk. Ninety percent of that are externalities, and of the remaining ten percent that are actual subsidies, ninety percent of those are subsidies to poor people, mostly in oil-producing countries, to give their citizens a break to be able to drive and do other things.

[00:21:48] Of the remaining one percent of actual subsidies, renewable companies are higher than they are for fossil fuel companies, and most of the

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subsidies to fossil fuel companies are actually in the form of tax credits. So to speak in terms of the amount of subsidies that governments give to fossil fuel and oil companies is a rounding error to the four hundred billion worker equivalents that fossil fuels give to us, to society Building on that, another point, and Just Stop Oil is a UK, activist organization.

[00:22:27] I realize that they're really not trying to stop oil. What they're trying to do is stop new oil and gas leases in the UK. Given the backdrop of this video so far, the critical power that is found in a barrel of oil, let me talk about the UK. The UK used to be one of the world's leading oil producers.

[00:22:48] Shown in this graph, the blue bars are the discovery of oil in the North Sea and various places around the United Kingdom. The red graphic is the production of oil, and we're less than half of the level that we used to be at. In the unshaded blue, the tiny little percentage of about 10 or 15% of the total is what's left to produce.

[00:23:12] So the UK's wealth and energy is behind it. Not only that, but, energy aside, the UK invests little and saves even less relative to the other G7 countries. And so it's no wonder that we have environmentally aware leaders in the world like President Biden and, the Prime Minister of England, that are environmentally aware and yet they're approving oil and gas leases in the UK, in Alaska, et cetera, because our countries depend on that.

[00:23:57] So there's optionality that comes from this. Right now we can pr- some countries can print money and with that money they can buy energy like Japan or, European Union. But ultimately the wealth of nations is energy and materials. From that vantage point, Russia and Canada are very wealthy nations in the long term and the UK and Japan not so much.

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[00:24:23] So when we talk about just stopping oil, this is part of it. It removes and truncates the optionality of the UK, going forward if they don't have access to this incredibly potent energy source. Building on that, it is quite apparent that we need to reduce emissions relatively quickly to avoid worse or possibly catastrophic climate impacts.

[00:24:50] next week I'm talking to Kevin Anderson about this. It is obvious that the Global North has been using more fossil fuels and is responsible for the majority of the emissions. So from an equity perspective to have the Global North reduce faster, and still leaving fossil fuels for the Global South makes sense.

[00:25:15] From a maximum power standpoint, this is the same equivalent as arguing with a forest fire. There is a metabolism to the system and humans are not going to voluntarily degrow. They're not going to reduce consumption en masse. I can reduce consumption. Those people listening to this program can reduce consumption.

[00:25:43] But en masse humans are not going to voluntarily sign up for less, especially when other countries can have more. And then this is actually more and more I'm thinking that the Great Simplification will affect the Global North and the remaining fossil carbon that's extractable may be consumed happily by Indonesia and Pakistan and India and other countries after our mismanaged, financial, kind of musical chairs situation.

[00:26:22] So humans are generally going to get, more pissed off and meaner and hot, cold, hungry, and so on, which right now all those negative emotions are directly held at bay by oil infrastructure and I think only an insignificant minority of humans will ever voluntarily, be guided by abstinence. And the other thing that I, should probably do an entire frankly on, but there's a sentiment to have a wealth transfer, which would be fair from the Global North to the Global South.

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[00:26:59] It actually cannot happen because in the process of transferring the wealth, it disappears. Imagine you had a car that was worth \$40,000 and you wanna-- you wanted to give half of the money to, a--another person. You can't give them the engine or the wheels or something. The car exists as a totality.

[00:27:22] This office where I'm recording this is owned by a landlord. We pay him rent. I assume he's relatively wealthy. This office might be worth \$400,000. If there had to be a wealth transfer in the world, he would have to sell this office or some of his other real estate, but who would he sell it to? Because other people would have to be selling at the same time.

[00:27:42] So the metabolism of the United States is different than the metabolism of France or Indonesia, but the wealth exists because the metabolism is ongoing, and so a wealth transfer other than one or two percent or something at the margin, even if it were voted on, cannot physically happen okay. The other thing is when we're talking about climate and energy and oil, we're running out of time.

[00:28:12] If we look at the Russia-Ukraine situation, this was a shot across the bow, no pun intended, of a biophysical phase shift. Russia and Saudi Arabia and Iraq, the three of them together control over fifty percent of the global oil exports. So I think you can see what's happening with the financial claims in reality and who controls the oil and the energy, and this is gonna be a major story in the coming decade.

[00:28:42] Russia is trying to destroy the dollar hegemony of the world. The US and NATO are trying to destroy Russia. I don't know how this is gonna manifest, but a lot of the, let's extrapolate the last fifty years of technology and growth forward in time, I think are unlikely, going to happen. My last point in this potentially upsetting and intense, frankly, is perhaps the most upsetting and intense point.

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[00:29:14] And that is the concept of choice. There are a lot of people looking at our current situation, whether they're focused on environmental issues or climate change or global poverty and inequality or polarization or whatever, and they're like, "We have a choice. We have to choose a better future." And with respect to the metabolism and the maximum power principle, we don't have a choice.

[00:29:44] We are, like individual cancer cells, becoming self-aware of this situation. We have the potential for an emergent response, but there is a biophysical unfolding of what's happening, where there's a history of decisions and emergence, has created a situation where humans, in the global market economy have outsourced our decision-making to the market.

[00:30:14] The market is now in control of all Global North governments in the world, and they're afraid to circumvent the market for fear of some Wile E. Coyote response. So the market as an emergent phenomenon of human culture is now exerting downward causation on the individual components of the superorganism, you, all of you watching this, and me.

[00:30:45] this doesn't mean that things are bleak or that they're over. It's that there is not a direct policy logical response to combat the superorganism in its current form. Thank you for paying attention to this long, frankly, again I'm not advocating this. I'm not happy about this. This is the conclusion of the scientific synthesis that I've spent 20 years putting together, and I'm trying to get more smart, caring people to recognize this is where we've come and to inform the path ahead.

[00:31:23] Talk to you next week.