Wile E Coyote

Our initial attempts at renewable energy sources have been rather inefficient and environmentally messy, but the next generation can be much cleaner. We have what we need to sustain ourselves as a civilization, but only a few of us know how to use it, and that knowledge is useless if we don't get it done on a large scale in a hurry.

Currently, lithium and rare earth mining are an environmental and political mess. New closed circuit refining techniques are solving the environmental problems, but the political problems surrounding China's control of the rare earths will continue. The limit on lithium batteries will likely be cobalt. As they start failing in large quantities in about 40 years, the cost of solar panel and battery recycling will likely substantially reduce. If we've got any foresight, we'll design the next generation of solar panels and batteries to be more easily recycled.

As electric car batteries eventually need replacement, they'll run a house for another 10 years and are quite reliable and recyclable. They can be a huge source of dispersed energy storage. With a bit of design foresight this could be safe, efficient, and sustainable.

The internet and the cloud in particular use vast amounts of electricity, all of which eventually ends up as heat one way or another. With a little foresight we can put some of that heat to work. Some of the energy consumed by the internet is used storing unused and often abandoned data, but most of it is consumed by the frivolous chit chat that is driving our kids into loneliness, depression, and analog incompetence. They talk together in very simplistic conversation, but they don't learn to do much of anything useful together. AI is further disrupting society as well as compounding our energy consumption. Almost all the time we spend on social media is time spent on frivolous entertainment and misguided or dishonest abstractions, and all that time is spent learning next to nothing about the tools for dealing with the real world. We need to clean it up and curtail our internet addiction and abuse.

The emerging technology of very clean and simple, large scale, stationary iron-air batteries is solving the problem of non-constant wind and solar. This is a big deal. Google it.

They cost more up front and have higher maintenance, but solar thermal generation doesn't need rare earths and can be much more durable. They're well suited to the hot deserts where photovoltaics degrade from heat, although they'll need to be taken off line when the sand blows. In general, they're not as well suited for electrical generation as photovoltaics, but solar thermal generation can be used directly as a heat source in a number of industries; plastic recycle in particular, where we can sandwich it between standard metal roofing and bake it into modular wall panels. This would long term contain much of the zillions of tons of already existing plastics that are too contaminated and degraded for use in extrusion or 3D printers, and would go a long way to solving our rapidly increasing housing shortage.

Enzyme digestion of plastics all the way back to a monomer is an obvious choice for the plastic in the oceans and the most contaminated and degraded plastics. There's already a plant in operation in France.

New research on thermal contrast electric generation at the water-air boundary avoids some of the problems associated with photovoltaics. It's not ready yet, but it holds great promise.

We can invest in insulated underground winter ice storage for summer air conditioning. There will be a few places where mines and quarries will be close enough to where we need the cold in summer, and it doesn't cost much to dig a hole and insulate it. This is a huge energy savings. In places with cold winters and hot summers, every new building should be built over an ice pit.

The limit on how many E-bikes are in use is safety. Bike lanes next to traffic are dangerous even if you're an experienced rider in good shape, and you suck in a lot of exhaust fumes. A bit of infrastructure money spent on bike roads separate from car and truck traffic would bring a whole new segment of the population on board.

We can stop lighting up the sky. This can be another large energy savings. All that electrical energy is wasted and it's why we can't see the stars. Life on this planet evolved over billions of years with a dark sky, and a great many species rely on the cycle of light and dark and the stars for navigation. Light pollution has many negative side effects throughout the spectrum of life on this planet. The solution is absurdly simple. A reflective shield is almost as cheap as the light bulb, and cuts energy consumption by a bit less than half.

Building any more conventional nuclear power plants can be extremely reckless. Only the best of plans for the next generation of nuclear power seem safe and affordable. It's not about abandoning nuclear energy. It's about learning from our mistakes and proceeding with caution.

Studying state of the art technology for the disposal of obsolete and derelict nuclear power plants; unless we spend a lot of time and money, it seems likely that a high percentage of them will end up spilling their guts one way or another. You can learn most of the basic plans for their cleanup just by watching a cat take a crap. For those that use plutonium we'll need to babysit the plutonium far beyond the life of this civilization. All of them rely on the grid with diesel backup to avoid catastrophe, both of which are vulnerable to a variety of disasters, both natural and manmade. We don't need to hear any more bullshit about how contemporary nuclear energy is cheap, safe, and clean. Short term, it's statistically safe and clean, but it sure ain't cheap, and when you factor in all the time, energy, resources, and pollution that all that money bought, and will need to be bought into the distant future, it's not a bit clean. Costs for the disaster at Fukushima are already around $1,000,000 per customer. Chernobyl is much the same.

Vitrification and deep burial can be safe waste disposal, but it's a bit expensive and it's potentially wasteful, as new technology is about ready to mitigate some of the problems with spent fuel rods and provide us with clean energy as we learn to get another round of energy from spent fuel rods. They still contain a lot of usable energy.

Carbon fiber wind turbine blades are toxic ticking time bombs. As the resins that bond the carbon fibers eventually degrade they'll release the very toxic carbon fibers into the environment. Unlike contact with fiberglass, which itches for a week or two until your skin sluffs the fibers off, if you come in contact with carbon fibers, you'll likely itch till the day you die. Our current use of carbon fiber composites is becoming widespread and it's gonna bite us in the butt as the resins that bind the carbon fibers eventually decay, releasing all that toxic carbon fiber into the environment. It's gonna be an itchy world someday. There are other materials that are almost as strong and much less toxic.

Many years ago I figured out a cheap, efficient, dependable way to harness wave energy, but before I went any further I computed the amount of mass in motion over time and found there wasn't nearly enough energy to bother with, so I dropped it. Waves are just a minor derivative of the wind. Now I'm watching someone spending millions on a system that looks like it's not nearly as efficient and cheap as what I had in mind who never stopped long enough to research how much energy was there, or maybe he just got the math wrong.

Carbon capture is much the same. It's a fool’s errand. It's not carbon; it's CO2, which is several times the mass and many times the volume of the coal and oil that it came from. Separating the carbon from the oxygen takes as much energy as we got when we burned it. The idea that we can refill the coal mines and oil wells is an absurdity. It's unlikely that it could even offset the energy, resources, and pollution that it takes to put a tiny fraction of it back in the ground. Even in places where energy is cheap and abundant, that energy could be better used in other more efficient ways. The exception is at the point of extraction for oil and gas, where byproduct CO, methane, and CO2 can be put directly back in the ground, but that's only a small fraction of our problems with greenhouse gasses.

Almost completely overlooked is designing our lifestyles and industries to use energy when it's available so we don't need to waste it or store it.

All of this is way too little too late. The massive industrial potential after WWII allowed the baby boomers to get us into the mess we're in, but even with all the talk about dealing with climate change

and pollution, the next generation is still doubling down on our consumption addiction, and the shit's hitting the fan as we speak. Look out for the fan blades on the way through and start planning about what to do with all the fertilizer on the other side.

You know how Wile E. Coyote never falls till he looks down? We've been riding the inertia of the industrial revolution for a long time now. It's becoming obvious that we're gonna crash. Unlike Wile E. Coyote, we don't have to give up, but we won't get a second chance. Now it's about our glide path on the way down. We need to stretch it out as much as we can, look for a good place to land, and hope for the best.