March 1, 2020

Thinking about the Environment

It is no secret that in this assembly of *religiously* liberal folks the majority is also, generally, Progressive. So, to the Progressive congregant, specifically the Progressive Environmentalist:

Thinking about the Environment.

Consider first, how we Think, or, more to the point, how we think we think. None of us is omniscient. Yet, it is in our nature and from our need for survival that we are compelled to *know* things. As a result, we form the best hypotheses we can to build a world view and inform our actions. We each weave a web of information and opinions, some shakier than others, differing person to person.

We often get into trouble when we do this. Popular Certainties. Imagined Reality. Fear. Anger. Cherished Enemies. … Seductive traps.

It is easy for us to observe resulting errors in thinking in certain quarters. *** (1) Current contra-factual "Radical Right" attitudes about immigrants are clearly ginned-up to hysteria levels by an appeal to ignorance and fear. (2) Denial of science amongst currently powerful office holders is astounding, especially in a country that has nurtured basic research and the advancement of technology and medicine. (3) Blind fealty to Capitalism, capital "C", without acknowledging its weaknesses and *inherent* dangers, is just plain simple-minded. The pernicious thing is this, that once adopted these certainties are no longer objects of rational thought. They become articles of faith, no longer open to question. We "intelligent" and self-satisfied Progressives find it easy to dismiss such thinking for its manifest ignorance. However, a rational humanistic and anthropological understanding of this behavior must lead us immediately to self-examination. If our "uninformed" brothers and sisters come to the preceding erroneous conclusions unknowingly, it is *more than likely* that we Progressives do the same thing in the same way. If the "Radical Right" nourishes *** irrational fears, favorite whipping-boys, and cliché salvations, so do we Progressives.

Today, consider how we fall prey to these errors when it comes to our fervent environmentalism and today's Energy and CO_2 Crisis.

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These days we speak earnestly about Climate Change and Gobal Warming, but remember that the underlying cause is the volume of CO_2 production, over 30 billion tons per year. Unlike Global Warming – which is nevertheless real -- this is not debatable. It's just a fact. Even before we consider global warming, *even* if global warming were not a threat, the CO_2 certainly is, *even* without knowing what it might do. We are significantly changing the delicate balance of the

atmosphere to which evolution and geology have subtly adapted. Before we even know what the damage may turn out to be, we can see the danger. This is, precisely, pissing in the well.

Ocean Acidification, another excess CO_2 effect, threatening all sea life, may actually be a more immediate threat than Global Warming, but it's seldom discussed. We latch on to the dramatic Doomsday narrative and forget about the elephant.

Not to mention the millions killed annually by particulate pollution from the burning of coal or the sulfur, mercury and radioactive material in the smoke and ash.

Granting that we do have a crisis, whatever we call it, what should we do? ** Can we make a big impact through Conservation? What forms of energy should we use to replace fossil fuels?

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Start with Conservation. A Green Sanctuary Committee is active here in our church. As they do their work, we are decreasing our energy usage and carbon footprint while saving money. This is a good thing. Compared to Western Europeans, who share a similar standard of living, we Americans use almost double the energy per person, so these efforts are obviously worthwhile here. But this does not apply to the majority of the earth's population who are starved for energy. Ten times the U.S. population uses under 85 watts of electricity per person while we use 1500! *Increased* energy usage over the centuries has led to *** better living standards, elimination of slave labor, and – dramatically – the emancipation of women and an attendant lowering of the birth rate.

Being stewards of our environment is one moral imperative. Relieving misery, poverty, and over-population is also an imperative. To accomplish this, we will need to provide vastly *more* energy to the world's population than we do now. If the world as a whole used energy at half our rate, it would need to more than double its current production! Conservation in rich societies is working at the margins and virtually irrelevant in solving the planet's energy and CO_2 crisis. If it doesn't degenerate into gratuitous self-denial, Conservation is a good thing, but it's not the solution to this problem.

In fact, it's a queer thing for the Progressive to become obsessed with capping our energy usage. A great part of our *progressive* human spirit is invested in creative improvements to our shared well-being and exploration of the unknown. Energy is the currency of these endeavors.

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Moving on then, what replaces coal and oil? Before considering some details, I pause with a simple assertion. You have to do the math! You have to do the math!! If you see a scattered family of sleek wind turbines on the Iowa prairie and know that they are tapping a "free" source while producing no CO_2, you fall in love. What a wonderful way to go. "Renewable!" "Green!" Let's do that! But you have to do the math. Can this mode of energy production, combined with others like solar, meet the needs, solve the energy crisis? You have to do the math.

I am an ardent Environmentalist. Rachel Carson galvanized my thinking at an early age. I am also a 74-yr old engineer who has been considering the energy options for over fifty years. I've spent hundreds of hours thinking about technical improvements that might be made to things like wind harvesting, and there are some interesting possibilities. But I've also evaluated the global need and the technology and done the math. As a result, I have come to two conclusions, each of which may shock, even anger, some of the Progressive Environmentalists here today.

Conclusion One:

As primary actors, Wind and solar do not have a ghost of a chance to solve the problem.

We now consume globally an equivalent of 4 cubic miles of oil every year (coal, oil, gas – an equivalent), 20 Terrawatt-years, on the way to doubling by 2050. Solar and wind are on a steep growth curve, but from where to where? Even with its recent rapid growth, the contribution is still marginal, with serious limits to its ultimate potential, and a host of intrinsic deficiencies.

Wind and solar are helping in a time of transition, but they can't really carry the load. Although they can contribute to electricity production -- requiring methane-leaking global-warming natural gas backup -- they can't even play in the huge sectors of heavy transportation and industrial heat. These harvests do have several fine applications. A small field of solar panels may revolutionize the life of a farmer in Senegal who can employ the energy to irrigate his small field for the first time. If you can go off the grid by erecting a wind turbine in your back yard, hurray! I've thought of doing it myself. But that option is not remotely relevant to the residents of New York, Los Angeles and Mumbai If you can harvest solar energy from your south-facing rooftop, *and* amortize the expense, go for it. But, if it takes a tax break to make the economics work, that isn't even close to a solution to the global energy problem.

If we attempt to meet our growing energy need using primarily inefficient and diffuse wind and solar, we will be perpetrating an environmental disaster through the use of gigatons of precious material, and millions of acres of the earth's surface. **** Concrete, steel, polymer, copper, lithium, heavy metals, caustic chemicals, and an ultimate disposal problem of gargantuan proportions. This is decidedly *not* the way to solve the problem.

Stanford's Mark Jacobson and colleagues have set forth a popular "Roadmap" to an all-renewable U.S. energy portfolio by 2050, but, if you do the math, it's wishful thinking. A careful analysis has shown that this erudite fantasy calls for half a million 5-megawatt turbines, 18 billion square meters of solar panels, 50,000 wind and solar farms, impossible storage schemes, and (*this* is a killer), based on a *generous* 40-year lifetime, the replacement of over a million square meters of solar panels *every day forever*, at a 15 to 23 trillion dollar cost which is greater than our GDP. This is bizarre!

Some of you may be thinking that this is really opinionated and inappropriate commentary to come from the pulpit. However, nothing is more important in our congregation than discussing our moral responsibilities to others and the earth. Consider our 7th principal: "Respect for the interdependent web of all existence of which we are a part." If we are going to give more than lip-service to this ideal, we have to go beyond fanciful dreams to hard-headed reality. We have to do the math.

If this evaluation is correct, why then have so many of us come to believe that the answer to the energy crisis lies in the area of so-called Renewables? There are several reasons, many romantic, but is it just possible that this has become a religion? Think about it!

Well, if not "Renewables", then what? If there is nothing else, Nigeria will burn coal, which leads to …

Conclusion Two:

We have in our immediate grasp a mode of energy production that can *** eliminate the burning of fossil fuels, produce no CO_2, and meet all of the earth's energy demand, even throwing desalination of water and synthesis of liquid fuels into the bargain. That answer is nuclear.

Now some of you are thinking that your brother has really lost his mind. I beg you to suspend your disbelief for a moment.

I was, like many—most?—of you, anti-nuclear for a long time, concerned about long-lived radioactive waste and other risks. In recent years, on closer examination, I have found that these matters can be, and generally are, handled in a robust and straightforward manner.

The Safety concern is way overblown in popular consciousness and readily addressed. We live in a sea of radiation. You are receiving 82% of your lifetime exposure flux right now, from the ground and the sky. The remainder will come almost entirely from medical diagnosis and treatment. A banana is radioactive and so are you. A person is in greater danger working in a grain elevator on the prairie than working in a nuclear power plant. *You* are in greater danger from

gasoline and Chlorox. Believe it or not, if you do the math, today, nuclear power generation is safer than solar and safer than wind, based on the number of deaths per unit of generation.

Also, "nuclear waste", which is mostly not waste, actually gives us a powerful argument *for* nuclear. Nuclear is the only method that sequesters all its waste, and the volume is tiny compared to any other large-scale method of power production. Nuclear waste is not a supernatural being about to grab you by the ankle. It's just physical material that can be physically secured.

On my own journey of discovery, having long known that Renewables fail an essential Criterion of Compactness (or Energy Density), I have followed hopefully the progress toward nuclear fusion, a likely but still elusive goal. We need something now! Personally, logic and knowledge of some wonderful technology has led me back to the potential of nuclear fission.

Visualize our vestry for a moment, 29 feet square, 12 feet high. If your American lifetime energy needs were met with coal, you would need to fill that room to the ceiling *twice*. If met through nuclear fission, you could hold the fuel in one hand. This is not a potential to be ignored lightly – because we're too scared. It's a gift from the stars!

Granted, we do have challenges doing nuclear the way we do it today with huge, expensive solid-fueled, water-cooled reactors. Even so, the French safely produce most of their electricity this way, recycling fuel, vitrifying a tiny waste stream, and creating the cleanest air in Europe, while Germany has gone backwards with its "green" elimination of nuclear, which has forced them to burn more coal. In the U.S., we still get one fifth of our electricity from nuclear.

Remarkably, there are even better, cheaper ways of doing nuclear. One of them is particularly exciting. The brainchild of our brilliant nuclear energy pioneers, it was successfully tested fifty years ago in our Oak Ridge labs, something called a Molten Salt Reactor. This is a **** simple, compact, economical, walk-away-safe means for harvesting nuclear energy. It has *zero* danger of *** hydrogen explosion, steam explosion, or meltdown. Zero. Also no release of volatile cesium or iodine. Furthermore, rather than producing more and more transuranic waste like plutonium, it has the potential to consume these materials, essentially eliminating the waste problem that is most fearful. That Oak Ridge reactor ran without a problem for almost five years until the end of testing. Leading physicists saw this as the future of energy production but the effort was abandoned for a variety of political and historical reasons.

A future home-run version of this technology can internally convert non-fissile Thorium into Uranium fuel. When this is a reality, we can power the world from beach sand. This little golf ball of Thorium would supply all your energy needs for a lifetime and cost about 100 dollars. Based on our work, the Chinese are actively exploring this technology while we, its inventors,

wring our hands. There are several significant efforts underway here, and some new support from our Federal Government, but public fear is still a strong headwind for these endeavors.

Maybe you have processed Three Mile Island, "The China Syndrome", Chernobyl and Fukushima in such a way that you will not even think about this. Maybe you picketed at Seabrook or Vermont Yankee. But maybe the mythology about all of this is just that, resting on a flimsy foundation of over simplification and fueled by irrational fear. We fear nuclear because it's as sneaky and invisible as the monster under the bed, yet everyday industrial chemistry presents a far greater hazard. Remember Bhopal? That terrible disaster dwarfs any nuclear accident in history, including Chernobyl. We'll live with it, though, because we can smell chlorine and vinyl monomer; we can't smell a gamma ray. This is not logical.

Speaking of nuclear accidents, thorough-going changes after Three Mile Island ensure that such a scenario will never recur here. In Fukushima, the tsunami itself was the deadly disaster; released radiation was miniscule and non-deadly. Chernobyl, tragic as it was, doesn't even count as a summary indictment of the nuclear industry. It was a faulty design being recklessly operated, with no containment structure! It was criminal! As a reason to stop doing nuclear, it's as logical as selling your car because some drunk drove into a school bus.

One other fear: nuclear energy generation is often conflated with nuclear weapons. Just to clarify, it is *physically impossible* for a conventional nuclear power plant to produce a nuclear explosion. The fuel is not close to a required level of enrichment, and there is no available mechanism for instantaneously compressing a fissile mass to the required density.

Let us be rational. The manufacture of chemicals, airliners, and drugs, the processing of foods all have serious dangers associated with them, but generally speaking, we manage these dangers thoughtfully and effectively, just as we can manage the dangers associated with nuclear energy.

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Return to where we began today: the careful construction of our cherished certainties and our favorite dart boards. If right-wing ignorance and irrational fear of "soft-headed liberals" contribute to denial of global warming, is it not possible that we progressives have also created and honored our own false demons?

A younger generation is looking at this with new eyes. One group has published "An Ecomodernist Manifesto", and begun enthusiastic advocacy for *modern* nuclear energy. At a conference, I heard two young women speak with enthusiasm about their founding of Mothers for Nuclear.

We old timers have a synapse or two left, too. Many of you know the work of Stewart Brand, creator of the wonderful Whole Earth Catalog. Like many of us, he was striving forward in the 60's & 70's with a crunchy-granola, smaller-is-better, anti-establishment, chickens-in-your-backyard agenda. But he has not lost his capacity to think, and to reconsider. A few years ago, he summarized this reconsideration with the following question. "In light of climate change, can you be an environmentalist and not be pro-nuclear?" That is a strong challenge.

The dense potential of nuclear energy can be readily harvested to end pollution and alleviate poverty. The big roadblock is not technology, but fear. I dream that we Progressives will overcome our fear and stand in the vanguard.

Amen

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Order of Service Header:

"Nothing in life is to be feared, it is only to be understood. Now is the time to understand more, so that we may fear less."

-- Maria Sklodowska (a.k.a. Marie Curie)

Sermon delivered March 1, 2020, First Church Unitarian, Littleton, MA