MuseLetter

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MuseLetter #327 / May 2020 by Richard Heinberg

Dear Readers,
This month I offer two short pieces: my review of Planet of the Humans*, a new film produced by Michael Moore; and "Nobody Takes Renewable Energy Transition Seriously," in which I offer suggestions for what we should do if we really want to get society off of fossil fuels and avert catastrophic climate change.*
Stay safe and healthy,
Richard

Review: Planet of the Humans

A few days ago, Emily Atkin posted a reaction to Michael Moore's latest film, *Planet of the Humans* (directed and narrated by Jeff Gibbs), in which she began by admitting that she hadn't seen the film yet. When writers take that approach, you know there's already blood in the water. (She has since watched the film and written an actual review. Full disclosure: I'm in the film, included as one of the "good guys." But I don't intend to let that fact distort my comments in this review.)

The film is controversial because it makes two big claims: first, that renewable energy is a sham; second, that big environmental organizations—by promoting solar and wind power—have sold their souls to billionaire investors.

I feel fairly confident commenting on the first of these claims, regarding renewable energy, having spent a year working with David Fridley of Lawrence Berkeley National Laboratory to assess the prospects for a complete transition to solar and wind power.

We found that the transition to renewables is going far too slowly to make much of a difference during the crucial next couple of decades, and would be gobsmackingly expensive if we were to try replacing all fossil fuel use with solar and wind. We also found, as the film underscores again and again, that the intermittency of sunshine and wind is a real problem—one that can only be solved with *energy storage* (batteries, pumped hydro, or compressed air, all of which are costly in money and energy terms); or with *source redundancy* (building way more generation capacity than you're likely to need at any one time, and connecting far-flung generators on a super-grid); or *demand management* (which entails adapting our behavior to using energy only when it's available). All three strategies involve trade-offs. In the energy

world, there is no free lunch. Further, the ways we *use* energy today are mostly adapted to the unique characteristics of fossil fuels, so a full transition to renewables will require the replacement of an extraordinary amount of infrastructure in our food system, manufacturing, building heating, the construction industry, and on and on. Altogether, the only realistic way to make the transition in industrial countries like the US is to begin reducing overall energy usage substantially, eventually running the economy on a quarter, a fifth, or maybe even a tenth of current energy.

Is it true that mainstream enviros have oversold renewables? Yes. They have portrayed the transition away from fossil fuels as mostly a political problem; the implication in many of their communications is that, if we somehow come up with the money and the political will, we can replace oil with solar and continue living much as we do today, though with a clear climate conscience. That's an illusion that deserves shattering.

But the film does make some silly mistakes. Gibbs claims that a solar panel will generate less energy than it took to build the panel. That's a misleading claim. Many teams of researchers have addressed the question of energy return on energy invested for solar power, and even the most pessimistic results (with which I mostly agree) say that the technology can yield a marginal energy gain. Much of that gain goes away if we have to "pay" for the energy investment entailed in providing batteries or redundant capacity. Wind power generally has a better energy payback than solar, but the location of turbines matters a great deal and ideal sites are limited in number. Assessing solar and wind power calls for complicated energy accounting, but the film reduces that complexity to a blanket, binary dismissal.

The film is low on nuance, but our global climate and energy dilemma is all shades of gray. Gibbs seems to say that renewables are a complete waste of time. I would say, they are best seen as a marginal transitional strategy for industrial societies. Given climate change and the fact that fossil fuels are depleting, finite resources, it appears that if we want to maintain any sort of electrical energy infrastructure in the future, it will have to be powered by renewables—hydro, wind, or solar. As many studies have confirmed, the nuclear power industry has little realistic prospect of revival. The future will be renewable; there simply isn't any other option. What is very much in question, however, is the kind of society renewable energy can support.

The fact is that we've already bet our entire future on electricity and electronics. Communications and information processing and storage have all been digitized. That means that if the grid goes down, we've lost civilization altogether. I don't think we can maintain global grids at current scale without fossil fuels, but I can envision the possibility of a process of triage whereby, as population and resource consumption shrink, the digital world does as well, until it's small enough to be powered by renewable electricity that can be generated with minimal and acceptable environmental damage.

I agree with Gibbs, however, that renewables are realistically incapable of maintaining our current levels of energy usage, especially in rich countries like the US. Transitioning to electric cars may be a useful small-scale and short-term strategy for reducing oil consumption (I drive one myself), but limits to lithium and other raw materials used in building e-cars mean we really need to think about how to get rid of personal cars altogether.

Mainstream enviros will hate this movie because it exposes some of their real failings. By focusing on techno-fixes, they have sidelined nearly all discussion of overpopulation and overconsumption. Maybe that's understandable as a marketing strategy, but it's a mistake to let marketing consultants sort truth from fiction for us.

During recent decades, the big environmental orgs wearied of telling their followers to reduce, reuse, and recycle. They came to see that global problems like climate change require systemic solutions that, in turn, require massive investment and governmental planning and oversight.

But the reality is, we need both high-level systemic change *and* widespread individual behavior change. That's one of the lessons of the coronavirus pandemic: "flattening the curve" demands both central planning and leadership, and individual sacrifice.

Planet of the Humans paints environmental organizations and leaders with a broad and accusatory brush. One target is Jeremy Grantham, a billionaire investment analyst who created the Grantham Foundation for the Protection of the Environment in 1997. Grantham was already a mega-rich investor before he "got religion" on environmental issues. I've had several face-to-face meetings with him (full disclosure: the Grantham Foundation has provided modest funding to Post Carbon Institute, where I work) and it's clear that he cares deeply about overpopulation and overconsumption, and he understands that economic growth is killing the planet. He's scared for his children and grandchildren, and he genuinely wants to use whatever wealth and influence he has to change the world. To imply, as the film does, that he merely sees green tech as an investment strategy is a poorly aimed cheap shot. Bill McKibben, who is skewered even more savagely, also deserves better; he has replied to the film here.

Finally, the film leaves viewers with no sense of hope for the future. I understand why Gibbs made that choice. Too often, "hopium" is simply a drug we use to numb ourselves to the horrific reality of our situation and its causes—in which we are all complicit.

Yet, however awful the circumstance, we need a sense of human agency. In the face of the pandemic, many of us are reduced to sitting at home sewing facemasks; it seems like a paltry response to a spreading sickness that's taking tens of thousands of lives, but it's better than sitting on our hands and saying "Woe is me." The same goes for climate change: figuring out how to eat lower on the food chain, or how to get by without a car, or how to reduce home energy usage by half, or growing a garden might seem like trivial responses to such an overwhelming crisis, but they get us moving together in the right direction.

For all the reasons I've mentioned, *Planet of the Humans* is not the last word on our human predicament. Still, it starts a conversation we need to have, and it's a film that deserves to be seen.

Picture credit: Rumble Media via Hollywood Reporter

Nobody takes the renewable energy transition seriously

"A goal without a plan is just a wish."

—Antoine de Saint-Exupéry

Despite all the demands from climate activists, scientists, and even policy makers, hardly a single country is taking the shift to renewable energy seriously. Even countries and regions that *claim* to be working toward an energy transition are failing to do what would be required in order for the transition to succeed. What's behind this surprising and disturbing state of affairs?

The energy transition is a big job, it's complicated, and it needs to be done quickly if we are to avoid the catastrophic impacts of climate change. Therefore, it can't just be left to the whims of the market. Yes, if solar panels produce electricity cheaper than coal power plants do, then more households and businesses will buy solar panels. But the energy transition demands far more than this: it requires either finding ways to hook up millions of new intermittent power sources in such a way as to provide electricity that matches demand day and night, summer and winter, or giving up on the luxury of having 24-7 access to power at our fingertips. And it requires finding ways to curtail the energy demands of manufacturing and transport systems and to run those streamlined systems on renewable electricity rather than solid, liquid, or gaseous fuels.

In short, it requires a plan. Small teams of academic researchers have already attempted to provide transition plans, but so far these are little more than schematic suggestions based on assumptions that are typically over-optimistic and untested. A serious plan would, of course, be constantly revised on the basis of new findings and changing circumstances. Nevertheless, without a serious and detailed plan, and one endorsed by high-level policy makers, we cannot hope to achieve much.

A serious energy transition plan would start with a goal—not just the general target of "zero-carbon energy," but a vision of an end state whose details derive from the specific characteristics of renewable energy sources. This goal would need to be both realistic and desirable.

Crucially, the plan and its goal would address the problem of scale. When our team at Post Carbon Institute spent a year studying the opportunities and roadblocks of a renewable energy transition, we concluded that industrial nations like the United States would have to scale back their overall energy usage considerably—perhaps by three-quarters or more—in order to get along without fossil fuels. If that's really the case, then a serious plan should identify ways to reduce energy usage substantially, sector by sector, and not just through efficiency gains. A serious energy transition goal would describe, in detail, a smaller economy that nevertheless meets people's genuine needs.

Another mark of a truly serious effort at energy transition would be a proof-of-concept experiment. Why not transition a small industrial city right away? That would mean running not just its electrical power system on renewables, but its transport system and food system as well, while also supplying heat

for its homes. The concrete for its roads and buildings would be made using renewable electricity, as would the glass for its windows. The experiment would have to be subsidized, with the understanding that many technologies used in it might get cheaper later on as they are deployed at scale. But costs would nevertheless be calculated and fed back into the overall iterative plan. This experimental approach would provide an opportunity to see what works and what doesn't. Adjustments would be made on the fly.

As I've already implied, one of the biggest challenges to a wholesale shift to renewable energy is that solar and wind generators produce electricity, while existing transport systems, food systems, building heating systems, resource extraction systems, and manufacturing operations typically depend on gas, oil, or even coal. There are two ways of matching new energy supplies with current energy usage patterns: electrify the end use (for example, by building millions of battery-powered electric cars); or use electricity to make a fuel that works in existing technologies (for example, by building factories that use electricity to extract hydrogen from water, and that then combine the hydrogen with carbon from the atmosphere to produce a hydrocarbon liquid, so that internal combustion-engine cars can be fueled indirectly by solar and wind power). Both approaches have costs and drawbacks. Which is better, and in what circumstances? What are the likely unintended environmental, economic, and social consequences? It's hard to know without doing real-world experiments that involve integrated systems—i.e., actual people working with actual materials and energy supplies on farms and in factories within actual communities and ecosystems.

By the way: when you read about towns or regions already running on "100 percent renewable energy," look closer. Typically, what that means is "100 percent renewable *electricity*," with the great majority of overall *energy* usage (usually around 80 percent) still occurring by way of fossil fuels. Also, many places with very high percentages of electricity coming from renewables—such as Quebec and Norway—benefit from unusually large supplies of hydro power. And then there are municipalities that achieve the "100 percent renewable" goal only by purchasing renewable energy credits. The experimental city I am envisioning does not currently exist. But if we are serious about the energy transition, we need to retrofit or build one right away.

I should note that our team considers nuclear power an even more challenging substitute for fossil fuels than solar or wind power. If you have a differing opinion on that point, the electrification challenge still remains, as does the requirement for a detailed plan, which has to include safety, security, and waste management measures.

A plan would specify the means for its fulfilment. How much money would be needed, and over what period of expenditure? What kinds of raw materials, in what quantities? How many workers, with which skills? And, how much energy would have to be devoted to the job? The numbers, in each case, are likely to be boggling; that's one of the main reasons our team concluded that highly industrialized countries should aim to shrink their economies as they make the transition.

A plan would entail stages of completion, with targets and evaluations at each stage. Such a plan would also require sound leadership and social cohesion.

Leaders would need to communicate clearly why the transition is needed, what sacrifices will be required, and what rewards can be anticipated. The scale of the leadership challenge for the energy transition can be compared with the extraordinary requirements during the current pandemic: in both instances, leaders must successfully motivate large majorities of citizens to change behaviors and expectations, and to maintain unusual levels of effort over long stretches of time.

By pointing out that little of what is required for a successful energy transition is currently in place, I'm not intending to sow despair or discouragement—only realism. Everyone knows that current US federal executive leadership has no interest in developing a renewable energy transition plan, but Green New Deal proposals from the Democratic opposition have been carefully framed to avoid mentioning difficulties and tradeoffs. Until national leaders around the globe start taking the energy transition seriously, there is little hope of it actually happening. Right now, we have no shared plan other than to bumble our way along until fossil fuels deplete or climate change undermines civilization, whichever comes first, while making half-hearted gestures at building add-on renewable energy supplies. Surely, we can do better. We don't need a perfect plan in order to begin, but we do need one—and it has to be serious.

[Addendum, mainly for energy policy nerds:

None of what I have said above is meant to obscure the multitudinous efforts under way globally to develop renewable energy and reduce greenhouse gas emissions.

For example, within the US, California has the most comprehensive set of incentives and penalties and the clearest focus. The central document laying out the state's energy policy is the 2019 Integrated Energy Policy Report. The state's end goals have been updated over time as prior goals were met. For instance, Executive Order S-03-05 Schwarzenegger set the goal of GHG emissions 80 percent below 1990 levels by 2050; and EO B-55-18 Brown targeted statewide carbon neutrality by 2045.

The SB 32 GHG emission targets for 2030 of 40 percent below 1990 levels were achieved by the electricity sector in 2017. Renewable electricity is the easiest part of the energy transition, as is reflected by that sector's achievement of its goal 13 years ahead of schedule.

Other strategies are set forth in various laws and programs, including more aggressive energy efficiency of buildings and appliances, funding for electrification of transportation, development of a comprehensive car charging network, funding to increase energy efficiency in industrial food processing facilities, increasing and developing storage to absorb excess solar production, utilizing grid management to support transition goals, the Low Carbon Fuel Standard, and CARB's Cap and Trade program. One of the reasons California has been able to develop so many different and somewhat coordinated programs is that the state now has a third consecutive governor who is making climate change a priority. This has created a consistent direction for the key state energy agencies.

However, these various efforts have not been folded into an integrated plan

with related policies, investments, and piloting. So, while California does have a plan of sorts for an energy transition, its plan is still framed within the narrative of a growth-based economy and deals mostly with decarbonizing the grid. Serious gaps that have not been addressed include high-heat industrial processes, aviation, imported materials, and embodied energy. Demonstration projects have focused on specific technologies, such as microgrids, not on the integrated energy, transport, food, waste, water, resource extraction, and manufacturing systems on which every city, region, and country depends.

The situation is generally similar for other nations, regions, and cities often cited as examples of leadership in the energy transition. Hard work is being done, but relatively little overall progress is being made toward the ultimate goal of ending the world's reliance on fossil fuels. That is likely to continue being the case until serious transition goals and plans are adopted, and integrated, multisectoral, regional experiments are undertaken.

Many thanks to David Fridley and Jared Babula, who were consultants for this article.]