A Mostly Wind- and Solar-Powered U.S. Economy Is a Dangerous Fantasy

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The Biden Administration's proposed transition to "net zero" via wind and solar power is not only not easy, but is a total fantasy. It likely cannot occur at all without dramatically undermining our economy, lifestyle and security, and it certainly cannot occur at anything remotely approaching reasonable cost. At some point, the ongoing forced transition will crash and burn. (Photo by VCG via Getty Images)

USA: With or without Congressional support, President Joe Biden has determined to move the U.S. as quickly as possible toward an economy predominantly powered by wind- and solar-sourced electricity. In his earliest days in office, Biden issued multiple Executive Orders directing the federal bureaucracy to bend all efforts to achieve this goal. One of those early Executive Orders, dated January 27, 2021 and titled "Tackling the Climate Crisis At Home and Abroad," stated:

> "It is the policy of my Administration to organize and deploy the full capacity of its agencies to combat the climate crisis to implement a Government-wide approach that reduces climate pollution in every sector of the economy…"

When burned to generate energy, fossil fuels — coal, oil and natural gas — all emit carbon dioxide, otherwise known in Biden-speak as "climate pollution." Thus, under Biden's directive, they are all to be suppressed. The alternative of expanding nuclear power has meanwhile equally been made impractical by regulatory obstruction; and our potential hydro-electric capacity is already mostly in use. That leaves as the principal remaining option the generation of more electricity from wind and solar facilities; and indeed, the wind/solar electricity option is currently the subject of great regulatory favor, including extensive government subsidies and tax benefits.

On last year's Earth Day, April 22, 2021, Biden issued a press release expanding on his Executive

Orders and setting specific goals for the elimination of fossil fuels from the U.S. economy. Although Congress has not acted on any such proposals, the Earth Day press release supposedly committed the United States by unilateral executive action to “100 percent carbon pollution-free electricity by 2035,” and to a “net zero emissions economy by no later than 2050.”

We are thus as a country embarked on a government-ordered crash program to eliminate our fossil fuel electricity generation within a very short 13-year period, and to eliminate all usage of fossil fuels within a not-much-longer 28 years. When Biden and other advocates of wind and solar generation speak, they appear to believe that the challenge posed is just a matter of currently having too much fossil fuel generation and not enough wind and solar; and therefore, accomplishing the transition to “net zero” will be a simple matter of building sufficient wind and solar facilities and having those facilities replace the current ones that use the fossil fuels.

They are completely wrong about that.

The green energy advocates, including our President and his administration, entirely misperceive the challenge at hand. The proposed transition to “net zero” via wind and solar power is not only not easy, but is a total fantasy. It likely cannot occur at all without dramatically undermining our economy, lifestyle and security, and it certainly cannot occur at anything remotely approaching reasonable cost. At some point, the ongoing forced transition, should it continue, will inevitably hit physical and/or financial limits, and will crash and burn. But the circumstances under which the crashing and burning will occur are currently unknown. Thus, worse than being a mere fantasy, the attempt to accomplish a “net zero” transition is a highly *dangerous* fantasy, putting the lives, health, and security of all Americans at risk as the attempted transition proceeds to its inevitable failure.

The root of the mostly-unrecognized problem is that wind and solar generation facilities produce something fundamentally different from what fossil fuels produce. Fossil fuels produce energy that is reliable and dispatchable, that is, available when wanted and needed. The wind and sun produce energy that is intermittent, that is, available only when weather conditions permit, which often does not correspond to consumer demand.

Here is something that ought to be blindingly obvious, but unfortunately goes largely unmentioned in discussions of the green energy transition: **No amount of incremental wind and solar power generation on their own can ever provide a reliable 24/7 electricity grid.** Electricity gets produced the moment it is consumed, and therefore a reliable grid must provide electricity to meet consumer demand at all hours. To take just the most obvious example, wind turbines produce nothing when the wind is calm, and solar panels produce nothing at night; and therefore, a combined wind/solar system produces nothing on a calm night. Unfortunately, peak electricity demand often occurs in the evening, shortly after sunset, when the wind is calm or close to it. Without full back-up from some source, an electrical grid powered by the wind and sun will experience, as just this one example, a full blackout on every calm night. And it doesn’t matter whether you build a million wind turbines and solar panels, or a billion, or a trillion. On a calm night, they will still produce nothing, and will require full back-up from some other source.

Fossil fuels, and particularly natural gas, are fully capable of providing the back-up needed by a principally wind/solar electricity generation system. But our President now directs that fossil fuel back-up is “carbon pollution” and must be eliminated. The remaining option is storage of the energy from the time when it is produced (e.g., in the case of a wind/solar system, at noon on a windy June day) until

the time when it is needed for consumption (e.g., 7 PM on a calm December night).

Which brings us to blindingly obvious statement number two: **If you propose a predominantly wind/solar electricity system, where fossil fuel back-up is banned, you must, repeat must, address the question of energy storage.** Without fossil fuel back-up, and with nuclear and hydro constrained, storage is the only remaining option. How much will be needed? How much will it cost? How long will the energy need to remain in storage before it is used? And, do storage systems exist that can store the energy for that period of time and return it without significant loss and at the rate required to keep the lights on?

If our government officials were remotely competent, while proposing a green energy transition for the country over a short period of years — and with hundreds of billions of dollars, if not trillions, being spent on the imminent transition — these questions should be at the forefront of their attention every day. Long before the U.S. ever got committed to transition to an energy system based mostly on wind and sun, it should quite obviously have been far down the road toward demonstration of the feasibility and cost of the energy storage systems that are capable of enabling the transition.

There should be highly-detailed engineering studies of how the transition can be accomplished. The requirements for amounts of batteries measured in gigawatt hours should be known at a high level of precision. The amounts of materials needed to produce the batteries should be known with an equally high level of precision. The technological capabilities of the batteries should be known with an also equally high level of precision (e.g., What is the optimum chemistry of the batteries to be used in the system? What will be loss of energy between input into the battery and consumption? How much in the way of additional generation facilities must be built to provide for this loss? How long can the batteries hold the charge? If charge added in June needs to be stored until December, do the proposed batteries have that capability? Do the proposed batteries need expensive climate control systems to enable them to hold the charge before it is used? And so on, and so on.)

Indeed, by this time, supposedly only 13 years from when we will have a carbon-free electricity system, there should be existing demonstration projects showing clearly what technology will be used, and that the proposed technology works and can be deployed at grid scale and at reasonable cost.

But the opposite is the case. At the current time, the government is paying little to no significant attention to the energy storage problem. There is no detailed engineering plan of how to accomplish the transition. There are no detailed government-supported studies of how much storage will be needed, or of what technology can accomplish the job, or of cost.

It gets worse: In the absence of any serious government effort to address the engineering challenge of energy storage necessary to back up a predominantly wind/solar electricity system, the task has instead fallen to a small number of volunteer amateurs, mostly retired engineers of one sort or another. Several such people have produced credible calculations indicating that backing up a predominantly intermittent wind/solar electricity system using only battery storage will require storage in the range of approximately 30 days of average usage to avoid significant risk of the batteries running out of charge and the system crashing. The high amounts of storage required are largely a consequence of the seasonality inherent in either wind or solar generation, e.g., solar facilities produce far more electricity in the summer than the winter.

One example of a serious effort to determine how much and what type of energy storage would suffice

to back up a fully wind/solar electricity system was produced in 2018 by a man named Roger Andrews, a retired engineer then living in Mexico. Andrews's work appeared on a website called Energy Matters in November 2018. Andrews considered two cases, one for California and the other for Germany, and obtained detailed data of electricity usage and of production by existing wind and solar facilities in those places in order to make his calculations.

Andrews's spreadsheets, and charts appearing in his post, demonstrate that, largely due to seasonality of production from both the sun and wind, it would take approximately 30 days of stored electricity usage to get through an entire year with a wind/solar system. Andrews showed that batteries to hold that amount of charge would cost in excess of a full year's GDP for either California or Germany, although, based on existing technology, batteries even at such enormous cost would not have the capability to hold the charge for sufficient months to fulfill their task. At the end of his post, Andrews concluded: "[B]attery storage is clearly not an option for a low-cost 100% renewable future."

In a more recent example, in January 2022, a man name Ken Gregory — a retired engineer living in Calgary, Canada — undertook to produce a spreadsheet calculating storage requirements and costs for backing up a wind/solar electricity system for the case of the entire United States. Gregory's work is accessible at this link. Gregory's spreadsheet is based on detailed (in this case, hourly) data for actual consumption and generation from existing wind and solar facilities, with their wildly fluctuating output.

Gregory's principal result is that full back-up by storage of the U.S. electricity system at current levels of consumption, and assuming all generation comes from wind and solar, would require something in the range of 250,000 gigawatt hours of battery capacity. Some of that energy would need to remain in storage for over six months, and be discharged over the course of months. Since U.S. electricity consumption is currently in the range of 3.7 million GWH per year, the 250,000 GWH storage requirement calculated by Gregory represents about 24 days of average usage, a result in the same range as the result reached by Andrews. Gregory calculated the cost of such a system as well over $100 trillion, before even getting to the question of whether battery technology exists that can store such amounts of energy for months on end and then discharge the energy over additional months. And even at that enormous cost, that calculation only applied to *current* levels of electricity consumption. The Biden "net zero" plan for 2050 involves the approximate *tripling* of electricity consumption, which by Gregory's calculations would drive the cost of the necessary storage up to the range of some $400 trillion. For purposes of comparison, the entire U.S. GDP is currently around $22 trillion per year.

Obviously Gregory's calculations could be questioned or modified as to many of his assumptions, and perhaps his calculation of the cost of such a system is too high — or maybe, too low. The fact remains that if the U.S. government were even slightly competent, it would have its own detailed engineering studies of how to accomplish its coerced energy transition, let alone, at this late date, demonstration projects for small cities or towns establishing the feasibility and cost of what is being proposed. None of that exists. Indeed, none of it is even in the works.

To fully understand the depths of incompetence with which the U.S. government is approaching this energy transition, consider the current effort of the federal Department of Energy called the Energy Storage Grand Challenge. Under this program, the DOE proposes to hand out grants to study the challenges of creating batteries to back up the electricity grid when the grid has gone almost fully wind/solar, and particularly to study the subject of the "long duration" batteries that will clearly be needed to store and then discharge massive amounts of energy over the course of months on end to

deal with the issue of seasonality.

According to a piece that appeared in Energy Storage News in September 2021, here is the status of that effort: “The DOE is also helping to get a US $75 million long-duration energy storage research centre built at Pacific Northwest National Laboratory, which is expected to open by or during 2025.” In other words: we have a hundred-trillion-or-so dollar effort that under presidential directive must be fully up and running by 2035, with everybody’s light and heat and everything else dependent on success, and not only don’t we have any feasibility study or demonstration project, but we haven’t started the basic research yet, and the building where the basic research is to be conducted won’t be ready until 2025.

Meanwhile the country heads down a government-directed and coerced path of massively building wind turbines and solar panels, while forcing the closure of fully-functioning power plants burning coal, oil and natural gas. It is only a question of time before somewhere the system ceases to work. It is impossible to predict exactly when and where that will occur. But it is easy to see how the consequences could be dire. Will millions be left without heat in the dead of winter, in which case many will likely die? Will a fully-electrified transportation system get knocked out, stranding millions without ability to get to work? Will our military capabilities get disabled and enable some sort of attack?

No sane, let alone competent, government would ever be headed down this path.

by Francis Menton

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Date Created
06/26/2022