The End Of Electricity

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There seems to be a consensus that the depletion of fossil fuels will follow a fairly impressive slope. What may need to be looked at more closely, however, is not the "when" but the "what." Looking at the temporary shortages of the 1970s may give us the impression that the most serious consequence will be lineups at the pump. Fossil-fuel decline, however, will also mean the end of electricity, a far more serious matter.

It is easy to assume that the main issue with fossil-fuel depletion is the problem of what to put in our automobiles. For some, the problem may seem hardly big enough to worry about. The average motorist will have to accept paying far more for gasoline than in earlier times. "So what?" the driver may ask. "The Japanese [or whoever] have been paying far more for decades." And driving is not only a matter of transportation, it is one of our great passions. The mileage we rack up on our vehicles is breathtaking, and for many the motto is, "I'd rather drive than eat." We can always assume with only the slightest of guilt feelings that ecological matters are somebody else's problem. We are tacitly confident, in other words, that our own problem of fossil fuels can be solved by a job promotion and a raise.

But that view may be totally wrong. A far greater consequence of fossil-fuel depletion could be the effect on the production of electricity. As time goes by, the biggest question of all may be, "Can we even keep the electricity going?" If we end up facing unavoidable world-wide blackouts and brownouts, then the result will be a sudden and catastrophic chain reaction. Fossil fuels and electricity are tightly integrated. We cannot have one without the other. Without fossil fuels, we can produce no (or not much) electricity. Conversely, without electricity, we lack the "nervous system" (a good analogy, since nerves work by ion transfer) to control any equipment that uses fossil fuels.

If all the above is true, then what we should be thinking of is not the familiar slope of fossil-fuel depletion depicted in 20 or 30 major studies, but a figure consisting of a gentle slope that continues for a very few more years and then becomes a steeper curve downward. When fossil fuels are inadequate for maintaining electricity, the further results will be manifold. Fossil-fuel production itself will cease, and so will a great deal else.

For that matter, it is not only fossil fuels and electricity that form a tightly integrated group, but a triad: fuels, electricity, and metals. Without fossil fuels and electricity, we cannot produce metals. For now, let us focus on the first two of the three, but there are other issues will also need attention one day.

Is there tangible evidence for such a rapidly plunging slope? Let us look at energy in general, not just fossil fuels. In several versions of his "Olduvai" essay, Richard C. Duncan gives various dates for a "brink" and a "cliff," even if I cannot always follow his reasoning in arriving at these dates. What is most important among the data that Duncan uses is the fact that world energy production per capita peaked and reached what he calls a "rough plateau" in 1979 (the same year in which global oil per capita reached a peak). If world energy per capita has already reached a peak, then electricity is in danger. It is very unlikely that demand for electricity will decline.

There have been various studies of this plateau, but they all give approximately the following results. For each of the following years, (A) is global energy generation in terawatts, (B) is global population in billions, and (C) is global energy generation per billion persons (the ratio of A over B).

1965 (A) 5.0 (B) 3.2 (C) 1.6

1979 (A) 8.9 (B) 4.2 (C) 2.1

2005 (A) 13.4 (B) 6.3 (C) 2.1

The danger is when "global energy available for production of electricity" in a particular year no longer matches "global energy required for electricity." In other words, when we no longer have enough energy to channel into necessary electricity production, the game is over. Yes, we can divert some energy sources away from their present uses towards the production of electricity, but such a diversion causes its own problems.

For better or worse, the sources of electricity are mainly fossil fuels, and will continue to be so for the foreseeable future, so as these reach the down-slopes of their bell curves, electricity will follow a fairly similar curve. When will all this happen? It already has, beginning with that "rough plateau." The only remaining question is how quickly the various events will unfold. That in turn must be subdivided into questions on such matters as the supplies of the sources (oil, natural gas, coal, hydroelectricity, nuclear power, etc.); on global GDP; on global population; on the amount of electricity generation; and on the chances of voluntarily conserving electrical power. (The chances of voluntary reduction are obviously slim, however. According to BP's Review of World Energy, from 1990 to 2008 global electricity use actually rose by 70%, which means an increase per capita of 41%.)

We must not forget the above-mentioned chain reaction   the feedback mechanism. As less fuel (or any other source of energy) is available to produce electricity, there is less electricity to produce fuel. As less electricity is available to produce fuel, there is less fuel to produce electricity. The end is swift.

The answers are also complicated, of course, by the fact that the global data are not reflected in more-localized data. For some countries, blackouts and brownouts have been a way of life for years. But no country should assume that it is safe. In the U.S., the main energy source for electricity is coal, and there have been several recent reports that coal in the U.S. is not as abundant as once assumed. The remaining coal is of poor quality and difficult to extract.

For years I have lived with Richard Duncan's several versions of his "Olduvai" essay, reading them many times, often puzzled. Yet his writing continues to haunt me, because there is obviously something important staring out. In particular, I am struck by his emphasis on electricity. An important addition to his 2006 version is his emphasis on "proximate" versus "ultimate" causes of systemic collapse. ". . . Permanent blackouts . . . will be the proximate (direct, immediate) cause of the collapse of industrial civilization. In contrast, [there will be] many ultimate (indirect, delayed) causes. . ."

Duncan also points out that the importance of electricity is overlooked because it is not the underlying giant problem of "the limits to growth." As any science-minded person knows, electricity is not even a source of energy, it is merely a carrier of energy. Fossil fuels are the primary sources of energy in our industrial civilization. Yet electricity is subtle, and its importance is easily underestimated.

It is "end use" that is significant. In his 2006 version, Duncan says that "electricity wins hands down as our most important end-use energy. To wit: I estimate that 7% of the world's oil is consumed by the electric power sector, 20% of the world's natural gas, 88% of the coal, and 100% each for nuclear and hydroelectric power. The result is that electric power accounts for 43% of the world's end-use energy compared to oil's 35%."

There are always many problems with the use of electricity. It is certainly costly. Duncan notes that, according to the International Energy Agency, the worldwide investment funds required for electricity from 2003 to 2030 will be about $9.66 trillion. That sort of money is simply not available. In the 2000 version of his essay, Duncan adds that electric power systems are "complex, voracious of fuel, polluting, and require 24h-7d-52w maintenance and operations." Personally, I think of the great blackout of August 14, 2003, when a large part of northeastern North America came to a halt. But that was only one day, with a few serious problems on following days. Independent generators kept hospitals and restaurants going. Water trucks solved a problem for cities that did not have gravity-fed reservoirs. But what if the problems had continued for a much longer time perhaps forever so that those clumsy attempts at rectification were no longer operating?

When the lights go out, so does everything else.

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