BASIC IDEAS ABOUT ELECTRIC POWER SUPPLY: CAN WE SURVIVE ON WIND, SOLAR AND MARINE POWER?

By Cliff Ollier

ELECTRIC POWER is used for different purposes at different times, and we have to distinguish between average load and peak demand. Sometimes the peak demand occurs in winter evenings (heating loads) and sometimes in the middle of summer (air-conditioning loads).

The Capacity factor is used to compare the relative merits of different types of power supply. It is the ratio of the average load to the peak demand.

CONVENTIONAL POWER GENERATION
There are basically three types of generating plant:

a) Base load that operates ~90% of the time generating efficient low-cost electricity. Coal and nuclear plants are prime examples.

b) Mid-range plants that are often shut down in the early hours of morning and generate maximum power during the day and during peak demand periods. Hydropower and gas-fired stations, are examples.

c) Peak load stations that operate for between 1% and 20% of the time during peak demand periods. Gas turbines, hydropower stations and pumped storage hydropower are examples.

All these plants can be relied upon to operate when needed - unless they break down or fail to start, which can also happen in alternative energy production.
Most conventional power systems have a capacity factor of between 50% and 70%.

RENEWABLE ENERGY POWER GENERATION
The currently popular renewable energy technologies add to the problems of operating a power system because they are unpredictable and their output changes rapidly.

Wind power. A change in the output of 50% in a few minutes is not unusual. Attempts to predict the output of wind farms more than an hour ahead have not been successful. Capacity factors vary from 18% to 37%.
Wind power costs about US$2200 per KW. This transfers to a cost of 8 -10c /kWh.

Solar power. The output varies predictably every day and unpredictably every time a cloud passes over the sun. A cloud can drop the output by as much as 60%.
The capacity factor is around 20%.
The capital cost is in excess of $5000 per KW. This transfers to a cost of around 40 c/kWh.

Marine power. Suggestions for using marine power come in many forms but all are very expensive to build, more or less unpredictable, and in most reliability is likely to be low. Operation and maintenance costs are unknown but likely to be very high. The much-touted Pelamis wave power generator project off the coast of Portugal has been abandoned because of financing and technical problems. In the UK the Severn Barrier project to use tidal forces is on hold. It would be the most expensive alternative energy project, and makes a barrier to shipping and fish migration. The tides are reliable, but occur at a different time every day.

None of these renewable energy technologies would exist without grants and massive subsidies.

FURTHER CONSIDERATIONS

Two further considerations are essential in power supply, though they are almost always ignored.

Frequency keeping . Power systems have a need for frequency keeping because the amount of electricity generated must always match the demand exactly. Generating plant must be available that can increase or decrease its output very rapidly to avoid system collapse. This is necessary if there is a sudden large change in load -- the beginning and end of a popular TV programme is a classic example.
Frequency keeping stations are designed to cope with these fluctuations.

Energy storage. Renewable energy like wind or solar is not produced when needed, so storage is needed, and this is expensive. All the promoters of renewable energy ignore the need for storage.
What is needed is a large-scale, efficient, low-cost technology that can store huge amounts of electrical energy for weeks or months. No suitable technology exists or has even been contemplated. Hydro-pumped storage is the best we have. It is expensive - at least $1500 /kW - and requires two very large storage lakes not far from each other and with one lake something like 700 m higher than the other. The losses are 25%. The cost, the losses, and the difficulty of finding a suitable site are insuperable barriers to large-scale adoption of hydro-pumped storage.

So people who tell us that it is possible to run modern power systems from wind power, solar power and marine energy are not telling the truth.

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SLASHING U.S. EMISSIONS

Paul Driessen

I am astonished at how casually activists, bureaucrats and politicians toss out these carbon dioxide reduction targets - as though cutting US (or EU, Canadian, Australian, et cetera) emissions by some essentially random amount by 2020 or 2050 is actually within the realm of possibility. Unless we assume major technological advancements ... and even if we accept the risk of widespread social and economic upheaval ... these targets land somewhere along the spectrum of fanciful, absurd, irresponsible and disastrous.

The group of 130 developing countries wants a 40% reduction from 1990 levels by 2020. A faction of this group wants a 45% cut by 2020. President Obama wants to slash US CO2 emissions by 80% below 1990 levels by 2050. Earlier congressional proposals talked about 60% cuts by 2050. Greenpeace and other Climate Armageddonites insist that the world must get global CO2 levels well below 450 ppm (0.045% of the Earth's atmosphere) by 2050 or earlier, despite expanding emissions from China and India - which means "guilty" developed nations must slash their emissions by some 90% by that date.

To illustrate the absurdity of these demands, one need only look at US carbon dioxide emissions data assembled by the Carbon Dioxide Information Analysis Center at the Oak Ridge National Laboratory, for the years 1800 through 2004. The following summary shows how far back in time the United States would have to travel, to achieve these various emission targets.

40% below 1990 levels = CO2 emission levels last seen in 1957
45% below 1990 = 1951
60% below 1990 = 1929 or 1940 (emissions fell during the intervening years of the Great Depression)

80% below 1990 = 1905
90% below 1990 = 1897

Barring major technological breakthroughs, a massive shift to nuclear power - or blanketing America's wild, scenic, desert, grassland, agricultural and coastal areas with hundreds of thousands of wind turbines and solar arrays - the only way I see to achieve these goals is via enormous reductions in industrial output, air and auto transportation, food production, internet server use, heating and air conditioning, and living standards. (Right now, the United States is 85% dependent on hydrocarbon energy, and twenty states get 60-98% of their electricity from coal. The repercussions of cutting off access to that energy - or pricing it out of reach of poor families, small businesses and manufacturers - would be intolerable and immoral. And let's not forget that every wind and solar "farm" needs CO2-producing natural gas-fired generators for backup.)

Perhaps millions of Americans would be willing to go part way along this route if Al Gore, James Hansen, Barack Obama, Nancy Pelosi, Harry Reid, John and Teresa Kerry, Henry Waxman, Nick Rahall and every warming alarmist environmental group would lead the way - beginning right now - by slashing their (private) jet travel, limousines, mansions, 78-degree White House offices, Bali and Bonn excursions, and big-carbon-footprint eco-lobbying offices. And perhaps millions of Africans would be content to continue living in poverty and deprivation - when elite eco-activists move into their own electricity-free, disease-ridden huts. But until then, I don't foresee a citizens' stampede to the lifestyles of 50 to 110 years ago.

As my grandmother always told me, "The only good thing about the 'good old days' is that they're gone." She grew up doing backbreaking labor on a Wisconsin farmstead, and didn't have running water, indoor bathrooms or electricity until after she was married. I think her perspective is much more valuable than that of the climate alarm activists just mentioned.

Somehow I don't see any of them adopting the lifestyle of the deprived and unfamous. They have no business imposing it on anyone else, especially by telling impoverished Africans (et cetera) that they must continue living "indigenous" lifestyles, to save the planet.

This is where the hysteria about "runaway global warming" and "catastrophic sea level rise" has taken us.

Before we head any further down this path, we (and our putative leaders) need to take a long, cold, honest look at scientific, energy and economic realities ... our planet's history of climate change ... the absence of global warming over the past decade, even as CO2 levels continued to climb ... the views and findings of 700-plus climate scientists who do not agree with the IPCC Summaries for Policy Makers ... the enormous adverse impacts associated with biofuels ... the speculative worst-case scenarios conjured up by abjectly unreliable computer models ... the allegations, headlines and special effects that substitute for actual evidence in many circles ... and the unwillingness of too many climate alarmists to engage in debate or even valid peer review with climate realists and skeptics.

Only then will we have anything remotely approaching ethical, responsible, reality-based policies on energy, economic, health, living standards and developmental issues that right now are governed far too much by an unsupported assumption that catastrophic, anthropogenic, CO2-driven global warming threatens our planet.

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