

The U.S. Electric Grid Is Reaching the End Game

by Marsha Freeman

This Summer, three decades of underinvestment and looting of the U.S. electrical industry grid system came home to roost. A week-long blackout in New York City, calls for “voluntary” conservation, the shutting off of power to large industrial enterprises, and lowering of voltages across the nation, were all evidence of the wreckage that has been made of this most critical infrastructure.

For the past three decades, financial warfare, and attacks by anti-technology fanatics and free-market ideologues, have created the “perfect storm” that has left the U.S. electric grid in a condition of increasing instability. The restructuring of the electric utility industry, begun during the mid-1970s Carter Administration, has changed the rules of the road that had created an electric generation and delivery system that was the envy of the world.

This wreckage was accomplished by changing the axioms. From the time of President Franklin Roosevelt’s regulation of the industry in 1935, the intention of the engineers who designed the electric grid was to deliver reliable, economical electricity, to every farm, family, and factory in the United States. Now this extraordinarily complex and fragile system has been degraded into a hodgepodge of hundreds of competing interests, run not by engineers, but by financiers and lawyers, where states are increasingly losing regulatory oversight, and reliability has taken a backseat to shareholder values.

Wheeling Power

The first sector of the electric utility industry to be deregulated was the network of high-voltage transmission wires, which were designed to make bulk power transfers, over relatively short distances, from large power-generating plants to the cities and towns where the power was needed. They were built by the utility company that had built the power plant, and as the grid grew, local lines were connected to other utilities’ power lines to be available in case of emergencies. During the 1977 blackout in New York, for example, power was transferred in from the Tennessee Valley Authority system in the Southeast, to restabilize the grid.

After the mid-1970s Middle East War and orchestrated “oil crisis,” which quadrupled prices, the Carter Administration proposed, and Congress passed, the 1978 Public Utility

Regulatory Policies Act, which promoted “conservation,” and poured billions of wasted Federal dollars into the development of small non-utility power generators, using “non-traditional” sources of power, such as biofuels, solar, and wind energy. This insane turning back the clock to pre-industrial 19th Century methods was reinforced by attacks on nuclear power, reversing the policy of massive additions of new nuclear plants then underway. The 1978 law required the traditional utility companies to purchase power from these expensive “alternative” power sources.

The utility companies objected to this potential anarchic use of the transmission grid, and refused to provide these non-utility generators access to their systems. So, the Federal Energy Regulatory Commission, which had been established to restructure the industry, promulgated a superceding Federal rule forcing “open access” for these new non-utility generators to the transmission system.

This “open access” rule was the foot in the door for the chaos and congestion in the transmission system that exists today. One of the huge electric industry conglomerates, American Electric Power, is an instructive case in point.

On Dec. 20, 1906, a certificate of incorporation was filed in Albany, New York for the American Gas and Electric Company. Over the ensuing 30 years, the company began electric, gas, water, steam, transit, and even ice services, in New Jersey, New York, Pennsylvania, West Virginia, Virginia, Ohio, Indiana, Michigan, and Illinois.

In 1928, the Federal Trade Commission launched a comprehensive inquiry into the entire electric power industry, as abuses mounted, from financial pyramid schemes and the stock market speculation of the “Roaring Twenties.” The investigations culminated in the 1935 passage of President Franklin Roosevelt’s Public Utility Holding Company Act, which forced the breakup of many holding companies, and several of American Electric Power’s holdings were divested. Other legislation made it incumbent upon utilities to provide universal service, and gave the states overall regulatory oversight. While what became American Electric Power still maintained operations stretching from Virginia to Michigan, each state regulated its utility companies, defined the level of reliability to be maintained, and, in return, assured each company a modest return on investment.

AEP built the first high-voltage transmission line, between Muncie and Marion in Indiana in 1911, the first long-distance line, transmitting electricity from a coal mine mouth plant, and the first commercial nuclear power plant on Lake Michigan, at the two-unit Donald Cook station, in the early 1970s. The wheeling of power, which is the transfer of electricity from one supplier over the transmission lines of another system, to where it was needed by a third customer, was used by regulated utilities to increase the reliability of regional grids, in case of an unscheduled shutdown of large generating units, such as from storms or other acts of nature.

But deregulation was marching on.

In 1992, the National Energy Policy Act created another class of non-regulated electricity producers, known as exempt wholesale generators. This broadened the authority of FERC to wrest control of the industry from the utility companies and the states. As has often been noted, FERC has never met a utility merger it didn't like. More and more companies were exempted from the restrictions of the Public Utility Holding Company Act, as mega-monopolies were formed to wheel, not just electrical power, but newly concentrated economic and market power.

In 1995, FERC proposed another rule to mandate open access, this time by any producer, to the transmission network. Under Order 888, implemented the following year, the wheeling of electricity, through multiple transmission systems, over any distance by any generator, was fair game. The Order "unbundled," or segregated, electrical energy generation from the transmission systems the generators had built. For the first time, "economy transfers" were enabled. The transmission grid would be used to enforce "competition."

If a utility, such as the far-flung AEP, could buy power halfway across the country that was even marginally cheaper than what it could produce locally, it could wheel that power hundreds, or thousands of miles to its customers. Even the largest utility holding company today, Exelon, owns only about 5% of the nation's electric generating capacity, with AEP coming in third. But it is not the size of the concentration of electrical power capacity that is creating the chaos; it is the "free market" concentration of economic power, which allows a handful of companies to maximize profits by buying up power lines, looting infrastructure through disinvestment, and setting prices to maximize profits.

At the same time that FERC was tearing apart the 50-year-old regulatory compact between producers and consumers for providing reliable power, states were being convinced by pirates waiting in the wings—most aggressively, Enron—that electric bills to their citizens could be lowered by forcing incumbent utilities to divest themselves of their generating capacity, and sell their assets off to unregulated holding companies, which would buy power for them through a "spot market in electrons."

As the North American Electric Reliability Council (NERC) warned a decade ago, the transmission system was

not designed to handle rapidly-changing bulk, so-called "economy" power transfers. On the three-year anniversary of the "Great 2003 Blackout," NERC vice president Donald Cook explained, "There's no question that the grid is being used now in ways for which it wasn't really designed. It was built to connect neighbor to neighbor, over the last several decades. It was not designed to move large blocks of power from one region to another."

The Federally built Tennessee Valley Authority system is illustrative. TVA built, owns, and operates 17,000 miles of transmission lines, to service its customers over an area including all or parts of seven Southeastern states. FERC has been trying to force the TVA to join a Federally regulated Regional Transmission Organization, which would require it to cede control of its transmission grid, and force it to build new transmission capacity (for which its customers would have to pay), not to service its own ratepayers, but to allow "economy" wheeling over its wires. So far, the TVA has refused.

It is often stated that the solution to this congestion is to build new power lines. But while more capacity is certainly needed, that in itself, will not solve the problem.

Blackout Blowback

Following the August 2003 blackout, which left 50 million people from the Midwest to the East Coast in the dark, multiple Congressional hearings and a Federal investigation were conducted to examine the problem and propose solutions. The Department of Energy was tasked with identifying the cause. Its final report blamed everything possible—including operators and fallen trees—except deregulation.

But the Congress mandated that the Department produce a report, the National Electric Transmission Congestion Study, which it released in August 2006. The report duly noted what everyone already knew—that areas of Critical Congestion included the New York City and Connecticut service areas, with Congestion Areas of Concern all the way from New York through Northern Virginia. The Los Angeles area was noted as a Critical Congestion area, with parts of the West Coast, from Seattle to San Diego, in the Areas of Concern category. But it is not in these regions that profit-conscious, and even foreign-owned companies, are proposing to build new power lines, or the new local generating plants that would obviate the need for long-distance transmission lines. Why?

Thanks to 30 years of irrational "environmentalist" brainwashing of sections of the U.S. population, particularly in "liberal" large urban regions such as New York and California, it is almost impossible to build new generating capacity—much less nuclear power plants—where the greatest needs are. Therefore, these regions, which do not generate enough power locally, are forced to import power from other utilities. Thanks to the efforts of the same so-called environmentalists, these cities have not even been able to build enough power lines to bring in the electricity from elsewhere.

TABLE 1

What's Wrong With This Picture? Capacity Additions by Energy Source

(Megawatts)

Energy Source	2005	2006	2007	2008	2009
Coal	573	450	2,064	1,879	8,122
Petroleum	432	441	186	—	8
Natural Gas	15,216	12,499	16,013	9,895	5,451
Dual Fired	4,916	1,924	5,236	2,649	1,860
Other Gases	159	—	340	580	—
Nuclear	—	—	—	—	—
Hydroelectric Conventional	32	8	3	4	—
Other Renewables	2,519	294	126	147	1
Pumped Storage	—	—	—	—	—
Other	—	—	—	—	—
Total	23,846	15,616	23,967	15,153	15,441

Electric Power Annual with data for 2004
Report Released: November 2005
Next Release Date: November 2006
Source: DOE.

Adding new electric generating capacity over the past 30 years, has been determined more by economic “free market” fads, than rational planning. For the past two decades, natural gas was the fuel source of choice, largely because it was cheaper than alternatives. Then, when natural gas prices tripled, utilities turned back to coal. No new nuclear power plants are listed for the next few years.

Under the no-holds-barred market of deregulation, this “elsewhere” has moved further and further away from the large cities, with their large power requirements, to areas of the country where power can be produced more cheaply, and new plants can be built with the minimum amount of local political opposition and legal interference.

For example, PJM is a regional transmission interconnection, which coordinates the operation of the transmission grid that now includes Delaware, Indiana, Illinois, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and the District of Columbia. It oversees 56,070 miles of transmission lines, and plans regional transmission expansion to maintain grid reliability and relieve congestion.

In March, PJM identified transmission constraints in its region, which were standing in the way of “bringing resources to a broader market.” PJM identified two transmission paths requiring significant investment: a high-voltage line from the coal fields of West Virginia to Baltimore and Washington, D.C. and another, extending from West Virginia to Philadelphia, New Jersey, and Delaware. However, these lines, hundreds of miles long, would not be necessary, if the mandate existed to build new nuclear plants where the capacity would be near the load centers (**Table 1**).

While Virginia and Maryland utilities are considering such new builds, most of the nuclear power plants that are

under consideration by utilities are in the semi-rural Southeast, where there is political support for new plants, and building more high-voltage transmission lines to carry the power is unlikely to be held up for 15 years by “environmental” court challenges. Some of that new nuclear-generated power from the Southeast will be used locally, for growing demand, and some will be wheeled to the energy-short regions of the mid-Atlantic and Northeast, which refuse to build their own capacity. Companies that have been buying up transmission capacity will make a bundle, in the process.

Investment in new transmission capacity overall has left the grid system vulnerable to even small instabilities. The industry estimates that \$100 billion is needed in new transmission capacity and upgrades, as quickly as possible. The 2003 blackout did spur some increase in investment industry-wide, from \$3.5 billion per year to \$6 billion in 2006. But profit-minded companies are only willing to invest funds where there is a profit to be made, namely to carry their “economy transfers,” regardless of how that destabilizes the grid system overall.

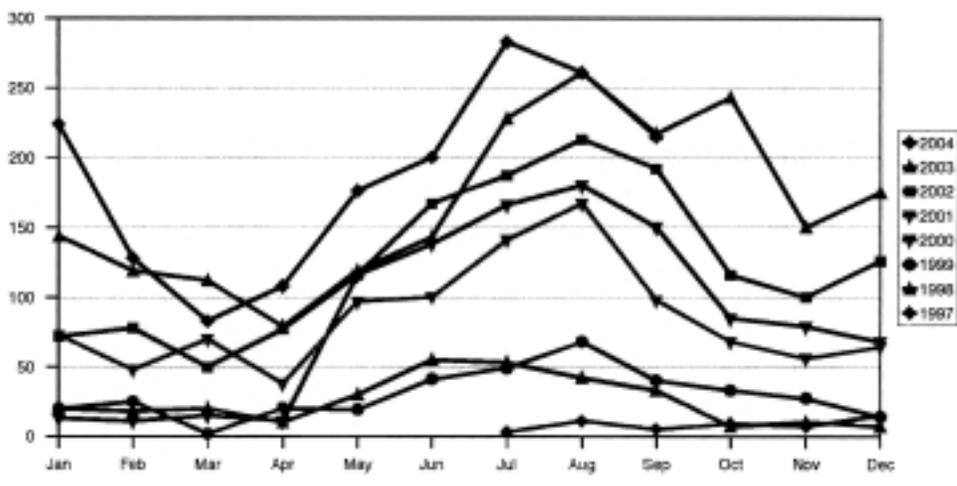
In a July 2006 article, three former electric utility executives, who formed the organization, Power Engineers Supporting Truth (PEST), out of disgust with the refusal of the government to pinpoint deregulation as the cause of the massive grid failure, after the 2003 New York blackout, stated that the “core issue is an almost fundamentalist reliance on markets to solve even the most scientifically complex problems. . . [P]olicy makers continue to act as if some adjustment in market protocols is all that is required, and steadfastly refuse to acknowledge the accumulating mass of evidence that deregulation . . . is itself the problem. Social scientists call this kind of denial, cognitive dissonance.”

The engineers, who have among them, more than five decades of experience in the electrical utility industry, insist that “new transmission lines will not by themselves improve reliability. They may increase transfer capacities, and hence improve commercial use of the grid,” but will not necessarily improve performance of the system. “Reliability standards have already been reduced to accommodate greater use of the grid for commercial transactions,” they warned (**Figure 1**).

There has been a huge penalty for this disruption of the functioning of the electric grid. PEST estimates that the 2003 blackout incurred economic losses in excess of \$5 billion. The California blackouts cost in excess of \$1 billion each. The national impact of declining reliability and quality, they estimate, is in excess of \$50 billion.

FIGURE 1

Increase in Transmission Congestion Since Deregulation, 1997-2004



Since the opening of the transmission grid to “competition,” reports of instances of congestion have increased from a little more than 50 to nearly 300, during the peak Summer season. Level 2 Transmission Loading Relief Reports (shown here), which are given to the North American Electric Reliability Council, indicate that any further increases in transmission on a line would violate security limits, and any designation higher than Level 2 requires that transmission shipments be curtailed.

Source: NERC.

Where To Go From Here

When the California energy crisis of 2000-2001 was raging, distraught state legislators and the embattled Gov. Gray Davis searched for a solution. Although they knew what that solution was, they protested that it would be impossible to put the toothpaste of deregulation back in the tube. Lyndon LaRouche and *EIR* proposed that that was *exactly* what needed to be done.

On Monday, July 17, 2006, in the midst of an intense Summer heat wave, one of Con Edison’s 22 primary feeder lines failed, below the streets of the City of New York. Over the next several hours, five more feeder lines were lost. Voltage was reduced 8% to limit the instability, and the utility was faced with 25,000 customers—about 100,000 people—in the heat and dark. It took until midnight July 23—seven days later—to restore 20,000 of the affected customers, according to Con Edison.

The New York City blackout was the result not of a Summer heatwave, but of the decades of underinvestment in the infrastructure that distributes electric power from central feeder lines, through transformers, to the wires that deliver power to each home, school, factory, office building, small business, and hospital. Some of Con Edison’s underground infrastructure goes back almost as far as Thomas Edison’s first central generating station and underground cable, on Pearl Street in lower Manhattan, in 1882. It was a length of 59-year-old cable whose failure was a factor in the July blackout.

A couple of years ago in Philadelphia, workers for PECO Energy found that some underground utility cable still in service dated to 1899. In July 1999, the failure of outdated cable was blamed for power outages in Manhattan affecting

200,000 people. In San Francisco, a failed cable in December 2003 created an outage for 100,000 residents. “We’ve been using equipment far beyond its original intended life because we’ve been concerned with the cost of replacement and the need to keep utility rates down,” remarked Dean Oskvig, president of Black & Veatch, an engineering firm based in St. Louis, last month.

Industry-wide, there is agreement that weaknesses due to the age of the underground distribution cable have been exacerbated by the way the system is run in today’s deregulated world. To “save money,” the industry has turned to a policy of “run to failure,” where a company waits for a failure before replacing aged power lines and other equipment. Black & Veatch reports that although utilities currently spend more than \$18 billion on local distribution systems, most of that is to string new wire to new housing developments (which will likely come to an end soon, along with the housing boom), and that an additional \$8-10 billion per year is needed to replace obsolete and corroded equipment.

On top of this disinvestment policy, local distribution systems, like the transmission system, are being stretched beyond their design limits. In addition to chronological age, overheating of equipment that is caused by heavy electricity use and is repeatedly stressed will age faster, and is more likely to fail suddenly.

In 1986, Con Edison began a program to replace all of its older cable with a newer design. It is spending about \$25 million per year, and at that rate, the utility will not finish until 2024. By that time, some of its *replacement* cable will be 38 years old. Con Edison delivers electricity to 3.2 million customers, through 95,000 miles of underground cable, and 33,000 miles of overhead wires. Estimates are that about 27%

of its underground cable needs to be replaced. Why is it taking decades to replace old cable?

According to media reports, recently Southern California Edison sought approval from the state Public Utilities Commission to replace 800 miles of aging underground cable, after concluding that cable failures were the leading cause of outages that could be prevented. But “consumer advocates” opposed the utility’s request to recoup the \$145 million cost of replacement, on the grounds that the utility’s records were not adequate to ensure the worst cables would be replaced first. The utility will proceed and spend \$250 million more than is recouped in customers’ bills anyway, because they “don’t want to get too far behind.” Apparently the shareholder-driven “consumer advocates” never added up the economic, and sometimes, life-threatening costs, of the alternative—blackouts.

Before deregulation, companies like Con Edison would make investments in infrastructure that were deemed necessary, to maintain a level of service and reliability that met industry-wide standards, assured that state regulators would allow them to recover the costs, and maintain their financial health. Today, many states have no authority to either order investments or compensate companies that make them, leaving Wall Street and the “free market” to decide who shall have reliable electric power.

Between 1990 and the year 2000, utility employment in power generation dropped from 350,000 to 280,000, as utilities looked for ways to slash costs, to be “competitive.” Over the same decade, employment in transmission and distribution went from 196,000 to 156,000, in a system that is growing more complex by the day. Today, the average age of a power lineman is 50 years.

“Quick profit,” deregulation, shareholder values, environmentalism, have all run their course, and nearly taken down the electricity grid. It is time to change the axioms.

Transmitting Power, or Just Profits?

Yes, there need to be more power plants built, to make up for the deficits in electric-generating capacity in many parts of the country. It is also the case that entire regions, in particular the West and East Coasts, have so much congestion on their transmission lines, that they cannot import the power they need. And as seen in New York City this past July, breakdowns in 100-year-old underground local distribution systems are now leaving tens of thousands of people in the dark, and must be replaced.

But it is foolhardy to think that the needed investments will be made under the present regime. Today, thanks to deregulation, a company can earn more profits by *not building anything*, and instead charging more for what they already produce, by creating shortages. This strategy was implemented to perfection six years ago by Enron and other power pirates in California, which withheld power to raise prices through the roof, allowing them to steal tens of billions of

dollars out of the pockets of electricity consumers throughout the West Coast.

Today, unregulated utility companies do not plow a large portion of their profits back into improving infrastructure, but instead pay out higher dividends to stockholders. If even a regulated company has any hope of raising hundreds of millions of dollars on Wall Street to finance growth, it must prove itself creditworthy, by cutting costs and showing it can abide by shareholder values.

Individual companies no longer cooperate to ensure the overall reliability of the electric grid. They compete to build power plants and transmission lines based on their return on investment, not on the physical requirements of a regional system. They make themselves “competitive” to undercut the competition by cutting maintenance costs and getting rid of as many employees as they can.

For two decades, industry officials and NERC have warned that restructuring the electricity system would destroy it. An understanding of that danger provoked Dr. Anjan Bose, former Dean of Engineering at Washington State University, to comment, citing the advancement of power systems expertise in China and India that “the next time a grandstanding politician in North America compares our grid to that of the Third World, he may actually mean it as a compliment.”

There is no way to “fix” the system, as Congress has tried to do, by piling on more and more Federal regulations, to try to patch up the gaping holes in the broken system that now exists. The only remedy is to return the intention of the industry to one of providing universally reliable service, by putting the toothpaste of deregulation back in the tube.

The nearly two dozen states that have restructured their local industry, forcing utilities to sell their generation assets to conglomerate holding companies, in order to “compete,” must return responsibility and oversight for electric generation and distribution to the state utility commissions. These public servants should decide what should be built, and where, on the basis of providing for the general welfare, not the profit profiles of companies headquartered a half-continent away.

The now-congested and unstable long-distance high-voltage transmission systems that criss-cross the nation must be used for the purpose for which they were intended: to enable bulk power transfer in case of emergency, not to wheel power from one end of the country to the other so a company can import cheaper power, charge a few cents less, and beat out the competition. Responsibility for the transmission system should be taken out of the hands of the Federal deregulators, and returned to the regional reliability councils that formulated the rules of the road to keep the system robust.

There are no shortcuts. Decisive action is needed to reverse the past thirty years of failed policies.