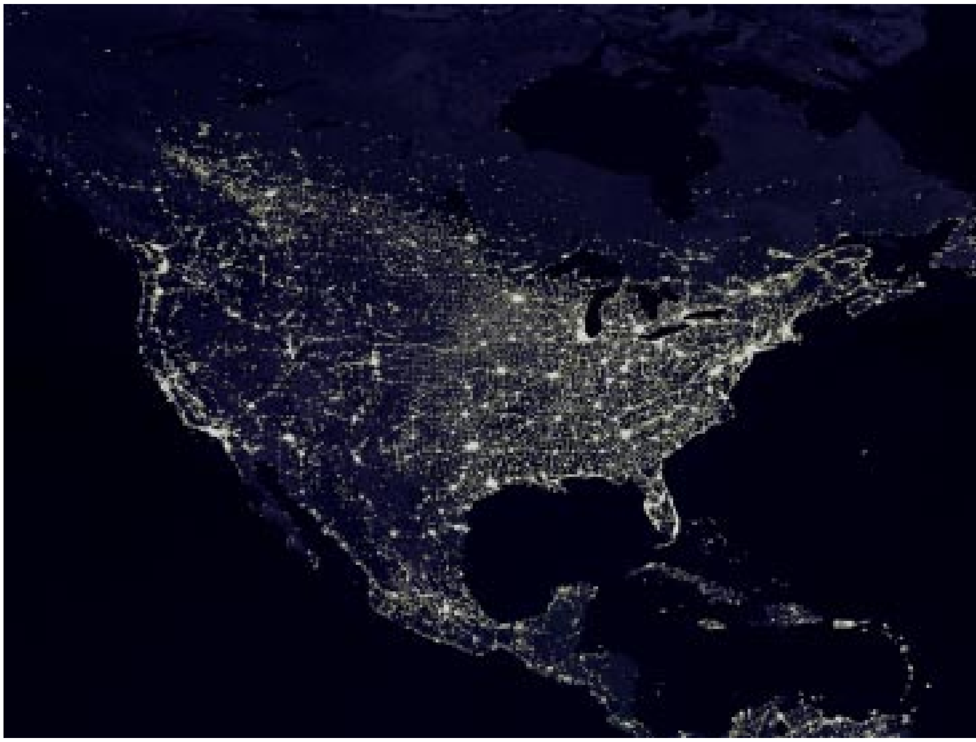

After the Blackout

Achieving A Cleaner, More Reliable Electric System

The National Association of State PIRGs

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ACHIEVING A CLEANER, MORE RELIABLE ELECTRIC SYSTEM

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The State PIRGs are a network of organizations working on environmental protection, consumer rights, and good government.

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Executive Summary

Today's cumbersome, centralized power grid linked to fossil fuel-fired and nuclear power plants is a costly, unreliable and environmentally destructive anachronism. The blackout that cut power to 50 million people in the northeastern United States and Canada on August 14 was a signal that this system – stretched to the limit by the demands of an increasingly deregulated electricity marketplace – is no longer able to reliably serve the nation's electricity needs.

A new kind of electric system is possible – one that is decentralized, resilient and focused on the efficient delivery of services such as light and cooling, rather than moving the maximum number of electrons from place to place. Such a system would take advantage of the nation's abundant supply of renewable energy sources, reduce the strain on the electric grid through conservation and efficiency, and encourage the development of flexible and reliable small-scale distributed generation systems.

Unfortunately, the energy industry and some policy makers have proposed "solutions" (such as those contained in the Energy Bill currently before Congress) that would do little to solve the nation's long-term electric reliability problems, and may make the situation worse.

While the exact cause of the August 14 blackout remains unknown, three important lessons can be learned from the event.

1) **Transmission Systems Are Strained**
Power surges and reliability problems have increased dramatically since 1997, as deregulation has encouraged the bulk transfers of power from region to region over an electric grid that was not designed for that purpose. The number of incidents in which reliability watchdogs have had to step in to prevent overloading of transmission lines has increased fivefold over the last five years – with the two worst months for such incidents being July and August 2003. Meanwhile, consumer demand for power increased only seven percent from 1997 to 2001.

2) **The Grid Is Too Centralized and Too Interdependent**
The interconnectedness of the American electric grid is one of its greatest potential strengths. But when power line problems in Ohio can cause subways in Manhattan to grind to a halt, the system has clearly become too interdependent. The blackout pointed out the potential for one utility's actions to impact other segments of the grid and demonstrated that an over-reliance on centralized fossil-fuel and nuclear power plants reduces the ability of the grid to "bounce back" from events such as the blackout.

3) **Lack of Accountability Threatens System Reliability**
Federal and state regulatory agencies, utilities, grid managers, and reliability watchdogs all have some measure of responsibility for the reliable operation of the electric grid. Yet, the lines of responsibility among those entities are so blurred that

clear blame for the blackout – and clear responsibility for preventing a recurrence – may never be assessed.

- **Avoiding the Next Crisis: Fossil Fuels and Nuclear Power**

The attention given to the events of August 14 should not obscure the other threats posed to the reliability of the electric system – specifically, the volatility in prices for natural gas and other fossil fuels and the potential for widespread system disruption in the event of a nuclear accident.

Passage of the Energy Bill now in Congress and the investment of billions of ratepayer dollars in transmission capacity expansion would not provide the surest, most cost-effective or cleanest path to improved electric system reliability.

- Reducing the load on the electric grid by improving energy efficiency and shifting to clean, local sources of power can reduce the need for new transmission lines – often at an overall cost savings. On the other hand, dramatic expansion of transmission capacity would add to the complexity of an already-complex electric grid, increasing the potential for more "system failures" in the years to come.

- The Energy Bill currently pending in Congress would loosen, rather than tighten, regulatory controls on utilities. Only the mandatory reliability standards contained in the bill would help to address the reliability problem – Congress should strengthen these standards and enact them separately.

Policy-makers at the state and federal levels should adopt four principles for creation of a clean, reliable and cost-effective electricity system.

1) **Increase Energy Efficiency –** The potential for energy efficiency improvements in the United States is massive, and largely untapped. Analysts have estimated that the U.S. could reduce commercial and residential electricity use by 1 percent *within a single year* by implementing proven efficiency strategies. A national systems benefit charge on electric bills to support efficiency improvements and the adoption of stronger appliance efficiency standards and building codes would help to achieve these efficiency gains. In addition, utilities should be required to prove to state and federal regulators that any transmission expansions they propose are the least-cost solution to reliability problems versus efficiency improvements and expanded use of local power.

2) **Shift to Clean, Local Sources of Power –** Clean alternatives such as wind power, solar power, combined heat and power systems, and fuel cells can reduce the demand on centralized fossil and nuclear power plants and reduce the strain on the grid by providing local power to communities. Federal and state officials should adopt renewable energy standards requiring the generation of 20 percent of America's power from renewable sources by 2020, set pollution limits for distributed generators of electricity, and allow local power producers to sell their excess electricity back into the grid through the use of "net metering."

3) **Plan for the Future –** The lack of coherent planning for the future of the electric grid is at least partially responsible for today's reliability problems. Federal officials should undertake a comprehensive study of the electric grid and clarify which parties are responsible for investing in efficiency improvements, distributed generation and improvements to the grid. Similarly, state officials should move toward more comprehensive evaluation of their transmission and distribution systems.

4) **Restore Accountability –** State public utilities commissions and the Federal Energy Regulatory Commission must reassert their authority for ensuring the safe, reliable, cost-effective and environmentally sound operation of the electric system. Utilities should be held ultimately responsible for carrying out their responsibilities to provide reliable electric power. Electric industry self-regulation has proven to be a failure; any new national standards for reliability should be enforced by the federal government and carry real sanctions for violators.

The Northeast Blackout: A Catalyst for Change?

When the lights went off in much of the eastern United States on the afternoon of August 14, 2003, millions of Americans were suddenly reminded of the importance of electricity to our daily lives. For the tens of thousands of commuters stranded in Manhattan, the thousands of Michigan and Ohio families forced to boil water, and the many businesses saddled with lost inventory and lost productivity, the blackout will not be soon forgotten.

The exact combination of human, mechanical and systemic failure that caused the blackout is not yet known, and may never be known with precision. But the events of August 14 were just the clearest of many recent signals indicating the fragility of our nation’s system of generating and transmitting electricity.

This white paper explores the reasons for that fragility and policy solutions that can make America’s electric grid cleaner, more affordable and more reliable over the long haul. We also look at some of the “false solutions” to the problem now being proposed, and propose a series of four principles that should be used to guide America’s response to problems highlighted by the blackout.

Just as there was no simple cause of the blackout, so there is no simple solution. The blackout of August 14 shows that America must not only invest in improving our electric system, but it must also make the right investments if we wish to move toward the safer, cleaner and more reliable delivery of electricity to our homes and businesses.

Lessons of the Northeast Blackout

With investigators still poring over the data from August 14, it may seem premature to derive "lessons" from the blackout. But, whatever the exact string of events, the spread of deregulated power markets over the last decade, the centralization and interdependence of the power grid, and the lack of accountability for system reliability helped enable the blackout to occur.

Lesson 1: Transmission is Strained

One of the mysteries of the Northeast blackout is that it occurred on a day of only ordinary summer demand. Despite normal summertime conditions, surges of power criss-crossed the electric grid, tripping power lines and forcing the shutdown of power plants.

Such power surges are not unusual in the Midwest, where the blackout is believed to have begun, and have been occurring with increasing frequency in recent years.[1] National transmission reliability watchdogs report that the number of incidents in which they must step in to prevent overloading of transmission lines has increased fivefold in just the last five years, with the highest number of such incidents ever in a single month occurring in August 2003. (The second-highest number was recorded in July 2003.) [2] In contrast to this spike in reliability problems, the growth in actual demand for power from consumers increased only 7 percent between 1997 and 2001.[3]

How can a system that is experiencing modest growth in overall power demand be experiencing such a dramatic rise in reliability problems and "close calls"? The answer has a lot to do with the deregulation of the electric power industry that has taken place in 17 states (13 of them in the Northeast and Midwest) over the past decade.[4]

Traditionally, electricity has been considered a "natural monopoly" – an industry in which true market competition was impossible to achieve. As a result, electric utilities have long been subject to stringent regulation, primarily at the state level. In exchange for maintaining a monopolistic position in the local marketplace, utilities agreed to receive rates of return on their investments that, while perhaps lower than what could be achieved in a competitive marketplace, were virtually guaranteed.

Under deregulation (or "restructuring"), the electric power business was essentially split into two businesses – an open-market *generation* business and a regulated *distribution* business. Consumers could (at least in theory) choose between a number of generators of electricity – perhaps including some generators located in far-away states – all of whom were entitled to access consumers through the electric grid. The grid itself, meanwhile, remained within the control of regulated public utilities responsible for distributing electricity to consumers.

The jury is still out as to whether the average consumer will ever benefit from the opportunity presented by deregulation to purchase cheaper power from elsewhere. Even putting aside the California crisis in 2001, the early experience with deregulation has been plagued by a lack of consumer choice and, in many states, increased electric rates.

There is little doubt, however, that deregulation has had a negative effect on the reliability of the electric grid. A grid that historically only had to carry enough power to allow local utilities to supply their customers has buckled under the added strain of carrying bulk transfers of electricity from state to state and region to region.

The North American Electric Reliability Council (NERC) – an organization formed by utilities in an effort to prevent a repeat of the Northeast's crippling 1965 blackout – has repeatedly warned that growing bulk transfers of power threaten the capacity of an electric grid that was largely built to handle the more local, regulated markets of the past.

> [I]n some areas of North America, transmission systems are reaching their limits as the systems are subjected to new loading patterns resulting from increased electricity transfers and customer demand increases. Even though transmission systems are expected to operate reliably, some areas of the grid are not adequate to transmit the full output of all new generating units to their desired markets.[5]

The added strain from long-distance bulk transfers of power has had a direct impact on the reliability of the grid. NERC noted in its 2002 reliability report that "[t]he transmission systems are being subjected to flows in magnitudes and directions that were not contemplated when they were designed and for which there is minimal operating experience." The massive and difficult-to-predict flows of power that occurred throughout the Northeast on August 14 may have been an example of this.

The Northeast blackout demonstrated that the electricity transmission system operates too close to its capacity, too much of the time. Increased consumer use of electricity is certainly a factor. But the bigger culprit is the transfer of large amounts of power over long distances – transfers from which most ratepayers benefit only modestly, if at all.

Lesson 2: The Grid Is Too Centralized and Too Interdependent

The interconnectedness of the American electric grid is one of its greatest potential strengths. By allowing power to be shifted from places where it is not needed to places where it is in short supply, the presence of an interconnected grid removes the need for excess generating capacity and can prevent outages in locations experiencing problems. Ultimately, the interconnectedness of the grid will allow us to move clean energy generated by sources such as wind power from where it is available to where it is needed.

But when power line problems in Ohio can cause subways in Manhattan to grind to a halt, the time has come to explore whether the system is, indeed, too interdependent. And the difficulties encountered in restoring power to the Northeast in the wake of the blackout indicate that the current power system is not resilient enough to bounce back quickly from large-scale failures.

Electric industry officials in the Northeast and Michigan have stated that they had no knowledge of the transmission line problems that began in Ohio in the hours prior to the blackout – knowledge that could have been used to isolate those regions before the cascading power surge reached them. Clearly, better safeguards to prevent such cascading outages are in order, but the problem lies at least in part in the nature of the grid as an interdependent system.

A second problem became evident after the blackout. On the afternoon of August 14, nine nuclear reactors and 12 fossil fuel-fired power plants went offline in the span of just three minutes.[6] These large power plants automatically shut down to protect themselves from frequency and voltage fluctuations on the grid – exacerbating the problem. Many – though not all – of the fossil fuel-fired generators were returned to service by the following morning. But several of the nuclear plants affected by the shutdown were not restarted for days, due to the extensive and time-consuming restart procedures they must go through to ensure safe operation. In contrast, hydroelectric and wind plants were able to start up nearly immediately after the safety of the grid was assured. Indeed, several hydroelectric plants in New York state operated throughout the blackout, supplying power to portions of upstate New York.[7] The overreliance on slow-to-restart fossil fuel and nuclear plants may have kept parts of the country dark, or preserved the unstable condition of the grid, longer than was absolutely necessary.

Finally, the electric system is dependent on the operation of other systems. A disturbance in a single natural gas pipeline, for example, could interrupt the supply of fuel to several electric generators in a region, forcing those generators to switch to a backup fuel (if possible) or to shut down entirely, threatening the stability of the electric system in that region.[8]

Increasing long-distance trading, large webs of grid interdependence, and over-dependence on large-scale generating facilities leave us with a power system that is incredibly complex, slow to react to problems like those that occurred on August 14, and, in some cases, dangerously vulnerable. Instead of a nimble system in which at least some communities could find ways to bring the lights back on quickly, using their own clean distributed resources, residents of cities such as New York, Cleveland and Detroit were forced to wait for the restart of massive power plants many miles away before they could be restored to power – a process that took days to complete.

Lesson 3: Lack of Accountability Threatens System Reliability

Readers of press stories about the Northeast blackout have been treated to a veritable alphabet soup of organizations supposedly responsible for ensuring the reliability of the electric grid. There are independent system operators (ISOs), regional transmission organizations (RTOs), NERC and the regional reliability councils, FERC (the Federal Energy Regulatory Commission), and state public utilities or public services commissions. Then, there are the electric utilities themselves, which are ultimately responsible for the reliable delivery of electric power to their customers.

In the past, state public utilities commissions (PUCs) were primarily responsible for regulating utilities within their states, while FERC regulated interstate power markets. Individual utilities were responsible for the operation of their own grids, sometimes in close cooperation with neighboring utilities, other times not.

These responsibilities remain intact for the distribution of electricity, at least on paper. Most state utility regulatory agencies have broad statutory authority to uphold the public interest and to ensure reliable electricity at least cost to the consumer. Many state utility regulators are also obligated to minimize the environmental impact of their policies.

In practice, however, much of the decision-making related to the day-to-day operation of the grid has been delegated to quasi-independent organizations created by utilities and government – ISOs, RTOs, regional power reliability councils and NERC – that set standards for, manage and supervise the transfers of electric power in various regions of the country.

The problem with the proliferation of industry self-regulation is not in the day-to-day performance of these organizations (although the performance of the Midwest ISO is coming under scrutiny in investigations of the blackout). Rather, it is in the lack of accountability of utilities to the self-regulatory organizations and the lack of accountability of the self-regulatory organizations to the broader public interest.

NERC provides an interesting example. For most of its history, NERC has relied on "peer pressure" to get member utilities to adhere to its voluntary reliability standards, without major incident. Because utilities did not compete directly with one another, they had incentive to cooperate on issues of grid reliability, making voluntary standards effective. In the wake of deregulation, however, NERC has come to believe that voluntary standards are no longer adequate. "[N]ot a single bulk electric system reliability standard can be enforced effectively today by NERC or the Federal Energy Regulatory Commission," concluded a recent NERC report.[9]

NERC has proposed creating a self-policing organization that would take primary responsibility in enforcing mandatory reliability standards established by FERC. The problem with the creation of additional such quasi-governmental organizations to police the grid is the same one posed by the quasi-governmental organizations that operate the grid: lack of direct accountability to the public.

This lack of direct accountability could lead to a situation in which no single entity will ultimately be held responsible for the Northeast blackout. Utilities will blame the ISOs. ISOs will blame utilities and neighboring ISOs. FERC and state PUCs will deny responsibility for the whole mess. And – in the absence of new reliability standards that can be directly enforced by the states or the federal government – no one will be specifically charged with making sure it doesn't happen again.

The National Commission on Energy Policy, in a report following the blackout, cited the lack of clear lines of responsibility for the transmission system as a key hurdle in improving electric system reliability. "[I]nvestment in all categories of electricity infrastructure is down significantly, in part because of surplus capacity conditions in certain regions, but also because of uncertainty concerning which entities have the responsibility for identifying and making investments in the transmission and distribution networks and uncertainties about how the associated costs will be recovered.[10]

The underinvestment in energy efficiency and demand management has been even more pronounced than the underinvestment in infrastructure. Utility-supported energy efficiency spending was sliced nearly in half – from $1.6 billion in 1993 to about $900 million in 1997 – as electric deregulation proceeded, and many load management programs have been abandoned due to the uncertainty about who is responsible for balancing loads and supply on the grid.[11]

Aggressive public planning for, and regulation of, the transmission system is especially needed given the recent economic history of deregulation. In the wake of restructuring, the transmission grid – and the investments in efficiency and local generation that lower demands on the grid – became economic "orphans" as electricity companies attempted to take advantage of the profits to be made in generation, leaving distributed resources and power delivery to languish. Utility regulators and other public-sector entities – and only public-sector entities – have the power and legitimacy to force utilities to serve as responsible stewards of an electric grid built over the years through the investment of ratepayer funds. And only public-sector entities have the ability to supervise the needed investments in efficiency, grid upgrades and distributed resources that can ensure that ratepayers' investments are channeled into the right projects and that the public interest is protected.

The Next Crisis: Fossil Fuels and Nuclear Power

At the same time that we focus on the issues that led to the blackout of August 14, it would be folly to ignore other glaring problems with the electricity system that could easily be at the root of the next electricity crisis – among the largest of which are our excessive reliance on fossil fuels and nuclear power.

FOSSIL FUEL PRICE INSTABILITY

Fossil fuels are a fatally flawed energy source for a variety of reasons: the amount of health-threatening pollutants they release to the air, their contribution to global warming, and the lack of sufficiently reliable supply.

The recent experience with natural gas points out the flaw in relying on increasing generation of electricity from fossil fuels – conveyed through a sprawling, centralized grid – to supply the nation's electricity needs. Low natural gas prices during the 1990s fueled a boom in the construction of natural gas-fired power plants. Between 1991 and 2001, the proportion of the nation's electricity that was generated with natural gas increased from 12 percent to 17 percent, and the percentage is likely to increase further in the years to come.[12]

The dramatic increase in natural gas usage by power plants was not matched, however, by a similar increase in domestic production. The amount of natural gas produced annually in the U.S. increased by 14 percent from 1990 to 2001, even as the number of producing natural gas wells increased by 36 percent.[13] The amount of gas placed into storage also fluctuated, with storage levels reaching long-time lows during 2003.

As a result, natural gas prices at the wellhead have more than doubled since 1999, when they hovered at about the $2.50 per million cubic feet rate that had held for most of the previous decade.[14] And economists and experts agree that the low market prices that fueled the spurt in natural gas power plant construction during the 1990s are likely gone forever.

The instability of natural gas prices could bring about dramatic fluctuations in consumers' electricity bills – producing a double price squeeze for consumers who heat their homes with natural gas. Just as worrisome, rising natural gas prices could drive increased production of electricity from oil and coal – both of which are associated with severe environmental and public health problems.

The natural gas episode teaches two lessons about reliance on fossil fuels for electricity. The first is that actions – such as the construction of a natural gas-fired power plant – that may seem economically rational for a single actor within a marketplace at a particular point in time are not economically rational when all actors simultaneously make the same decision. The second is that fossil fuels are, by their very nature, non-renewable resources. It is simply not possible to perpetually increase the supply of a resource that will inevitably become more scarce. And even if short-term supply increases are possible, they will come at increased cost in terms of exploration, development, importation and environmental destruction.

The solution to avoiding a fossil fuel-related crisis in electricity supply is not to open environmentally sensitive areas to fossil fuel extraction – a move that would create only a temporary reprieve in exchange for permanent environmental damage. Rather, it is to move away from the use of fossil fuels for the generation of electricity to the greatest extent possible and to engage in sound planning for our use of these exhaustable resources.

NUCLEAR SECURITY AND SAFETY

Nuclear power provides just over 20 percent of the nation's electricity. Some in the nuclear industry are pushing for the expansion of nuclear power as a solution to the nation's energy woes, but the potential health and safety problems posed by nuclear plants make them more of a reliability threat than a benefit.

The incidents at Chernobyl and Three Mile Island convinced millions of Americans that nuclear power is simply not worth the risks – and the terrorist attacks of September 11, 2001 reawakened many of those fears. The nuclear industry points to its relatively "clean" record since Chernobyl in asserting the safety of the technology, but a deeper look at the record suggests that it is not nearly as clean as claimed. For example, in 2002, a football-sized cavity was discovered in the reactor vessel head of Ohio's Davis-Besse nuclear reactor, which is owned by FirstEnergy – the same utility at the center of speculation about the cause of the August 14 blackout.

A serious accident or terrorist strike at an American nuclear power plant would be a human and environmental catastrophe, first and foremost. But the immediate loss of one or more nuclear reactors would also deal a body blow to the electricity system.

The linkage between reliability and nuclear safety is also a two-way street. The sudden loss of power on August 14 caused nine U.S. nuclear reactors to shut down immediately. It appears that those shutdowns occurred without major safety problems, but the Nuclear Regulatory Commission is investigating two equipment failures that occurred at Ohio's Perry Nuclear Power Plant (also owned by FirstEnergy) in the wake of the power loss.[15] Nonetheless, the sudden, unexpected shutdown of numerous nuclear reactors poses an unacceptable increased risk of mishaps, and should be avoided.

A final problem with nuclear power is its tremendous cost – some of which is passed on to ratepayers in their electricity bills, but even more of which is assumed by taxpayers through massive federal subsidies. A 2002 report prepared for the U.S. Department of Energy found that even today's large taxpayer subsidies – such as federally backed insurance for nuclear plant operators, federal research and development funding, and the federally funded nuclear waste disposal program – are insufficient to make new nuclear reactors cost effective. To achieve that goal for just five nuclear power plants would require the expenditure of at least $1.5 billion to $2.75 billion in additional federal subsidies.[16]

In essence, much of the cost of nuclear power is an "off-balance sheet" expense that does not appear on utility bills but comes out of the wallets of taxpayers nonetheless. Given the safety and reliability concerns and cost, America should begin to plan for an energy future that does not include nuclear power.

False Solutions: Transmission Capacity Expansion and More Deregulation

The Energy Bill now in Congress has been touted by some as the “solution” to the problems facing the electric grid. In reality, the combination of aggressive deregulation contained in the Energy Bill and the billions of dollars in new investments in transmission capacity recommended by many in the electric industry are no solution at all to the reliability problems that plague the grid. And the Energy Bill’s addition of large subsidies for fossil fuels and nuclear power plants could result in an electric system even further wedded to these dirty, dangerous and ultimately unstable sources of energy.

Transmission Capacity Expansion: How Much Is Needed?

Nearly everyone agrees that investments will be necessary to solve the reliability crisis. But what investments make the most sense?

Electric utilities and their allies suggest that the only real way to improve system reliability is to make massive investments in expanding transmission capacity. In the immediate wake of the blackout, U.S. Energy Secretary Spencer Abraham suggested that improvements to the electric grid could eventually cost as much as $50 billion, with ratepayers bearing much or all of those costs. Other electricity industry analysts suggest that even greater investments will be needed.[17]

A massive build-out of transmission capacity is not necessary – nor is it the least expensive way to resolve the nation’s reliability problems. Reduction of electricity demand through energy efficiency improvements and distributed generation resources in grid-constrained areas is often less expensive than building new power lines. As the U.S. Department of Energy’s National Transmission Grid Study recently concluded, “Expansion of the transmission system must be viewed as one strategy in a portfolio to address transmission bottlenecks; this portfolio also includes locating generation closer to loads, relying on voluntary customer load reductions, and targeting energy efficiency and distributed generation.”[18]

In a recent filing before the Vermont Public Service Board, for example, the Vermont Electric Power Co. found that a strategy to maximize demand side management (DSM) efforts through efficiency improvements and other programs would save nearly $80 million in total societal costs versus a major transmission system upgrade proposed by the utility. However, the DSM program requires a higher upfront capital cost, making the transmission upgrade the utility’s preferred alternative.[19]

In other cases, reducing grid loads by increasing the production of local power can produce economic benefits. Distributed generation technologies – such as fuel cells, combined heat and power systems, and wind and solar power – may incur more upfront costs than traditional sources of power, but can produce economic savings because they do not require the construction of new transmission lines and can provide improved reliability. One study has estimated the economic benefits of distributed power – including the reduction of transmission system losses of electricity, deferred need for transmission system upgrades and enhanced reliability – at 1.7 to 2.8 cents/kilowatt-hour.[20]

If energy efficiency and distributed generation are so cost-effective, why aren't utilities pushing for them as the solution to the system's reliability problems? The reason is that utilities generally (though not always) experience greater profits the more power they sell. As a result – in the absence of a specific governmental requirement or an alternate revenue structure – utilities will only promote energy efficiency when it bolsters their bottom line.

In addition to typically being more expensive than efficiency and distributed generation, a massive program of transmission system upgrades would serve only to add complexity and interconnectedness in an already complex and interconnected grid. The events of August 14 could be considered a "normal accident" – an accident caused, in effect, by the very complexity of the system. The theory of "normal accidents" suggests that accidents are inevitable within very complex, interactive, and tightly coupled systems, in part because it is beyond the human capacity to imagine and prepare for all the possible ways the system might fail. The greater the complexity of the grid, and the more interdependent the various parts of the system, the more attention must be paid to imposing safeguards to prevent a catastrophic failure – and the higher the stakes will be should those safeguards fail.

All of this is not to say that there will not be instances in which additional transmission lines may be needed – perhaps to increase power capacity to an isolated and grid-constrained community that has maximized its savings in energy efficiency, or to link a new solar or wind farm to the grid. However, the multi-billion dollar investment in transmission capacity currently being proposed is neither prudent nor necessary. A more prudent investment strategy would involve utilities spending the resources necessary to modernize their current controls and equipment and improve efficiency and distributed generation – without vastly expanding the size of the grid.

More Deregulation: Making the Problem Worse

Utility deregulation may or may not be to blame for the August 14 blackout. But it certainly created conditions that would make such an event more likely.

One would think that the blackout – coming just two years after the California energy crisis – would cause policy-makers in Washington, D.C. to adopt the same "go slow" approach to deregulation that has been adopted recently by many states. Instead, the Energy Bill now pending in Congress would remove even more regulatory constraints on utilities and shift further management responsibility to non-governmental organizations.

The Energy Bill furthers deregulation by repealing the Public Utility Holding Company Act (PUHCA), which limits utilities' ability to assemble complicated corporate structures and invest in non-related business ventures.

The events of August 14 call for *more* regulation of utilities in the provision of electric services, not less. The Energy Bill would finally require utilities to meet minimum reliability standards – a step forward. However, the provisions leave the oversight and enforcement to the same industry that caused the problem. By further deregulating the electric industry, spending billions in subsidies for fossil fuel and nuclear power plants, and doing little to increase energy efficiency or the use of clean renewables, the Energy Bill increases the risk of future blackouts and reliability problems. The benefits of reliability standards are not worth such a huge step backward on overall energy policy. Congress should strengthen the reliability provisions to include public participation and strong enforcement provisions, then pass them separately.

Effective Principles for a Reliable Electric System

Many alternatives exist to accelerating the deregulation of the electric industry and investing tens of billions of ratepayer dollars in transmission capacity. To improve the reliability of the electricity system – while protecting ratepayers and the environment – policy-makers at the state and federal levels should adopt four common-sense principles.

1. Increase Energy Efficiency

Excess consumer demand for electricity may not have been the direct cause of the blackout, but reducing demand can be a big part of the solution.

Why? Because transmission constraints are especially problematic in certain regions of the country. Improving energy efficiency in these regions can not only be less expensive in the long run than expanding transmission capacity, but it can also save money for individual consumers and enhance the nation's overall energy security.

The potential for energy efficiency improvements in the United States is massive – and largely untapped. A recent study by the American Council for an Energy Efficient Economy (ACEEE) found that, of 21 states that reported reliability problems or "close calls" during 2001, only 7 had attempted a demand-side management strategy aimed at solving the reliability problems.[21] Another ACEEE analysis found that significant efficiency savings could be brought on line relatively quickly, resulting in a 1 percent reduction in commercial and residential electricity demand *within a single year*.[22] A detailed study prepared for the National Association of Regulatory Utility Commissioners found that " a large fraction – as much as 40 to 50 percent – of the nation's anticipated load growth over the next two decades" could be met with cost-effective energy efficiency and load management programs.[23] Importantly, accelerated investments in efficiency will lower stresses on the grid while also lowering consumers' bills, lowering demands on local distribution grids, and reducing price pressures on the natural gas system.

Significant barriers, however, exist to the deployment of energy efficiency as a solution to transmission bottlenecks. Among the barriers to efficiency improvements facing utilities and consumers identified by the Regulatory Assistance Project are the following:

- inadequate information in the hands of purchasing decision-makers
- inadequate financial capacity to make the upfront investment
- inadequate capacity to accept the payback duration
- inadequate responsibility to make the decision[24]

Compounding these problems are the perverse financial incentives facing regulated utilities, which are financially rewarded for using their fixed investment in transmission lines to provide a maximum amount of power for sale. In addition, the typical stipulation that utilities receive a reasonable rate of return on their investments means that they are given further incentives to expand capacity, rather than reduce overall energy demand.

As a result, many states – especially those with deregulated electric markets – have sought to create a pool of funds dedicated to efficiency improvements through "systems benefit charges" on ratepayer bills. States that have taken over administration or oversight of these funds have had significant success in reducing electricity demand and saving money for ratepayers.

States and the federal government have also adopted energy efficiency standards on various appliances used by consumers and businesses. Unfortunately, in 2002, the Bush administration weakened a new rule that would have improved air conditioner efficiency by 30 percent – an improvement that would have made a major difference in reducing electricity use on high-demand summer days.

Among the steps that can be taken by the states and the federal government are the following:

- The federal government should adopt a systems benefit charge that would allow for the expansion of energy efficiency programs. States that have not yet adopted systems benefit charges for energy efficiency should do so, and should administer the funds themselves as opposed to allowing utilities to administer them.

- The federal government should immediately reinstate the stronger air conditioner efficiency standard rejected by President Bush and adopt strong efficiency standards for residential furnaces and boilers. States should adopt strong standards for appliances when the federal government fails to do so, and should adopt strong residential and commercial building energy codes.

- State PUCs and FERC should require utilities proposing transmission upgrades to consider the benefits of alternative approaches, such as efficiency improvements and expanded use of distributed generation. PUCs and FERC should insist upon the implementation of efficiency measures and distributed generation when they are the most cost-effective solution for consumers, and remove any barriers to those solutions contained in the rules of ISOs or other grid managers. Regulators should only approve transmission upgrades that are the lowest-cost, most reliable means to meet reliability needs for construction and cost-recovery from ratepayers.

2. Shift to Clean, Local Sources of Power

The back-up generators that provided power to hospitals and other important public facilities were a rare bright spot during the Northeast blackout. There is no reason that small power producers such as these cannot make an even bigger contribution to system reliability by providing extra power that can be sold into the grid.

The main problem with the "distributed generation" capacity that is currently deployed is that much of it relies on polluting energy sources, such as diesel fuel. And because this capacity is often concentrated within urban areas, the health effects of exhaust from these facilities are magnified.

Fortunately, cleaner alternatives do exist, and even better technology is coming. The use of combined heat-and-power (CHP), small-scale wind turbines, solar photovoltaic (PV) systems and fuel cells can reduce the environmental and public health consequences of distributed generation while providing reliable local power. Solar PV systems are especially attractive in this regard since they generate the most power on sunny days when power demand peaks.

As with energy efficiency, America's potential for renewable energy development is massive, and largely untapped. The Pacific Northwest National Laboratory estimates that America has enough windy spots to generate as much as 20 percent of America's electricity using current technology, and the wind potential that could be tapped by advanced turbines is even greater.[25] Solar thermal and PV systems are not yet as cost-effective as wind power, but could play an important role now in distributed generation systems, and will become increasingly cost-competitive as demand increases and per-unit production costs decrease.

Clean, distributed generation has several reliability advantages over centralized power production. Local power sources can reduce the need for long-distance transmission of electricity over the grid, utilize waste heat more effectively (resulting in improved overall efficiency), and can continue to provide power to local areas even in the midst of a major grid disturbance. Of course, distributed generation – particularly those sources powered by intermittent power sources such as solar and wind power – does not usually obviate the need for connections to the larger grid. But the spread of distributed generation would reduce the day-to-day burden on the grid for the transfers of power over long distances and reduce the risk of price instability caused by over-consumption of fossil fuels such as natural gas.

As is the case with energy efficiency, utilities should be required to consider the potential load reduction benefits of distributed generation when considering new transmission capacity, and to invest in distributed generation when it makes sense economically. Federal and state officials must establish stringent pollution limits for remote generators in order to ensure that the growth of local power sources does not result in the growth of local public health problems. The best way to encourage the development of local, renewable resources would be for the federal government to adopt a renewable energy standard – similar to those already adopted in several states – that would require 20 percent of America's electricity to come from new, clean, renewable sources of energy by 2020.

Another way to encourage more Americans to generate local power is to enable them to sell the excess power they generate back into the grid. Thirty-three states have already adopted some form of "net metering," but the standards vary significantly from state to state. A national net metering standard – if developed appropriately – would significantly improve the financial attractiveness of clean local power.

3. Plan for the Future

The current reliability problems facing the electric grid are symptoms of the lack of coherent planning at the national level for the future of the electricity transmission system. Indeed, the grid is akin to a rudderless ship, in which individual utilities sometimes make improvements to meet local needs, but no one takes responsibility for setting priorities for future investment.

There has not been a comprehensive survey of the functioning of the national grid in many years – despite the dramatic changes that have arisen in the wake of deregulation. Such a study – carried out under federal supervision – is urgently needed, and should be followed up by devising a plan that prioritizes system improvements and assigns responsibility for making those improvements happen. Similarly, state regulators must value planning as a tool for better management of their electric grids.

4. Restore Accountability

The proliferation of organizations with overlapping responsibilities for the management and operation of the grid must end. State PUCs must reassert themselves as the primary protectors of the rights and interests of utility consumers and guardians of the electric grid within their states. FERC must assert responsibility for setting and enforcing standards for the reliability of the system, guiding the overall planning and development of the grid (and of reliable alternatives to grid expansion), and ensuring that interstate commerce in electricity is both fair and protective of the public interest. Individual utilities must accept bottom-line responsibility for the operation of their segment of the grid.

Cooperation on the part of utilities – whether through ISOs or other organizations – should be encouraged, but the utilities themselves must ultimately be held responsible both for their own actions and the actions of the organizations they create.

The decision over whether to deregulate electricity markets should remain in the hands of the states. Further federal efforts to force aspects of deregulation on the states – such as those contained in the Energy Bill – should be opposed. On the other hand, mandatory reliability standards, such as those contained in the Energy Bill, should be enacted as quickly as possible, and implemented on a technology-neutral basis.[26] Those standards should be enforced by the federal government – not the electric power industry – and carry real sanctions for violators.

Finally, policy-makers must acknowledge that the delivery of reliable electric power affects many constituencies – utilities, businesses, state and local governments, and the broader public, just to name a few. As a result, when important decisions are made that affect the future reliability of the grid, efforts should be made to include all of these constituencies in the decision. The public, in particular, must have its interests represented in these discussions. California sets a good example by providing funding for intervenors representing consumers to participate in regulatory proceedings. Citizens utility boards – or CUBs – such as those created in Illinois, Oregon and Wisconsin – provide a good model for consumer representation in utility decision-making and should be replicated at the federal level.

Needed: A Real National Energy Strategy

The events of August 14 demonstrated to Americans the vulnerability of our electric power system – a vulnerability caused, in large part, by our long-time overreliance on centralized, fossil-fuel fired power plants, coupled with the misuse of the grid for bulk interstate transfers of electricity for which it was never designed, and the breakdown of traditional lines of regulatory accountability.

A new kind of electric system is possible – one that is decentralized, resilient and focused on the efficient delivery of services such as light and cooling, rather than moving the maximum number of electrons from place to place. Such a system would take advantage of the nation's abundant supply of renewable fuels, reduce the strain on the grid through conservation and efficiency, and encourage the development of flexible and reliable small-scale distributed generation systems.

The creation of this system would be a win-win-win situation for the environment, consumers, and the reliability of the electric system. But it will require investment. The $50 billion to $100 billion now being proposed to update and modernize the grid could go a long way toward bringing such a system to fruition.

To be sure, even this new electricity system will require some investment in transmission capacity. The flow of power over the grid will be regulated by smarter, state-of-the-art controls. More efficient transmission lines will come to replace less efficient ones. And the development of large-scale renewable energy projects – such as solar and wind "farms" – will require the development of some entirely new transmission capacity.

Such an innovative electricity system will never be possible, however, as long as perverse financial incentives reward utilities based on power sales, not energy savings; as long as no one can be held accountable for the reliable operation of the grid or for planning its future; as long as power generators continue to use the electric grid – built over the course of decades through the investment of billions of ratepayer dollars – as their own "electricity superhighway"; and as long as artificial barriers stunt the growth of renewable power sources and distributed generation.

America has reached a turning point. Investing billions more dollars in the transmission system now while further deregulating the electric industry would only leave ratepayers throwing good money after bad in a system no longer capable of serving their needs. Now is the time for America to plan for an electricity system that can prevent blackouts, enhance our nation's energy and economic security, and reduce threats to the environment and public health.

Notes

[1] Andrew C. Revkin and Matthew L. Wald, "Midwest Utilities Were Warned About Pushing Limits of System," *New York Times*, 18 August 2003.
[2] Based on number of Level 2 and higher Transmission Loading Relief (TLR) procedures imposed in North America according to the North American Electricity Reliability Council. Data obtained from ftp://www.nerc.com/pub/sys/all_updl/oc/scs/logs/trends.htm, 2 September 2003. Note: Nearly one-third of all Level 2 and higher TLRs reported in 2003 to date have occurred in systems managed by the Midwest Independent System Operator.
[3] U.S. Department of Energy, Energy Information Administration, *Electric Power Annual 2001 Spreadsheets*, March 2003.
[4] U.S. Department of Energy, Energy Information Administration, *Status of State Electric Industry Restructuring Activity as of February 2003*.
[5] North American Electric Reliability Council, *Reliability Assessment 2002-2011: The Reliability of Bulk Electric Systems in North America*, October 2002.
[6] Nuclear Regulatory Commission, *Frequently Asked Questions About the Loss of the Electric Power Grid on August 14, 2003*, downloaded from http://www.nrc.gov/reactors/operating/8-14-03-power-outage.html, 2 September 2003.
[7] American Public Power Association, "Blackout: Public Power Utilities Recount What Happened, Part I," *Public Power Weekly*, 25 August 2003.
[8] North American Electric Reliability Council, *Reliability Assessment 2002-2011: The Reliability of Bulk Electric Systems in North America*, October 2002.
[9] Ibid.
[10] National Commission on Energy Policy, *Reviving the Electricity Sector: Findings of the National Commission on Energy Policy*, 29 August 2003.
[11] "sliced nearly in half" from Dan York and Marty Kushler, American Council for an Energy-Efficient Economy, *State Scorecard on Utility and Public Benefits Energy Efficiency Programs: An Update*, December 2002.
[12] U.S. Department of Energy, Energy Information Administration, *Electric Power Annual 2001 Spreadsheets*, March 2003.
[13] U.S. Department of Energy, Energy Information Administration, *U.S. Total Natural Gas Production*, downloaded from http://tonto.eia.doe.gov/dnav/ng/ng_enp_sum_nus_a_d.htm, 3 September 2003.
[14] U.S. Department of Energy, Energy Information Administration, *U.S. Natural Gas Wellhead Price*, downloaded from http://tonto.eia.doe.gov/dnav/ng/hist/n9190us3M.htm, 2 September 2003.
[15] Nuclear Regulatory Commission, *Special NRC Inspection of Equipment Problems at Perry Nuclear Plant* (press release), 28 August 2003.
[16] Scully Capital, *Business Case for New Nuclear Power Plants*, prepared for the U.S. Department of Energy, July 2002.
[17] The Electric Power Research Institute, in a report completed before the blackout, but released afterward, estimated the cost of creating a "21st Century Transformation" of the electricity grid as costing as much as $100 billion. EPRI's study, however, did not simply recommend expansion of the transmission system, but also updating that system with 21st century technology, clarifying regulatory responsibilities, enhancing energy efficiency, and developing effective accountability mechanisms. See: Electric Power Research Institute, *Electricity Sector Framework for the Future*, 6 August 2003.
[18] U.S. Department of Energy, *National Transmission Grid Study*, May 2002, 51.
[19] LaCapra Associates, *Alternatives to VELCO's Northwest Vermont Reliability Project*, prepared for VELCO, 29 January 2003.
[20] David Morris, *Seeing the Light: Regaining Control of Our Electricity System* (Minneapolis: Institute for Local Self-Reliance, 2001), 54 as cited in Brad Heavner, Rob Sargent, National Association of State PIRGs, *Micropower at the Crossroads: Public Health and the Future of Distributed Generation*, 2002.

[21] Martin Kushler, Ed Vine, Dan York, American Council for an Energy-Efficient Economy, *Energy Efficiency and Electric System Reliability: A Look at Reliability-Focused Energy Efficiency Programs Used to Help Address the Electricity Crisis of 2001*, April 2002.

[22] R. Neal Elliott, Anna Monis Shipley, Steven Nadel, Elizabeth Brown, American Council for an Energy-Efficient Economy, *ACEEE Estimates of Near-Term Electricity and Gas Savings*, 15 August 2003.

[23] Richard Cowart, *Efficient Reliability: The Critical Role of Demand-Side Resources in Power Systems and Markets*, prepared for the National Association of Regulatory Utility Commissioners, June 2001, 23.

[24] Regulatory Assistance Project, "Energy Efficiency for Reliability and Risk Management," *IssuesLetter*, September 2002.

[25] American Wind Energy Association, *The Most Frequently Asked Questions About Wind Energy*, downloaded from http://www.awea.org/pubs/documents/FAQ2002%20-%20web.PDF, 2 September 2003.

[26] NERC reliability standards have historically tended to favor traditional "wires and turbines" solutions to reliability needs, and have been interpreted in ways that discriminate against distributed resources, customer load response, and long-term energy efficiency – even when these resources can help meet reliability needs.