POWER SHORTAGE

The Information Age is rendering the nation’s aging electricity grid obsolete and dangerously crisis-prone—with risks to IT potentially more serious than any Y2K bug would have been. Trouble is, there’s leadership focused on a fix this time, and companies and CIOs are starting to get nervous.

California’s recent energy woes should be a wake-up call to business leaders and strategists across the nation, says a recently convened CIO Insight Roundtable of energy and technology experts. While the rest of the country, they say, appears to be in better shape than California, some ominous clouds are already gathering. Supplies in several regions, including New York City, are tight. Prices remain stubbornly high in some areas, affecting businesses and consumers. In certain Marriott and Hilton hotels, for example, guests are being slapped with energy surcharges of between $3 and $10 per night on top of the regular room rates. Some businesses, meanwhile, are facing sharp price hikes over last summer’s severe heat wave in the Midwest or along the Eastern Seaboard this summer could send those parts of the country into their own power crunch. The breakdown of a few big plants in one region could cause the lights to flicker in nearly a dozen states.

Whole chunks of the country, in other words, are “walking a tightrope” between sufficiency and outright shortages, says Professor Roger Anderson of Columbia University’s Energy Research Center. It’s time, experts say, for business and government to grips with the gap between the growing power demands of the Digital Economy and the limits of the nation’s decades-old energy grid. But no single player in the chaotic world of energy industry deregulation has either the financial incentive or the political clout to upgrade the lines alone.

Developments in networking technology will help fix things, says energy expert Stephen Gehl—but not for years. Gehl envisions a day when the grid is fully automated and tied to Net-based systems that automatically regulate consumption and pricing.
Dr. Anderson, you recently wrote that in 1995, there were just 20,000 servers in the world. Today, there are 6 million. Just one new server farm proposed for the economic development zone of the south Bronx, for example, would draw more than twice as much power as the entire World Trade Center complex. Forty-six such developments are proposed for New York City and neighboring Westchester County alone over the next four years, increasing the total electricity demand on Con Ed by 4 percent. Are the electricity demands of the Information Age starting to push the nation's power grid to its limits?

Anderson: The system is crashing. The energy demands of the computer age represent the extra load on the nation's electricity system that wasn't there 10 years ago.

Is this the straw that breaks the camel's back?

Anderson: Yes. But the funny part about it? It's not really a power generation problem. There are seven new generators going up here in New York City alone. The big problem is that the nation's transmission grid itself is all messed up. The camel's back in this case is the transmission system that gets the fuel into the power plants and then the electrons out to the consumer. You can argue all day about what causes it, but brownouts are bad, brownouts are happening, brownouts are headed for New York City, and that's the fact. We should all go out and buy batteries.

Hurle: And the scary part of it is that we're not sure what's causing the outages. It's really not the increased demand for electricity that's been causing the problems in California, and I think you can extrapolate that to the rest of the country. It's more the organization and the topology of where the power generation is and how we get that generation out to the consumer.

Gehl: In Silicon Valley, we're at the end of a long distribution line. So we are pretty much at the mercy of everyone upstream of us. Combine that with the fact that we are highly reliant on power imported from other parts of California and other parts of the U.S.

How do we rethink the future of electricity generation, transmission and delivery? If it's not just a question of needing more power, what other issues do we need to address?

Anderson: Well, there's nobody in charge of the transmission system. You've got this tremendous increase in complexity with all of the new generator companies throwing power onto the grid and no software or hardware to redistribute it and handle it. It's like an air traffic control system without the Federal Aviation Administration up there running things. Of course, you can put planes in a holding pattern. You can't do that with electricity on a grid. You get these waves of chaos sweeping through the system, and as it gets more and more connected, it's going to get more and more chaotic.

Handfield: In one of the studies we did, we looked specifically at this issue of developing a supply management strategy for sourcing electricity. In fact, there is a process you can use to effectively look at the market, the contingencies [and] the risk factors. There are things you can do in terms of long-term contracts, hedging contracts—agreements that specifically set levels of reliability that you establish in key relationships with providers. And I think the most important thing is to know thyself, to know what your usage pattern is, what things are going to look like in the future. Once you have a baseline of that kind of information, you can set an appropriate strategy to be able to deal with the possi-
At the Navajo Generating Station in Page, Ariz., electricity is created, refined and distributed. Photograph: Christopher Griffith, 1999.

John Keast, the former CIO and Chief Technology Officer of California's Pacific and Electric, says that government age and utilities should use the California station as a wake-up call to build an improved business infrastructure to manage the nation's energy needs. He says an electronic place for electricity would have better hinted many companies in California for crisis just past there. Are Web-based electricity markets part of the solution?

Anderson: Well, the first problem is the urgent part of the intelligent grid. There's nothing that you can do by trading lots of anything will give the grid any intelligence for many systems. Systems integration requires them to move electrons from one place to another, and you can't do it with the current outmoded mechanical switch-throwing grid. You need to put the grid into the modern world, with solid-state switches, and then you have the chance that grid with computers that optimize flow and distribution.

Gehl: There are also advances on the horizon in high-density composite materials, with high conductivity, higher strength and lower weight, would allow you to really maximize the output on a given transmission right-of-way. Ultimately, we're looking at superconducting transmission lines as well. So there's a whole series of technologies that are at commercial stage that are sort of sitting on the shelf right now. What we need to do is come up with the appropriate incentives for us to actually implement these things off the shelf and into service. There's a tremendous task ahead of us to do this thing and create the sort of incentives that can induce people to do the necessary development to cooperate, to make sure that all the various interchanges are working properly. It's something that I think we are just beginning to grips with.

Asmus: Some interesting experiments are already under way, chiefly in the area of...
How does the CIO fit into the picture?

HANDFIELD: I think the CIO should definitely be a major player on the team that develops energy strategy. I think it should be led by supply management and operations, and it should be a cross-functional undertaking, really, because it is of critical importance.

GARDINER: I agree. What we see emerging is a need for IT organizations along with their facilities counterparts inside companies to be working very closely with power companies to talk about their strategies for the future, what kinds of technology needs they have, and how they can work together to anticipate what’s going to mean to the group.

HURLE: The CIO’s role in an organization is two-fold: First, to be responsible for integrating technology into the business strategy of the organization; and second, from an operational standpoint, to deal with issues on a day-to-day basis—provide technology, anticipate technology change. I don’t think it’s fair to expect the CIO or even any single organization to be responsible for redesigning the nation’s power grid, and I think Dr. Anderson’s point is well on. There really isn’t anyone in charge, and it’s not necessarily fair to hold anyone organization responsible. The CIO’s job, a company’s job, is to maximize shareholder value, and that’s what they’ll do. That’s what they get measured on, that’s what their performance is based upon.

ANDERSON: And they can do a great job and still have brownouts sweep through their company.

HURLE: I think CIOs fall into two groups. There are CIOs of energy companies who have, I guess, a lot more pressure on them to think of

company. Like CIOs at some of the companies that I work for, for instance, are trying to attract retail customers in more than eight states in the U.S., and for every single state they have a different billing system to be able to deal with attracting customers. That makes for a lot of inefficiency. Then there are a lot of other CIOs who aren’t with utility companies, but nevertheless have a lot of issues to deal with in terms of the infrastructure, the cost, how they organize themselves, how they procure their energy, involve themselves with base markets and so forth.

MEHRABANI: For us, it’s an economic problem. It’s an issue of what do we need to do to protect the basic fundamental operations of the business—and what is the source of the energy that will let us do that? I think we CIOs would be supportive of any reasonable economic approach to solving the capacity problem, whether it’s an alternative source of energy or something to enhance the capabilities of the grid. But I’m not sure that a CIO, for example, or even an architecture individual like myself, would want to stick his nose into the decision, “Do I want to use my windmill today or do I want to use my biomass?” That’s not what I’m being asked to do.

What new technologies have the most promise?

MCCREA: A lot of companies are looking at ensuring their own power supplies by considering building their own generating capacity and bypassing the regional power grid. In the past, CIOs didn’t really have to worry about this. But today, energy and pricing is a matter of information—and now they do.

HANDFIELD: I believe smart metering is a very practical application that I think we’re going to see a lot of in the future, whereby the electricity meters attached to a house or a building can be read virtually, via sensors that are placed on trucks that literally drive by and check them. I think one important aspect of upgrading the grid and tying it to the Net will be modernizing measurement of power consumption.

GARDINER: I think all vendors, ourselves included, need to focus on the kinds of intelligence built
device’s position in the architecture. It’s a different issue for a network device than it is for an end-user’s laptop or a PC. But all of them can be equipped with enough intelligence to understand how to make power consumption decisions based on the work that they’re doing at a moment in time. We are deploying devices that are very power smart at the user end, which is the most ubiquitous piece of technology that we have, and we’re teaching our employees how to use that power management capability to reduce our costs. And I think all vendors need to be focused on putting those kinds of products in the marketplace.

ANDERSON: I’m afraid I’m a little more pessimistic. The technology’s not the issue. This energy crisis is a gigantic systems integration problem without a leader. And if you look at the three main networks in the world, there’s the phone system, there’s the Internet, and there’s the electricity grid. Now, the phone system was built by AT&T Corp. with the government saying, “Go, take a monopoly and run the phone system,” and they successfully got phones cheaply everywhere. That has since bifurcated into all kinds of activity. The Defense Advanced Research Projects Agency, the military, did the Internet. Nobody’s doing the electricity grid. Who’s going to run this show?

I’d like to ask people like Steve Gehl where he thinks the leadership is going to come from for that to happen? Who’s going to pay the bill? Is it going to be the Pentagon when they finally get scared that this is a threat to our survival, or is it going to have to be the companies all banding together and saying we’re going to overcome? The problem is the public has little knowledge of how the electricity system works and therefore cannot assert political pressure. Most of my students at Columbia don’t know how their hair dryers work, let alone what comes out of the electric plug. So the general public hasn’t a clue what’s going on here.

Who should take leadership?

ANDERSON: It’s going to take somebody like DARPA getting engaged. The military was responsible for the interstate highway system. Whether that comes from the military or don’t know. I think it clearly has got to be the federal government, and right now, I hope it would be aided by voluntary organizations. For example, you have the Federal Regulatory Commission, and the North American Electric Reliability Council...

ANDERSON: You’re going to let them run it?

GEHL: No, but I think they’re going to have to be involved. But we are going to have to be hobbled degree by having locked in on an older energy base, and I think what we need to do is come up with an overall approach for moving the system and recognizing that the new technology is going to have to have a substantial advantage over those existing technologies. The other problem is that the time constant seems to be a lot larger in the electricity than it is in the Internet or computer bus. The electricity business tends to go through technological cycles at a slower rate, principally because the capital costs are so much higher. You power plant with the expectation that it’s to be around for 30 years, and if you do things sort of stuck with the performance of what some day will be a 30-year technology, the environmental limitation on technology, and so forth.

Is something being learned now in California that will eventually help other states?

GEHL: Gosh, I think so. I certainly hope so. Looking at what’s wrong with wholesale markets, what’s wrong with retail markets, what can do to develop technologies that won’t be modernize the grid. I think there’s a tremendous opportunity to learn from the California situation. We have taken to calling what happened in California “the perfect storm,” all of the various variables lined up in the adverse configuration. But that isn’t to say that parts of the California syndrome won’t be experienced in other areas of the country. The likely will be, and soon.

HURLE: (California Gov) Gray Davis is no Ge Clooney. (Laughter) I think one of the realities of the day, especially one that CIOs have to deal with is that they have dysfunctional organizations
aren't up to the game, just like the experience of the telecommunications companies of 10, 15 years ago when they were deregulated. You're essentially telling bureaucracies to go and be competitive, and they simply can't do that. They have a whole different set of metrics and cultures—the way they organize their data, the way they manage their processes, the sort of processes and technology that they have deployed internally. They just aren't up to the task. And so today's energy CIOs have this unenviable job of trying to integrate a very high level of expectation about what technology can deliver based on what they read [in magazines], telling them that the Holy Grail is just around the corner and if you put in automated meter reading or if you do wireless this or wireless that—or if you connect your palm pilot and manage your washer and dryer from the office—then everything will be fixed. And that's just simply not the case.

GARDINER: I think it simply brings to light the fact that we're probably at the point where policymakers and those who advocate for the individual consumer need to come together to address a very serious national problem that needs to be solved with a sense of urgency.

MCCREA: I guess I would compare this to Y2K. Look at the Y2K issue, when that problem was in front of all of us. There was a lot of hype, there was a lot of change, and a lot of dollars spent. At the end of the day, people realized, with all the changes that were being done, that nothing would work unless people were actually delivering. We've done a major reorganization in this industry, and IT, from a corporate perspective, will probably upscale any plan we had in numbers associated with that problem. And as an industry, we have to ensure we've got the power to take the 21st century.

**Is there a lesson to be learned from that?**

**ANDERSON:** I would love to settle for that. That was spent on Y2K. That would be a very good thing for the transmission grid if we could get that much attention. It's remarkable what $300 million got for a non-problem.

**HURLE:** This is a $300 billion market.

**ANDERSON:** How did Y2K happen? Was it a marketing scam or what was it? We still haven't figured...

**MCCREA:** It was a scare tactic, sort of...?

**ANDERSON:** Started by whom?

**MCCREA:** ...that got everyone's attention.

**ANDERSON:** Who did it?

**HURLE:** The software companies?

**ANDERSON:** Whoever it was, let's sign and fix the grid.