Forum: Let there be light

Jay Apt and Lester Lave say power blackouts are too frequent, dangerous and costly to blame operators or individual companies

One year ago, a great blackout crippled much of the East Coast. It should have sent a wake-up call to federal regulators: The complexity of our electricity system puts impossible demands on human operators, given the primitive tools they have to identify and react to an emergency.

A special task force spent months investigating the Aug. 14, 2003, event and blamed it on errors by control room personnel. The root causes are much deeper and the solution requires more than firing individuals or punishing one company.

Fortunately, air traffic control provides us a guide to a system which virtually eliminates the effects of human error. The problems uncovered by the blackout are ripe for the kind of change that transformed the air traffic control system from one of chance deadly accidents to a safe, relatively accident-free environment.

The $6 billion August blackout was not a rare event. Since the 1965 New York blackout, government officials have promised to end outages -- but a major power failure still occurs about three times a year in the United States, costing the economy billions.

Deregulation has transformed the operation of the electricity system.

Utilities used to transmit power from a nearby generation plant to customers. Now, industrial customers can buy power from plants hundreds of miles away, putting major burdens on the transmission system and increasing the likelihood of a blackout.

The stalled energy bill begins to deal with the issues. It vests authority for detailed standards and enforcement in a new Electric Reliability Organization under the supervision of the Federal Energy Regulatory Commission. This is a start, but much more is needed, beginning with expanding that authority to include certification and policing of transmission operators and systems to meet national standards of data and control, training and periodic testing -- a system not unlike the one that is used to assure airline safety.

There are parallels between the anarchy that existed in the skies before the air traffic control system was set up and what is occurring with the management -- or lack of management -- of the electrical grid.

Early airline safety investigators generally blamed the pilot -- for inadequate training, not inspecting the aircraft thoroughly, flying in dangerous conditions or not reacting properly to the danger. Rather than have many erring pilots and dead passengers, we redesigned the system to reduce errors.

In 1934 the federal Bureau of Air Commerce asked four airlines to develop the first air traffic control system. Charges of favoritism and a crash that killed a senator led the government to take over the system.

The new system was based on pilots radioing their best guess of their location. As traffic increased, safety levels declined. Four fatal crashes between 1956 and 1960 finally got the public to demand timely and accurate data through a national radar system. Problems remained in the 21 regional systems, and eventually national coordination was ordered.

We draw the following lessons: First, private voluntary cooperation is insufficient to end blackouts. Second, operators need tools that tell them when and where problems are developing and that help them to identify remedies. They are now largely flying blind, and need accurate data on the state of each part of the grid. A national center is needed to coordinate the local and regional centers, ensuring that each gets the information required to make informed decisions. It will also enhance normal operations, just as the air traffic control system now keeps aircraft at the gate, rather than having them circle overhead for hours when congestion develops.

Training is needed for those in control of the grid. Grid operators are like airline pilots, who describe their jobs as "years of boredom punctuated by moments of stark terror." Pilots prepare for a once-in-a-career emergency by training in realistic simulators. Grid operators need to do the same.

When incidents do occur, no organization should investigate itself. A trained staff of accident investigators can keep minor incidents from becoming major blackouts, as occurs with investigations of aircraft "near misses." The ad hoc nature of the Aug. 14 investigation shows that we don't have an agency specialized in investigating blackouts or applying the lessons of previous blackouts. An independent agency like the National Transportation Safety Board should be established within the Department of Energy to investigate incidents and make recommendations to regulators.

Our bottom-line message is that power blackouts are too frequent, dangerous and costly to blame operators or individual companies. Deregulation vastly complicates efforts to make the electrical grid more reliable. The air traffic control system has much to teach us about making an inherently complicated system operate safely.

Jay Apt is executive director of the Carnegie Mellon University Electricity Industry Center at the Tepper School of Business and the Department of Engineering and Public Policy, where he is a distinguished service professor. Lester Lave is the Higgins Professor of Economics at the Tepper School of Business and co-director of the Electricity Industry Center.