November 19, 2003

U.S.-Canada Power System Outage Task Force
Washington, D.C.
Remarks by Secretary of Energy Spencer Abraham

Three months ago today, large sections of the United States and Canada were still recovering from one of the largest power blackouts in our nations' histories.

Since the blackout, a U.S-Canadian Task Force has been working to determine how and why it occurred. Today, we are releasing an Interim Report that marks our progress to date.

August 14, 2003, started out as a fairly normal summer afternoon for most people in areas of Ontario and sections of the Northeast and Midwestern United States. But all that changed when the electricity suddenly went out in city after city across the region. Communications were disrupted, traffic was snarled, elevators stopped, air-conditioners quit, stores and businesses were forced to close, factories shut down, and hospitals and other vital facilities went to emergency power.

Millions of people were inconvenienced – some were even endangered – and everybody wanted answers about what caused such a widespread power blackout. For the past three months, hundreds of technical experts and energy specialists from both the United States and Canada have been working to find those answers.

The investigation into the August 14th blackout by the U.S.-Canada Task Force has made impressive progress in collecting and analyzing enormous amounts of complex data related to this power outage.

The Task Force investigation is being conducted by three Working Groups that are focused on specific aspects of the outage:

- the Electric System Working Group, which has the immense task of looking at the thousands of working parts of the power grid and its operations to determine exactly what happened on August 14th and why;
- the Nuclear Working Group, which has examined how nuclear power stations performed in the affected areas;

- and the Security Working Group, which is looking at whether any intentional actions were among the causes and whether any security issues were involved.

These three Working Groups have submitted their Interim Report to me and Canadian Minister of Natural Resources Herb Dhaliwal, and the other members of our Task Force. And yesterday, the Task Force voted unanimously to accept the Working Groups' findings to date and move ahead to the next phase of our process.

This Interim Report focuses on the events, actions, failures, and conditions that led to the blackout and allowed it to cascade over such a large region. It also focuses on questions relating to nuclear power operations during the blackout and to the security of the grid itself and the control systems that make it work.

The release of the Interim Report also marks the beginning of Phase Two of the Task Force investigation. During Phase Two, we will hold a series of public forums in the affected areas of both countries. These forums will give the public an opportunity to comment on the Interim Report's findings and present ideas for improving the reliability of our electric infrastructure and preventing future blackouts.

After this process, the Task Force will issue a final report containing our recommendations for improving the electric system and for any appropriate follow-up.

When the Task Force began its work three months ago, we said that we would not speculate on potential causes or make any judgments until we had studied the facts. We also said we would conduct a fair and thorough investigation. And, we said we would follow the facts wherever they lead.

We now have progressed far enough in the investigation that the public should see the results to date.

In addition to exploring the basic questions of what caused the blackout and why it spread, this Interim Report reminds us of the complexity of our power grid and the tremendous responsibility of those who are charged with ensuring its reliability.

One major conclusion of the Interim Report is that this blackout was largely preventable. However, the report also tells us that once the problem grew to a certain magnitude, nothing could have been done to prevent it from cascading out of control.

The electric grid is a complex and sensitive infrastructure that can only work properly when a delicate balance of electric supply and demand is maintained across the system. To accomplish this constant balancing act, hundreds of people are at work 24 hours a day all across North America to keep the grid operating.

Their job is to monitor the state of the power system, to identify and stay ahead of any problems, and to take steps to remedy any situations or conditions that might upset the delicate balance of electric supply and demand.

Grid operators must also deal every day with the unexpected. They watch for mechanical failures in equipment that keeps electricity flowing at the proper voltage. They must know where power is being consumed and at what rate, where it's being produced, and where more can be obtained if it's needed. And they must be prepared to shed load or take other necessary actions to offset any lost generation or transmission capacity. They must monitor the power lines to make sure they are working properly, and that the right amount of power is flowing to keep everything in balance.

And when something goes wrong, their job is to quickly find alternatives and activate backup plans, and take action to compensate for the imbalance, so the grid can still operate in a stable manner.

Electricity transmission experts know that the best way to keep a blackout from spreading over a wide area is to never let it get started. That's what the policies and procedures of organizations like the North American Electric Reliability Council are all about. NERC and its affiliated organizations set the voluntary reliability standards that govern the operations of our power grids.

When the procedures are followed and equipment works properly, the grid's delicate balance is maintained – even when things go wrong. But when something does go wrong – and very important procedures aren't followed and critical transmission monitoring and control equipment fails – the likelihood of major problems intensifies.

And that's what our Electric System Working Group has determined happened on August 14th.

And, because of that, a number of relatively small problems combined to became a very big one.

The Electric System Working Group found that the initial events that led to the cascading blackout occurred in Ohio.

- The blackout was initiated when three high-voltage transmission lines operated by FirstEnergy Corporation short-circuited and went out of service when they came into contact with trees that were too close to the lines.
- The report tells us that FirstEnergy's control-room alarm system wasn't working properly – and the control-room operators were unaware it was not working properly – which meant they were also unaware that transmission lines had gone down.
- And because FirstEnergy's monitoring equipment wasn't telling them about the downed lines, the control room operators took no action -- such as shedding load -- which could have kept the problem from growing, and becoming too large to control.
- Moreover, because FirstEnergy operators did not know their monitoring equipment had failed and were unaware of the growing problems, they did not

inform neighboring utilities and reliability coordinators, who also could have helped address the problem.

- The loss of the three lines resulted in too much electricity flowing onto other nearby lines, which caused them to overload.
- While all this was happening, there were also problems at the Midwest Independent System Operator – also called the MISO – which is the entity that coordinates power transmission in the region that includes FirstEnergy.
- The Interim Report found that MISO's system analysis tools weren't performing effectively on the afternoon of August 14th. This prevented MISO from becoming aware of FirstEnergy's problems earlier and taking action.
- The Working Group also found that MISO's reliability coordinators were using outdated data to support real-time monitoring, which hindered them in detecting further problems on the FirstEnergy system and assisting in relief actions.
- Furthermore, the investigators found that MISO also lacked an effective means to identify the location and significance of transmission line breaker operations reported by its monitoring systems. Having that information would have enabled MISO operators to become aware of important line outages much earlier.
- The report shows that MISO and the PJM Interconnection – which is the reliability control area that includes Pennsylvania, Maryland, New Jersey and parts of other states – lacked joint procedures to coordinate their reactions to transmission problems near their common boundary.
- And the report identifies other factors that contributed to the conditions that led to the blackout, including poor communications, human error, mechanical breakdowns, inadequate training, software glitches, and insufficient attention to things ranging from the performance of sophisticated computer modeling systems to simple tree-trimming.

The Electric System Working Group has concluded that at least four reliability standards established by NERC were not observed by FirstEnergy on August 14th, and two were not followed by MISO. These failures helped create a problem of such magnitude as to be insurmountable.

In addition to determining what started the blackout, the Working Group also attempted to determine how the blackout spread so far.

If several major power lines suddenly go out of service in close proximity, like they did in Ohio on August 14th, it can disrupt the area's balance between production and consumption of electricity. It can also cause fluctuations in reactive power or voltage levels, which can likewise destabilize the system. As discussed earlier, when this occurs, grid operators must restore that balance – either by adjusting the output of certain power plants, or taking certain customers temporarily off-line, or by adjusting equipment to stabilize the power flows.

If they don't, as was the case on August 14, the electricity being produced quickly moves on to other lines. But if those other lines are unprepared to receive the additional power,

this extra electricity can overload them and shut them down. If that happens, the power keeps moving to other lines, and the problem builds.

If a power imbalance is allowed to reach a certain magnitude, it can spread over a wide area in an uncontrollable cascading blackout – which is what happened on August 14th as transmission line after line went out and generators disconnected from the grid.

The reason the blackout spread where it did has to do with physics and geography – including how many power lines are in an area, how large they are, how close they are to major power plants and load centers, what sort of protective equipment they have, and how much electricity is already moving across them.

We know, though, that the blackout did not reach every part of the Eastern Interconnect, and that some areas were still receiving power. The report outlines three principal factors that – working alone, or, in some cases, together -- appear to have allowed this to happen.

- First, because of line trips, some areas were isolated from the portions of the grid experiencing instability, yet they retained sufficient on-line generation or the capacity to import power from other, unaffected, parts of the grid. This enabled them to balance their system and keep the power on.
- Second, other areas were sufficiently distant from the central source of the cascade that they received smaller current and voltage fluctuations than areas closer to the source. Consequently, the instability encountered by relays and other circuit breakers in these areas did not cause additional plants and lines to trip.
- Finally, some areas possess more robust transmission lines and were better able to absorb more of the power and voltage surges. Certain areas also are interconnected by direct current – or D.C. – tie-lines, which kept the alternating-current power disturbance from getting through.

In addition to the findings of the Electric System Working Group, our Nuclear Working Group determined that all the affected nuclear plants in the United States and Canada functioned properly.

- Procedures at the nuclear plants were followed, and the procedures and equipment both worked well on August 14th.
- The nuclear plants all shut down safely when they detected a disturbance.
- And they were restarted safely when the grid was restored.

The Security Working Group has found no evidence to date of terrorist activities or any sort of foul play or sabotage on August 14th.

- No deliberate damage or tampering has been found in any equipment in affected areas of the grid.
- And no computer viruses or any sort of illicit cyber activities have been identified as factors.

While the Interim Report identifies a significant number of problems and shortcomings, it also shows us something very positive.

In the 100-plus years that the grid system has been in operation, massive power outages have occurred only a few times. But smaller outages occur every day. These minor outages are inevitable on such a vast and complex array of interconnected and interrelated machinery that is so vulnerable to internal malfunctions and external forces. Things go wrong. But it is the responsibility of the people who operate the system to keep the small problems from getting bigger.

So despite the potential for a major blackout, it hardly ever happens. That's a credit to the design of the system and the people who run and maintain it. It's a good record, overall. But even one major blackout is too many, and we intend to use what we've learned from our investigation of August 14th to make the system even stronger and even more reliable.

Phase One of our Task Force investigation has given us a wealth of information that will be the basis for Phase Two of the process – formulating recommendations on ways to make our electric system stronger, more efficient, and better able to withstand and adapt to all the things that can hinder its safe and reliable operation.

On behalf of the U.S.-Canada Task Force, I would like to thank the dozens of highly skilled men and women who have spent so much time and effort producing this report today – and who continue to work on this project. I would also like to thank the regulators, utility employees, political leaders and technical experts who have cooperated with this investigation, and helped us make such excellent progress.

And I would like to thank the people of the United States and Canada for their patience and support as we have worked to answer your questions about the blackout – and as we move forward to improve this infrastructure that is so vital to our economy and our way of life.

For a PDF version of the ***Interim Report: Causes of the August 14th Blackout in the United States and Canada***