

## Maintaining grid security

### *Layers of protection for prevention, response and recovery*

A significant disturbance can occur on any electric grid. While no system is 100 percent invulnerable, industry members work continually to keep their systems and protection measures state-of-the-art to ensure that the state's electrical grid remains secure. ERCOT's job is to take appropriate steps to minimize the probability of a significant grid event and to be ready to respond if it does.

We comply with the federal cyber security and critical infrastructure protection standards enforced by the North American Electric Reliability Corporation (NERC), which require bulk power system users, owners and operators in the United States to identify cyber risks and vulnerabilities, establish controls to secure critical assets from physical and cyber sabotage, report security incidents, and establish plans for recovery in the event of an emergency.

ERCOT is prepared for grid emergencies regardless of cause, whether it's a weather event or some other physical or cyber event that might cause multiple failures of power plants or transmission lines.

Our system runs a real-time contingency analysis every five minutes, and normal operation is maintained within first-contingency limits. This helps prevent overloading a line if any piece of equipment fails. Our operators have authority to re-dispatch generation to keep within contingency limits, and can order load shedding — or reduced electric use — to prevent system overload that could potentially lead to uncontrolled cascading outages.

### Potential causes for grid disturbances

- Weather event
- Multiple generator equipment failures or forced line outages
- Terrorism

### ERCOT is prepared for an emergency, regardless of cause

#### Prevention and Mitigation

ERCOT performs real- and near-real-time operations and long-term planning to provide reliable electric service at the bulk power level, working with its market participants to:

- Maintain loading on transmission lines to safe levels.
- Maintain balance between load and generation.
- Maintain adequate reserves to provide for unexpected situations.
- Add sufficient infrastructure to meet the future needs of the grid.

#### System Operations Tools

- Real-time contingency analysis runs every five minutes.
- Normal operation is maintained within first-contingency limits.
- Operators have authority to re-dispatch generation to keep within limits.
- Advisories, Watches and Alerts are used if unable to operate within first contingency.
- Operators have authority to order load shedding to prevent equipment damage or cascading outages.

(continued)

## Emergency Procedures

ERCOT's emergency procedures are a progressive series of steps that allow the system operators to maintain the balance between load and generation during a capacity shortage by bringing on additional generation, and, if necessary, dropping firm load through temporary rotating outages.

- ERCOT will first bring on uncommitted generation and power from other grids.
- If the situation does not improve, operators will drop load resources — a market-based demand response program — and other resources under contract to be interrupted during an emergency, and ask the public to reduce electricity use.
- If necessary to maintain the security of the grid, ERCOT will ask utilities to reduce demand by dropping load through temporary, controlled outages — sometimes called rolling blackouts.

## Under-Frequency Firm-Load Shedding

If the emergency procedures are not successful at restoring frequency to 60 Hz, the final tool to balance the available generation and load to avoid a total system collapse or widespread blackout is under-frequency load shedding. Up to 25 percent of ERCOT's load would be shed automatically as the frequency dropped to certain levels:

- 5 percent dropped at 59.3 Hz
- 10 percent at 58.9 Hz
- 10 percent at 58.5 Hz

## Black-Start Procedures

In the event of a major system disturbance, ERCOT has “black-start” procedures in place and black-start units under contract to assist in restoring the system to a normal state as quickly as possible:

- These units must be able to start up on their own without support from the grid and then be able to pick up their own internal load. The units would be required to build a stable island, ultimately reaching synchronization points with other neighboring black-start islands. Their operators would contact ERCOT when islands are ready to be synchronized, and ERCOT would coordinate frequency control.
- ERCOT's goal would be to restore load and the active market as soon as possible.
- ERCOT contracts every two years for black-start units and holds an annual drill with the black-start unit providers to test the black-start procedures.

## Security Alert Plan

In response to homeland security issues, ERCOT has developed a Security Alert Plan. ERCOT communicates alert-level changes to the Security Response Group (Transmission Operators and Scheduling Entities).

Security alerts may be triggered by:

- Department of Homeland Security
- NERC (Electric Sector Information Sharing and Analysis Center)
- ERCOT

## Physical and Cyber Security

ERCOT complies with the federal cyber security and critical infrastructure protection standards enforced by the NERC, which require bulk power system users, owners and operators in the United States to identify cyber risks and vulnerabilities, establish controls to secure critical assets from physical and cyber sabotage, report security incidents, and establish plans for recovery in the event of an emergency.