Arctic Weather Event

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MISO is responsible for delivering safe, reliable and economic power across the high-voltage electric transmission system

- 15 states and one Canadian Province
- 42 million end-use customers
- 175,000 MW* of generation
- 65,800 miles of transmission lines
- ~ 180 members
- ~ 471 market participants

QUANTITATIVE BENEFITS

MISO provides approximately $3.5 billion in annual benefits to members
MISO’s Role as Reliability Coordinator

Overview of the Bulk Electric System

1. Generation
   Power is generated by turning an energy source into electricity. In MISO, sources include coal, natural gas, nuclear and renewable power.

2. Transmission
   Allowing the flow of electricity to bridge long distances, MISO’s member transmission lines and towers support more than 65,767 miles of electricity flow.

3. Distribution
   Allows energy to be moved from transmission lines closer to end users, ensuring reliability and power quality.

4. Final Delivery
   As travel distance increases, smaller power lines are used to reach business, industrial and residential end use customers.
What is load shed and how/when does it occur?

**1. Tight Supply**
The demand for electricity is high, putting pressure on supply. Emergency resources have been depleted, or there is an unexpected event such as technical issues at power stations or on major power generation stations.

**2. Emergency Demand Reduction—Energy Emergency Alert, Level 2**
To help balance the demand and supply of electricity, Demand Response and Emergency Demand Reduction customers are called on to reduce their demand. Utilities will also initiate public appeals for conservation.

**3. Load Shedding—Energy Emergency Alert, Level 3**
As a last resort and preventative measure to protect the electric grid from a blackout scenario, power to consumers may be temporarily disrupted on a rotational basis. In this stage, MISO instructs its Load Balancing Authorities to implement load shedding according to their schedules.

**4. Blackout**
If preventive measures, including load shedding, are insufficient—the electric grid will collapse. This incident is referred to as unforeseen and therefore the System Operator will not be able to make an announcement in advance.

A regional blackout will have massive implications and every effort is made to avoid this occurrence.

**5. Recovery**
Depending on the nature of the emergency, it could take a few weeks for the grid to recover from a blackout.
Communication Timeline

February 13-15
02/13/2021 00:00 EST Cold Weather Alert
02/14/2021 12:00 EST Conservative Operations
02/15/2021 09:00 EST MISO Capacity Advisory for the South Region
02/15/2021 07:00 EST MISO South Region Max Gen ALERT
02/15/2021 18:00 EST South Region Max Gen Warning
02/15/2021 18:00 EST Max Gen Event - EEA 2
02/15/2021 18:00 EST MISO is EXTENDING Max Gen Event - EEA 2

February 16-17
02/16/2021 00:00 EST MISO South Region Max Gen Warning
02/16/2021 08:00 EST Max Gen Event - EEA 2
02/16/2021 07:30 EST North/Central Region Max Gen Event - EEA 1
02/16/2021 07:30 EST Max Gen Event 1b - EEA 1 for North/Central Region
02/16/2021 13:32 PM Extending South Region Max Gen Event - EEA 2
02/16/2021 14:00 EST North and Central Max Gen Termination
02/16/2021 18:35 EST Max Gen Event - EEA 2
02/16/2021 19:40 EST Max Gen Event - EEA 3 (Load Shed Notice)
02/16/2021 22:00 EST Max Gen Event - EEA 2
02/17/2021 00:00 EST Max Gen Event - EEA 0
MISO’s Emergency Actions

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<tr>
<th>Message</th>
<th>Communication Intent</th>
<th>Potential Member/MISO Actions</th>
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| Conservative Operations Declaration| Alert for Situational Awareness; Reliability issue possible for defined area.        | • Potentially suspend transmission maintenance
• Review outage plans for deferral, cancellation |
| Hot Weather, Cold Weather or Severe Weather Alert | Alert for Situational Awareness; MISO could be approaching light supply conditions. | • Review outage plans for deferral, cancellation |
| Capacity Advisory                  | Advisory for Situational Awareness; Potential for limited operating capacity margins (<5%) in the next 2-3 days. | • Update facility and generation outages, including de-rates
• Update generation offers
• Update Load Forecast Values
• Update LMR Availability and Self Scheduled MW values
• Update EDR offers |
| Min Gen Alert                      | Alert for Situational Awareness; MISO is forecasting a potential supply surplus.    | • Prepare for de-commitment (taking generation offline), reduction in purchases or other actions |
| Max Gen Alert                      | Alert for Situational Awareness; MISO is forecasting a potential capacity shortage. | • Declare Conservative System Operations
• Prepare for possible Max Gen Event |
| Max Gen Warning                     | Warning to Prepare for Possible Event                                                | • Curtail non-firm exports
• Schedule all available external resources into the MISO Market
• Implement Emergency Pricing Offer Tier 1. This is an ex-post pricing change, and does not affect system commitment or dispatch. |
| Max Gen Event (Step 1)              | Actions Taken to Preserve Operating Reserves; NERC Emergency Alert 1                 | • All available resources in use
• Generators instructed to start off-line resources.
• Use of reserves not yet implemented.
• Emergency Pricing Offer Tier 1 is still effective. |
| Max Gen Event (Steps 2, 3, 4)       | Actions Taken to Preserve Firm Load; NERC Emergency Alert 2 (Step 3 declaration)    | • Implement demand management programs
• Utilize Contingency Reserves
• Purchase Emergency Energy
• Issue Public Appeals
• Prepare for possible firm load shed
• Implement Emergency Pricing Offer Tier 2. This is an ex-post pricing change, and does not affect system commitment or dispatch. |
| Max Gen Event (Step 5)              | Event Occurring: NERC Energy Emergency Alert 3                                      | • Shed firm load
• Rolling brownouts or blackouts for defined area
• Emergency Offer Tier 2 is still effective. |