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# 2026 Summer Weatherization Workshop

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**Outline:**

- Weatherization High Points
- Accumulating Inspections = Accumulating Benefit
- Winter Storm Fern Summary
- Extreme Cold Weather Reliability Improvement
- Failure Patterns Witnessed during Winter Storm Fern
- Cold Weather Critical Component Lists

**Key Takeaway**

- The reforms and improvements made to the ERCOT grid since 2021 through collaborative efforts with the Texas Legislature, the Public Utility Commission of Texas (PUCT), the Railroad Commission (RRC) of Texas, and Market Participants are having a positive impact on electric system reliability during extreme weather conditions.

# Weatherization High Points

- We have now been through five winters and three summers with the Weather Emergency Preparedness rule in place.
- Weatherization efforts continue to have a beneficial impact on system reliability, particularly during times of extreme weather.
- We evaluate individual facility outages during peak demand periods and will follow-up to assure that facilities have implemented weather emergency preparation measures that can reasonably be expected to ensure sustained operation at the required hot and cold conditions.

**Key Takeaway:** Rules adopted by the Public Utilities Commission and Railroad Commission of Texas after Winter Storm Uri have beneficially impacted the reliability of the ERCOT grid during extreme weather.

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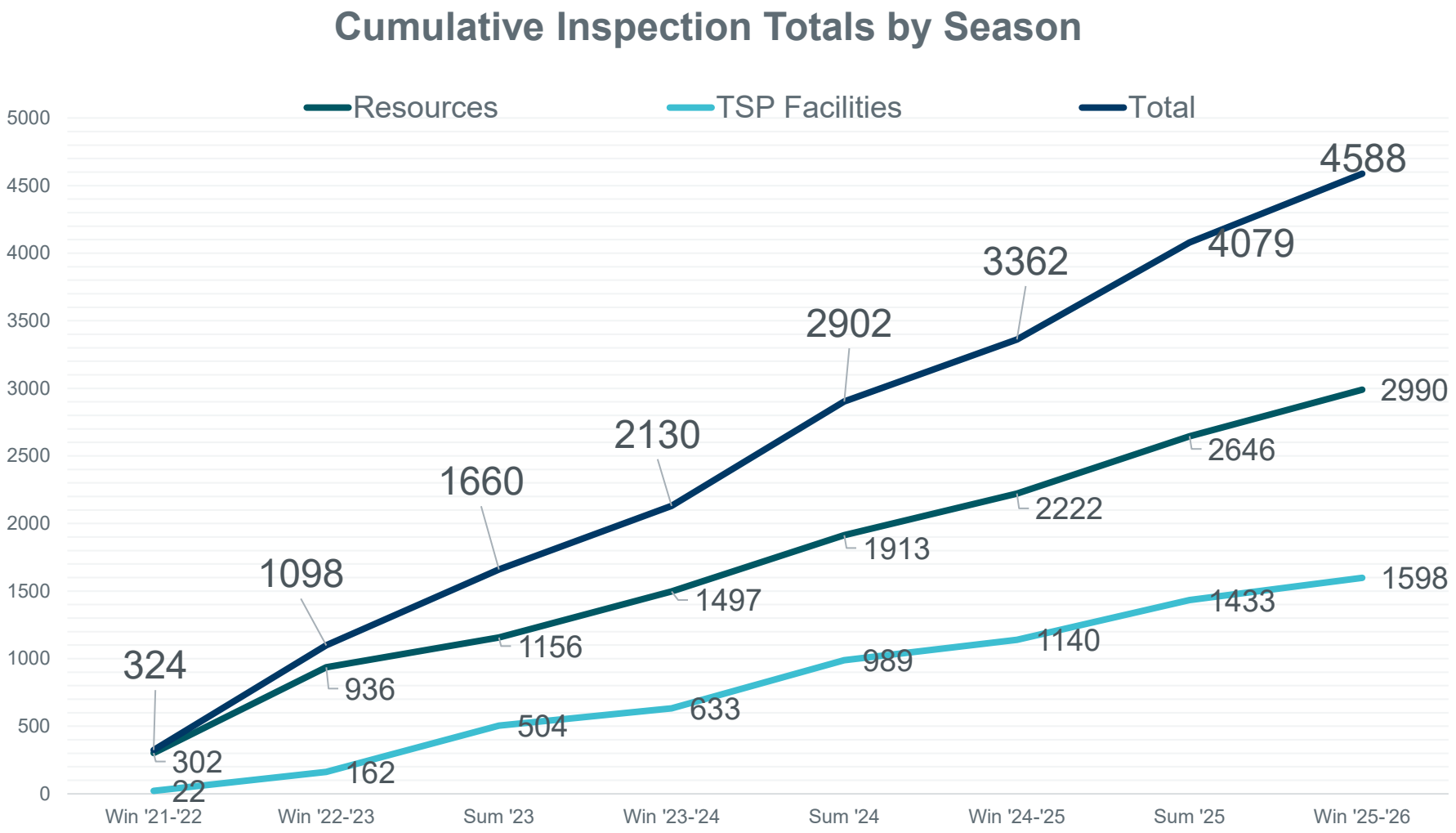
# Accumulated Impact of Weatherization Inspections




**Key Takeaway:** ERCOT has completed five winters and three summers of weatherization inspections. These inspections contribute to a high level of compliance with the PUCT Weather Emergency Preparedness rule.

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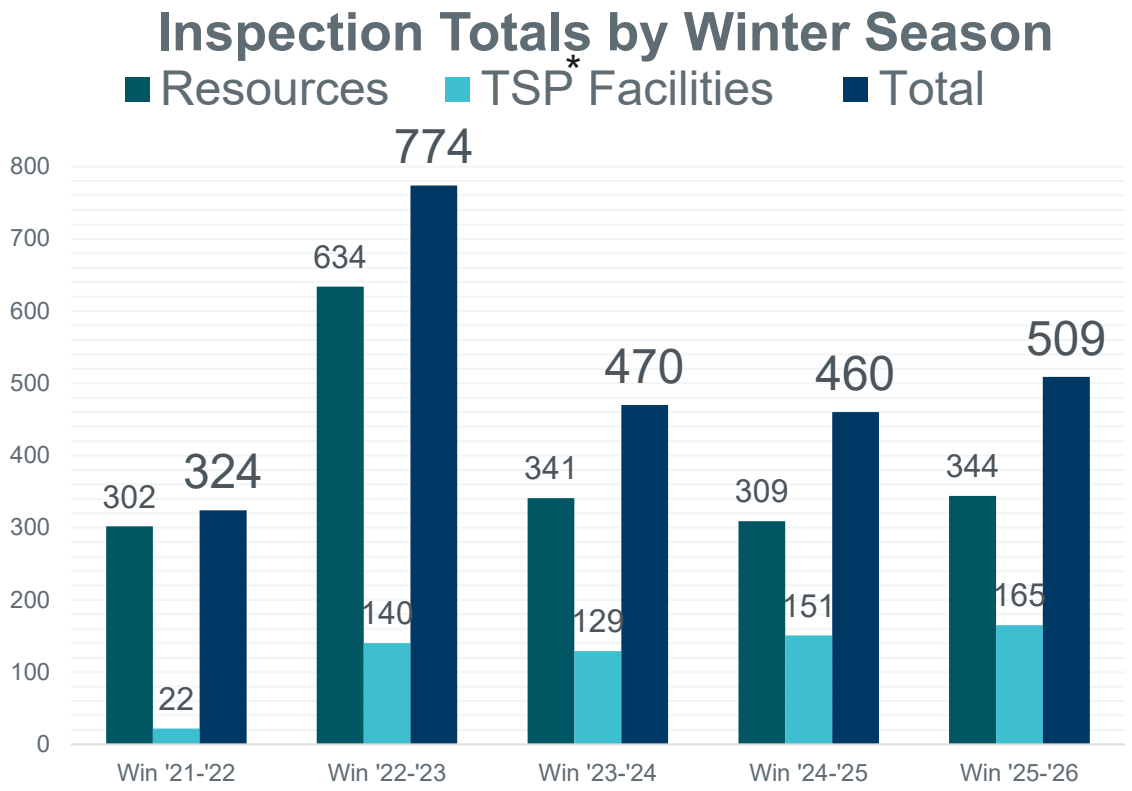
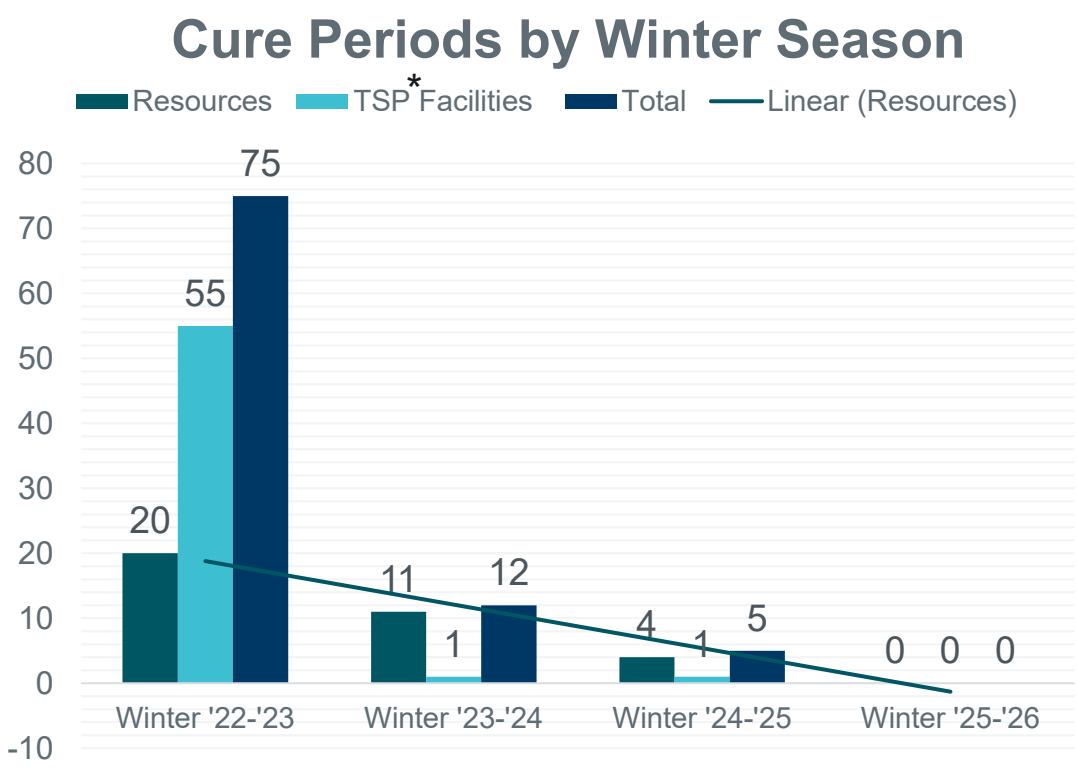
# Winter Weatherization Through First 5 Years – Achieving High Compliance

## Winter Inspection Totals




## Winter Cure Periods




*TSP (Transmission Service Provider)

**Key Takeaway:** The ERCOT grid has been more reliable since the implementation of weatherization standards and inspections. This program continues to strengthen the reliability of these generation resources and transmission facilities. Declining cure period numbers demonstrates high levels of compliance with rule requirements.

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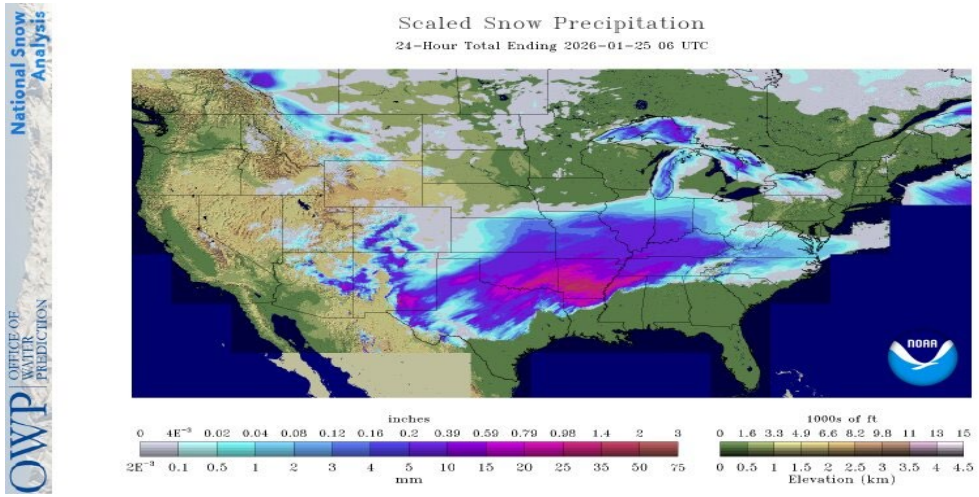
# Winter Storm Fern: January 23-27, 2026

- Cold temperatures impacted the entire ERCOT Region for multiple days; winter precipitation impacted the upper half of the state.
- Sufficient resources were available to meet demand throughout the duration of the storm.
- Large Loads and Multi-Agency coordination supported grid operations before and during the event.
- Transmission outages during the event were low for the amount of winter precipitation observed (total, not concurrent):
  - 345 kV: 3 transmission outages
  - 138 kV: 15 transmission outages
  - 69 kV: 2 transmission outages




**Key Takeaway:** Winter Storm Fern resulted in minimal impacts to ERCOT system reliability.

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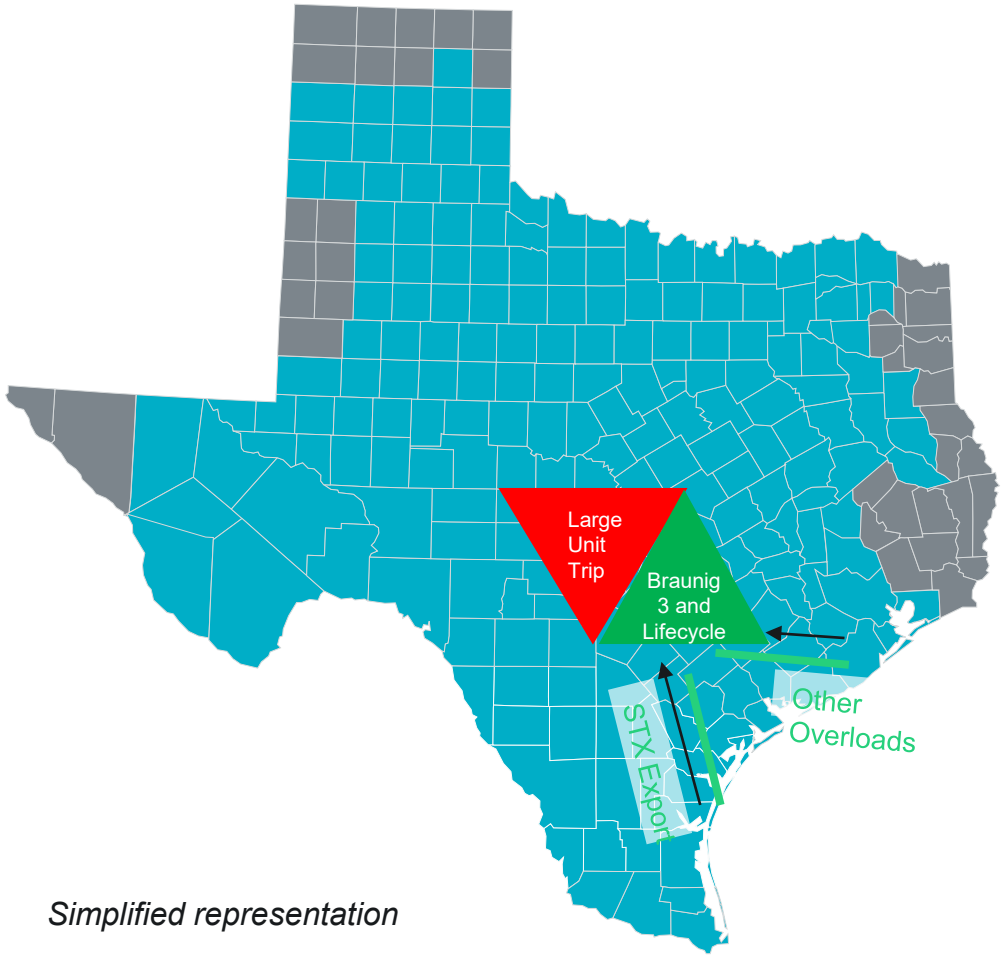
# Transmission Emergency




*Simplified representation*

- Following the trip of a large unit in Central Texas, the South Texas Export Interconnection Reliability Operating Limits (IROL) was briefly exceeded and other transmission lines between Houston and San Antonio experienced post-contingency overloads.
- A localized transmission emergency was in effect from Jan. 25 9:04 p.m. – Jan. 26 10:00 a.m. in the San Antonio-to-Houston area.
  - The Real Time Co-optimization (RTC) system redistributed Ancillary Services across the system to maximize generation used to relieve overloads, reducing manual action required.
  - Braunig Unit 3 repairs under Reliability Must-Run (RMR) contract were completed prior to the storm.
    - ERCOT committed the unit throughout the storm, providing support to relieve overloads and manage the binding South Texas Export.
  - ERCOT committed the Life Cycle units during the Transmission Emergency to relieve the overloads.

**Key Takeaway:** A transmission emergency for the South Texas Export IROL was handled effectively via RTC improvements, Braunig Unit 3, and Life Cycle Power unit deployments.

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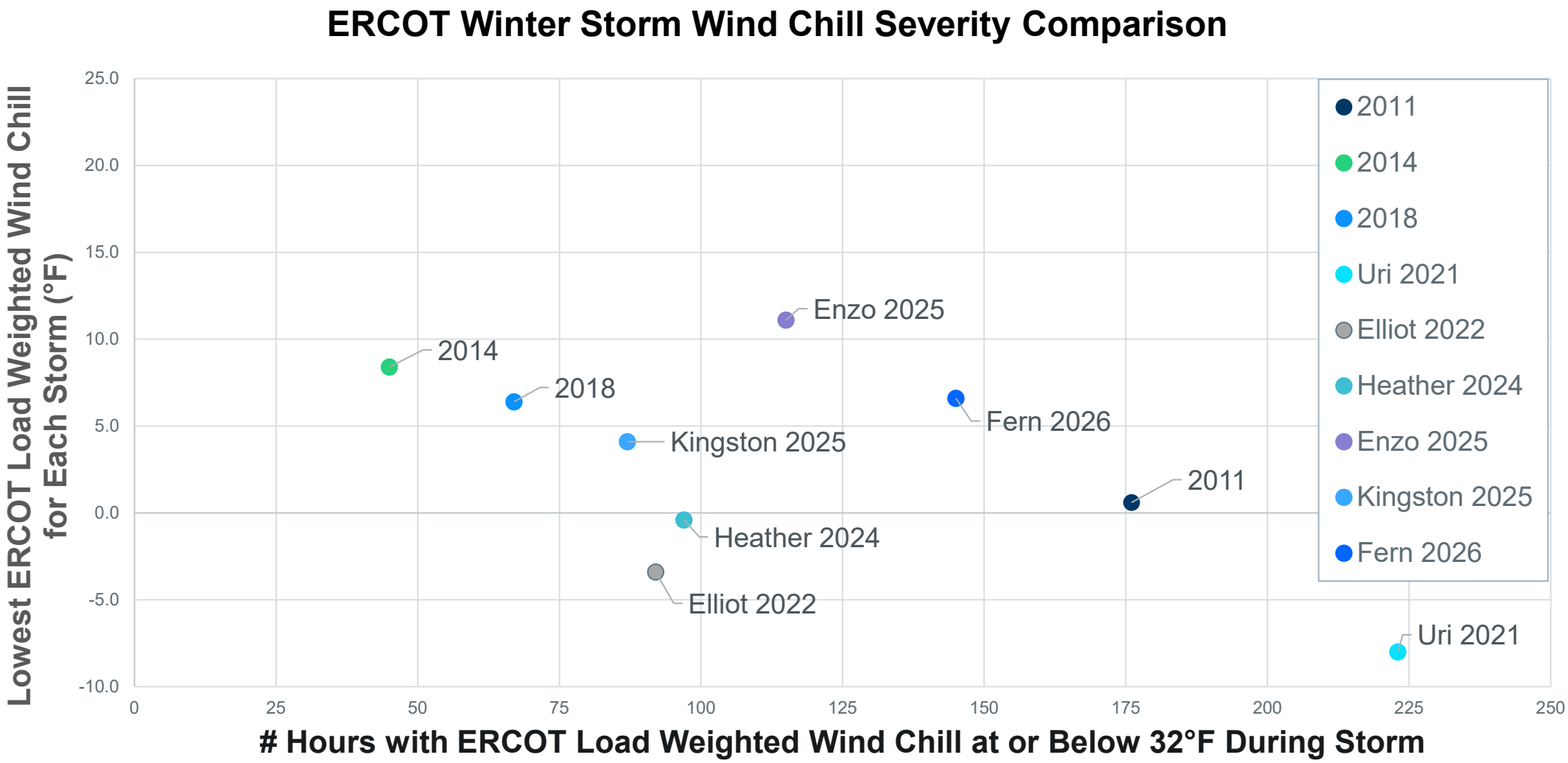
# Past Winter Storm Severity Wind Chill Comparison



# Outage patterns during Winter Storm Fern (1/21/26 to 1/29/26)

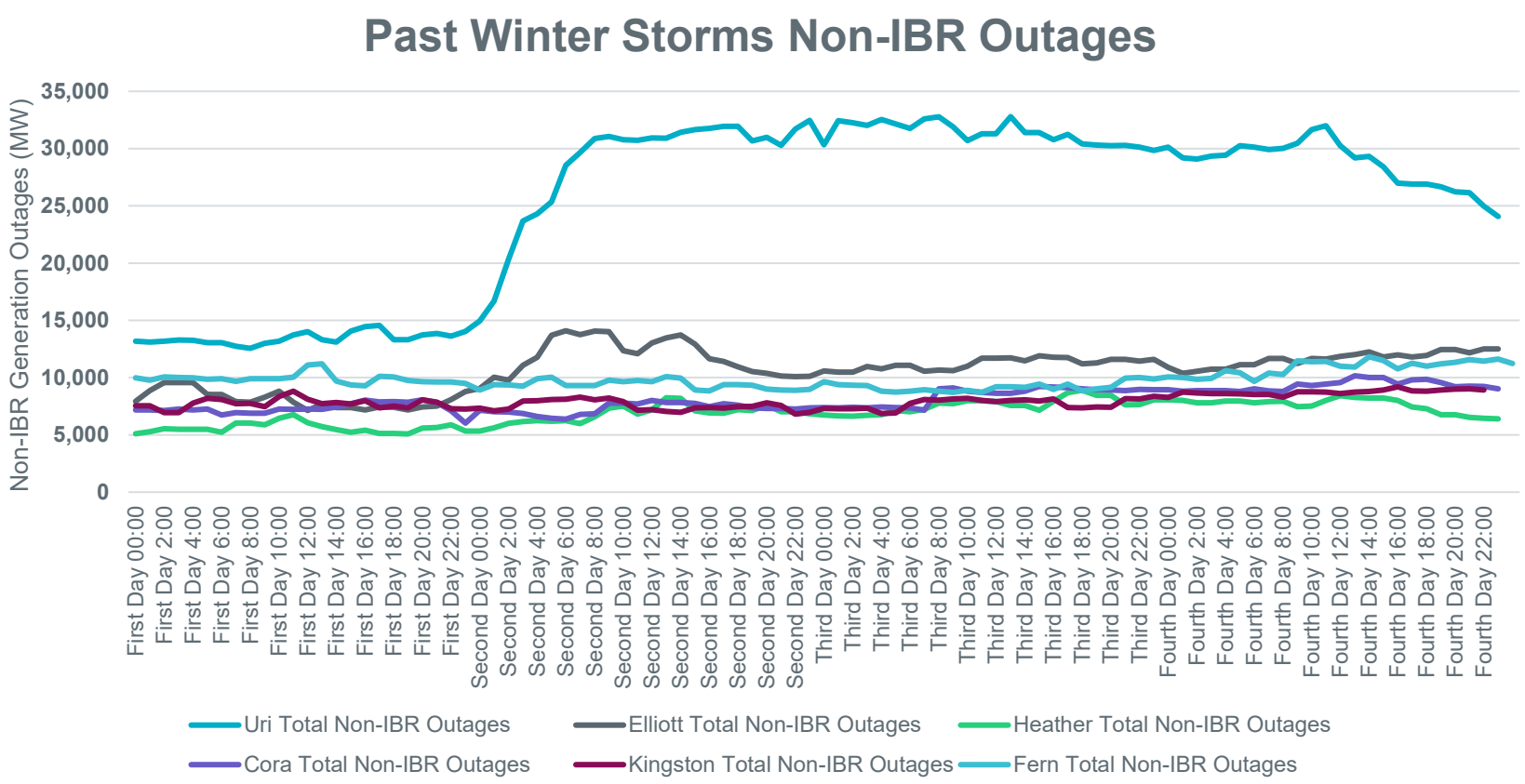
Program controls affecting all classes

- Current critical component lists reviewed against the ERCOT sample CWCC prompt
- Verify alarms, controls, and protection logic under cold-weather conditions
- Monthly seasonal verification
- Trained operator response capability
- More accurate outage notes (to assist cause determination) and implementation of lessons learned

| Failure Family | Dispatchable | IRR | ESR | Transmission |
|---|---|---|---|---|
| Controls / Automation | **HIGH** *Valves / Controllers / Positioners* | **LOW** *Present but not leading* | **VERY HIGH** *PPC / Comms / Setpoint Logic* | **LOW** *Present but not leading* |
| Electrical Protection / Switching | **MEDIUM** *Breaker / Transformer / Line Faults* | **MEDIUM** *Feeder / Breaker / Arrestor Faults* | **HIGH** *Transformer / CT / Switchgear / Breakers* | **MEDIUM** *Feeder / Breakers / Arrester Faults* |
| Mechanical / Rotating / Flow Path | **VERY HIGH** *Vibration / Exciter / Flow-Path Issues* | **MEDIUM** *Turbine Faults / Repairs* | **LOW** *Present but not leading* | **MEDIUM** *Turbine Faults / Repairs* |
| Icing / Cold-environment Effects | **HIGH** *Air Inlet / Combustion / Coal Path Sensitivity* | **VERY HIGH** *Icing and Cold Limits Dominate* | **MEDIUM** *Water / HVAC / Enclosure Exposure* | **HIGH** *Galloping / Low-Oil Level / Iced Switching* |

**Key takeaway:** MPs focusing future efforts on the **Very High** and **High** outage drivers, as applicable, should further reduce outage occurrence / severity.

# Historical Non-IBR Outage Data from Previous Winter Storms

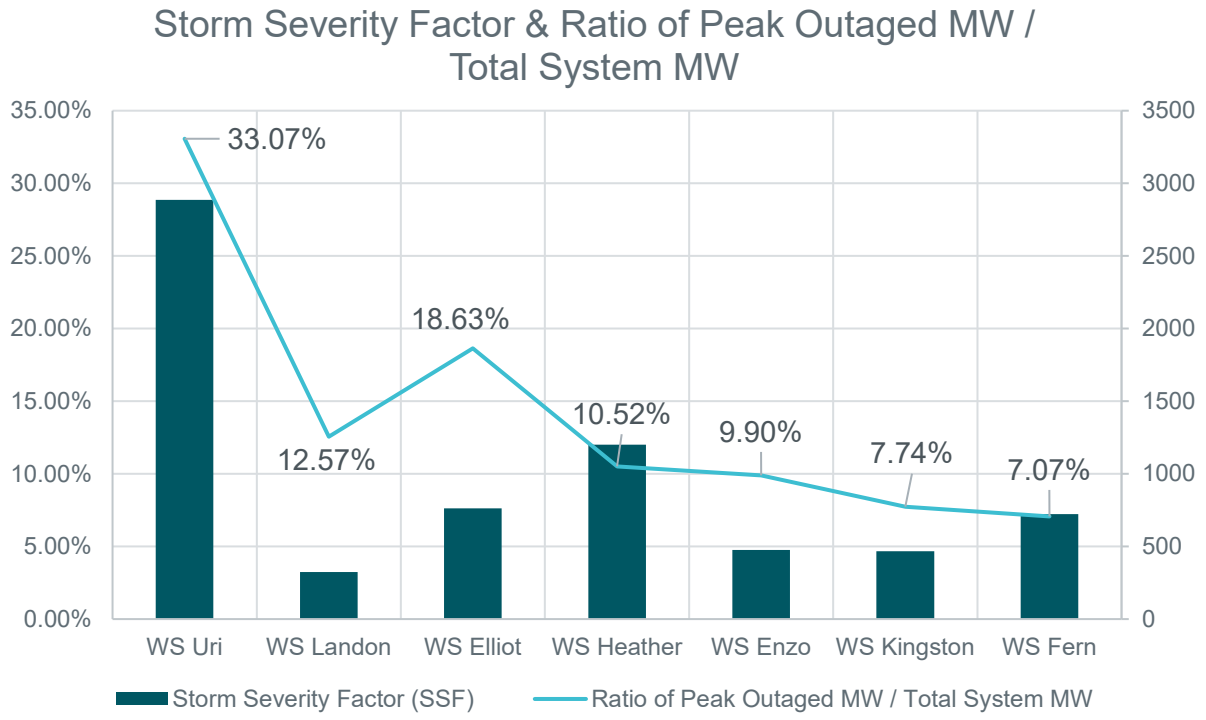



- Due to low temperatures, the typical gas restrictions in North Texas were issued.
- ERCOT utilized the Firm Fuel Supply Service (FFSS) to keep units impacted by gas restrictions running (340 MW).
- Many generators reported their pipelines issuing Operational Flow Orders (OFOs).
- Forced outages among non-Inverter Based Resources (IBR) have decreased and stayed at a consistently low level across 2024, 2025, and 2026 winter storms.

**Key Takeaway:** Weatherization is a critical enabler of flexibility. Weatherization maximizes the probability that generation resources of all types (dispatchable assets & IBRs) remain available during extreme weather conditions when they're needed the most.

# Extreme Cold Weather Reliability Improvement in ERCOT

| Event Name | Storm Severity Factor (SSF) | Ratio of Peak Outaged MW / Total System MW | Start Date |
|---|---|---|---|
| WS Uri | 2886.5 | 33.07% | 2/12/2021 |
| WS Landon | 323.5 | 12.57% | 2/4/2022 |
| WS Elliot | 763 | 18.63% | 12/23/2022 |
| WS Heather | 1200 | 10.52% | 1/15/2024 |
| WS Enzo | 475 | 9.90% | 1/20/2025 |
| WS Kingston | 466.5 | 7.74% | 2/20/2025 |
| WS Fern | 722 | 7.07% | 1/25/2026 |




These **MW levels represent dispatchable generation only** and do not include IBRs.

**Key Takeaway:** Even though Winter Storm Fern had the third-highest storm severity factor of the six winter storms evaluated since Winter Storm Uri, it had the lowest level of forced outages as a percentage of total ERCOT dispatchable generation capacity.

# Sample Cold Weather Critical Components Lists

| Nuclear, Coal, and Natural Gas Fired Generators with Steam Cycles | Gas Turbines Without Steam Cycles | Reciprocating Engines | Hydroelectric Facilities | Intermittent Renewable Resources | Transmission Service Provider (TSP) |
|---|---|---|---|---|---|
| Inlet air heating systems, if applicable | Inlet air heating systems, if applicable | Knock sensing line, sim(s) | Battery systems | Inverters and medium voltage transformers | Autotransformers |
| Feed, circulating, and seal water systems | Compressor bleed valves | SCR, emissions control | Water management systems | HVAC systems for inverters, control panels, etc. | Power transformers |
| Natural gas supply including duct burner systems | Instrument air systems | Main gas supply valve | SF6 breakers (controlled by the Resource) | SF6 breakers (controlled by the Resource) | SF6 breakers |
| SF6 breakers (controlled by the Resource) | SF6 breakers (controlled by the Resource) | SF6 breakers (controlled by the Resource) | Main, step-up, auxiliary, and standby transformers | Main, step-up, auxiliary, and standby transformers | Static var compensators |
| Main, step-up, auxiliary, and standby transformers | Main, step-up, auxiliary, and standby transformers | Main, step-up, auxiliary, and standby transformers | Air circulation fans | Feeder breakers | Emergency generators at substations, as applicable |
| Solid, liquid, and gaseous fuel delivery systems (controlled by the Resource) | Control house and other HVAC systems | Control house and other HVAC systems | Control house and other HVAC systems | Wind pad mounted transformer | Control house and other HVAC systems |
| Control house and other heating, ventilation, and air conditioning (HVAC) systems | Instrument air transmitters | Instrument air systems | Heating systems<br>• GPU (governor control systems) heaters<br>• Other heater | Down tower cabinet assembly heaters | Transmission voltage circuit breaker mechanisms that use pneumatic or hydraulic pressure to operate the contacts open, closed, or both |
| Coal reclaim equipment, conveyors, crushers, and storage bins | Auxiliary cooling water transmitters | Starting air compressors | | Hydraulic and lube oil system | Station batteries |
| Forced, induced draft, primary air and other fan systems | Dew point analyzer | | | HVAC for control house and battery container | Grounding transformers |
| Seal oil systems | Main gas supply valve | | | Fire suppression system | |
| Flue gas desulfurization (FGD) systems/scrubbers, fly ash and bottom ash handling systems, selective catalytic reduction (SCR) systems, and other air quality control (AQC) systems | Sprint or NOx control | | | Wind (if present)<br>• Wind vane and anemometer heating elements<br>• Pad-mounted transformer heaters<br>• Hydraulic pitch system accumulators and associated heating<br>• Gearbox oil heating and circulation systems<br>• Converter cooling system anti-freeze protection | |
| Demineralized and other water systems, caustic, and sulfuric acid | Coalescing filter | | | Solar (if present)<br>• Inverter heating and cooling systems<br>• Tracking system motors and gearboxes | |

# Sample Hot Weather Critical Components Lists

| Nuclear, Coal, and Natural Gas Fired Generators with Steam Cycles | Gas Turbines Without Steam Cycles | Reciprocating Engines | Hydroelectric Facilities | Intermittent Renewable Resources | Transmission Service Provider (TSP) |
|---|---|---|---|---|---|
| Generator step-up, auxiliary, and standby transformers | Generator step-up, auxiliary, and standby transformers | Generator step-up, auxiliary, and standby transformers | Generator step-up, auxiliary, and standby transformers | Generator step-up, auxiliary, and standby transformers | Autotransformers and other transformers |
| Continuous emissions monitoring and emissions control systems | Continuous emissions monitoring and emissions control systems | Continuous emissions monitoring and emissions control systems | Water management systems | Switchgear | Relay protection systems (thermal trip relays) |
| Excitation systems (voltage regulators) | Switchgear | Knock sensing line, sim(s) | Battery systems | Inverters | Transmission voltage circuit breaker mechanisms |
| SF6 breakers (controlled by Resource) | SF6 breakers (controlled by Resource) | SF6 breakers (controlled by Resource) | SF6 breakers (controlled by Resource) | SF6 breakers (controlled by Resource) | SF6 breakers |
| Heating, ventilation, and air conditioning (HVAC) systems | Heating, ventilation, and air conditioning (HVAC) systems | Heating, ventilation, and air conditioning (HVAC) systems | Heating, ventilation, and air conditioning (HVAC) systems | Heating, ventilation, and air conditioning (HVAC) systems | Heating, ventilation, and air conditioning (HVAC) systems |
| Main and auxiliary cooling towers | Instrument air systems | Starting air compressors | Air circulation fans | Solar panel tracking systems | Diesel/propane backup generator systems |
| Variable frequency drive climate control | Demineralizer systems | Instrument air systems | Cooling water strainers and pumps | Main gear box and coolant tank | Gas-insulated switchgear (GIS) cooling systems |
| Lube oil systems | Fin fan and other coolers | Variable frequency drive systems | Lube oil systems | Backup power | Station batteries |
| Chiller systems | Turbine inlet air cooling systems | Cylinder head cooling systems | Penstock air vents and surge tanks | | |
| Stator cooling systems | Air filtration systems | Crankcase ventilation system | Excitation systems (voltage regulators) | Battery and control container | |
| Air handling units (AHUs) | Fuel gas conditioning systems | Excitation systems (voltage regulators) | | Yaw drive motor cooling systems | |
| Combustion air and other fans | Lubrication oil coolers | Radiator cooling fans and heat exchangers | | Wind turbine blade pitch control systems | |
| Service water system | Excitation systems (voltage regulators) | Turbocharger and intercooler systems | | Photovoltaic panel junction boxes | |
| Condensate system | | | | Down tower assembly fan | |
| Feed, circulating, and seal water systems | | | | DC cabling and connectors | |
| Hydrogen coolers | | | | Hydraulic and lube oil systems | |
| Flow transmitters | | | | Uninterruptable power supply systems | |
| Switchgear | | | | | |
| Demineralizer systems | | | | | |
| Instrument air systems | | | | | |
| Cooling water intake screens & pumps | | | | | |
| Steam turbine condensers | | | | | |
| Air-cooled condensers | | | | | |
| Control systems | | | | | |
| Boiler feedwater pumps | | | | | |
| Condenser & cooling water systems | | | | | |
| Critical buildings and rooms (i.e., reactor containment, mechanical electrical aux, electrical aux, control rooms, relay rooms, etc.) | | | | | |