

# NERC

NORTH AMERICAN ELECTRIC  
RELIABILITY CORPORATION

## Bulk Power System Reliability

Key Findings from NERC's State of Reliability and  
Long-Term Reliability Assessment

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Joint Meeting of the Federal Energy Regulatory Commission and the  
Nuclear Regulatory Commission

RELIABILITY | RESILIENCE | SECURITY



## 2021 State of Reliability Report: 2020 Operating Year

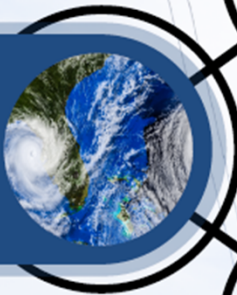
The bulk power system remained reliable even though operator-initiated load shedding increased in 2020. Pandemic impacts were avoided through advanced planning.



Summer load shedding underscores energy adequacy risk and a growing vulnerability to extreme weather.



Collectively, weather events and wildfires caused transmission outages with greater frequency than in prior years and were contributors to the most widespread transmission outages. Outages due to human error and equipment failure show continued improvement.



Supply chain disruptions increase the threat landscape and the urgency of cyber security risk response.

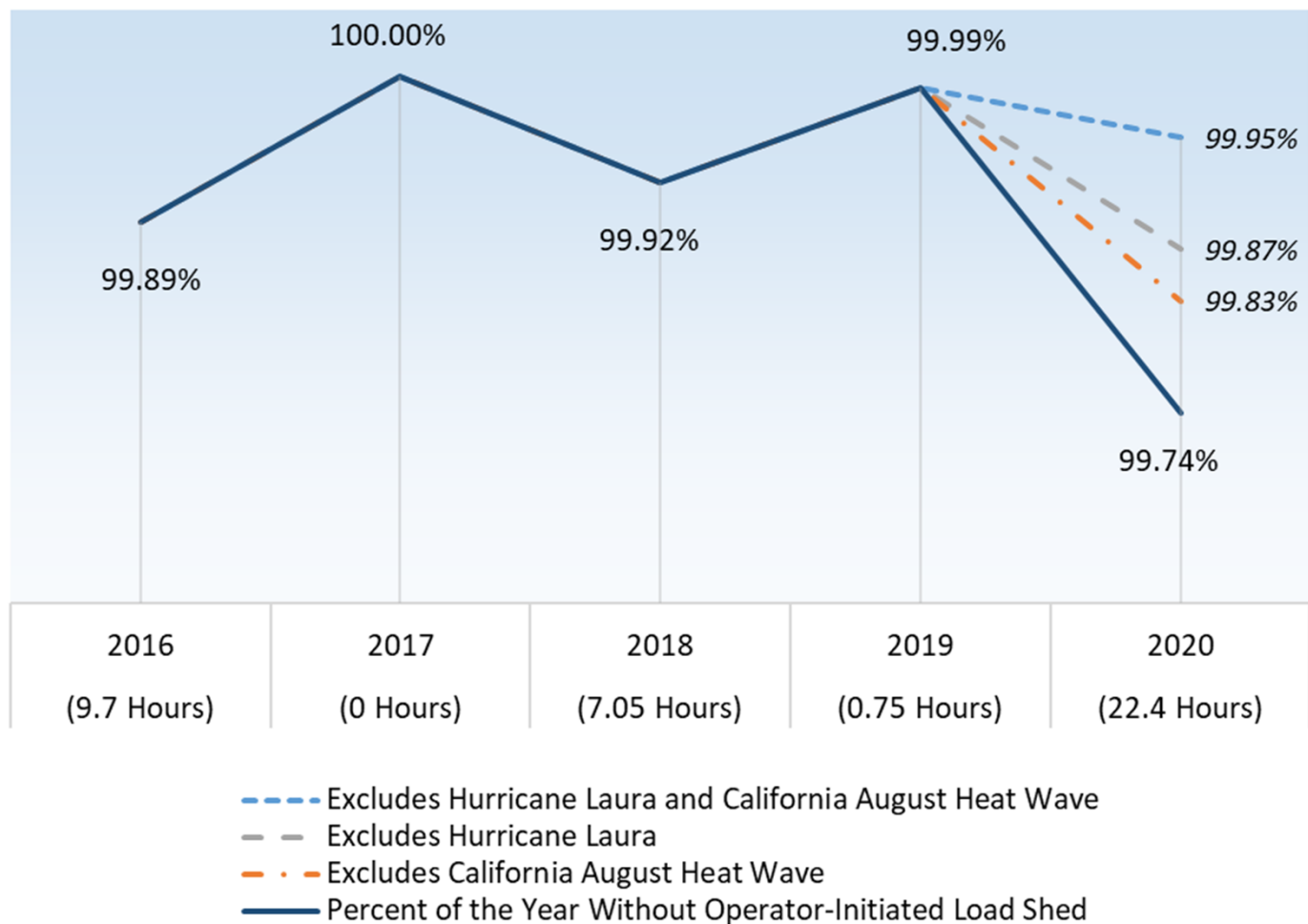


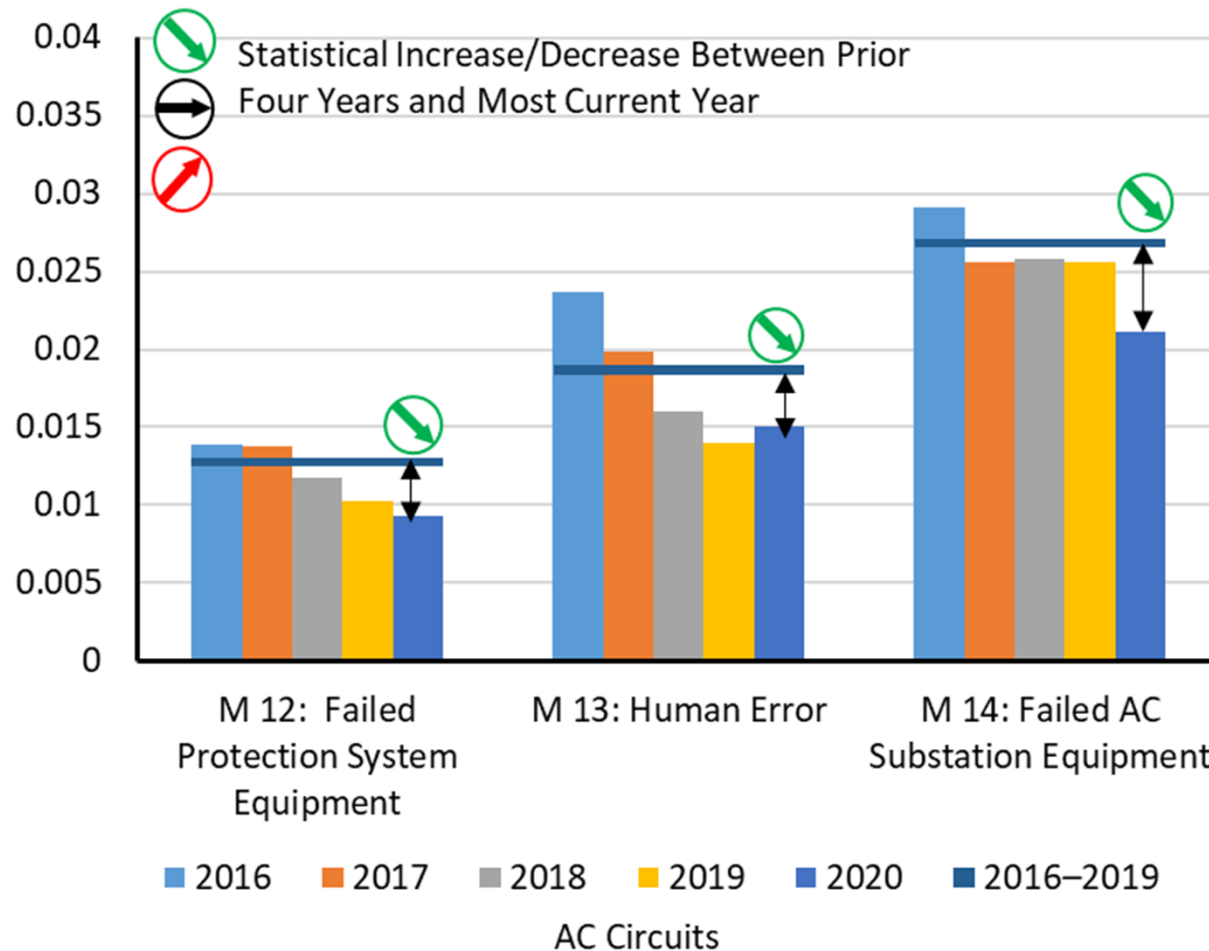
As the fuel mix continues to transform, increasing amounts of weather-dependent generation—like solar and wind—require more supplemental and flexible resources to help balance supply and demand. More transmission is needed to access diverse resources.



# Hours Without Operator-Initiated Firm Load Shed (%/year)

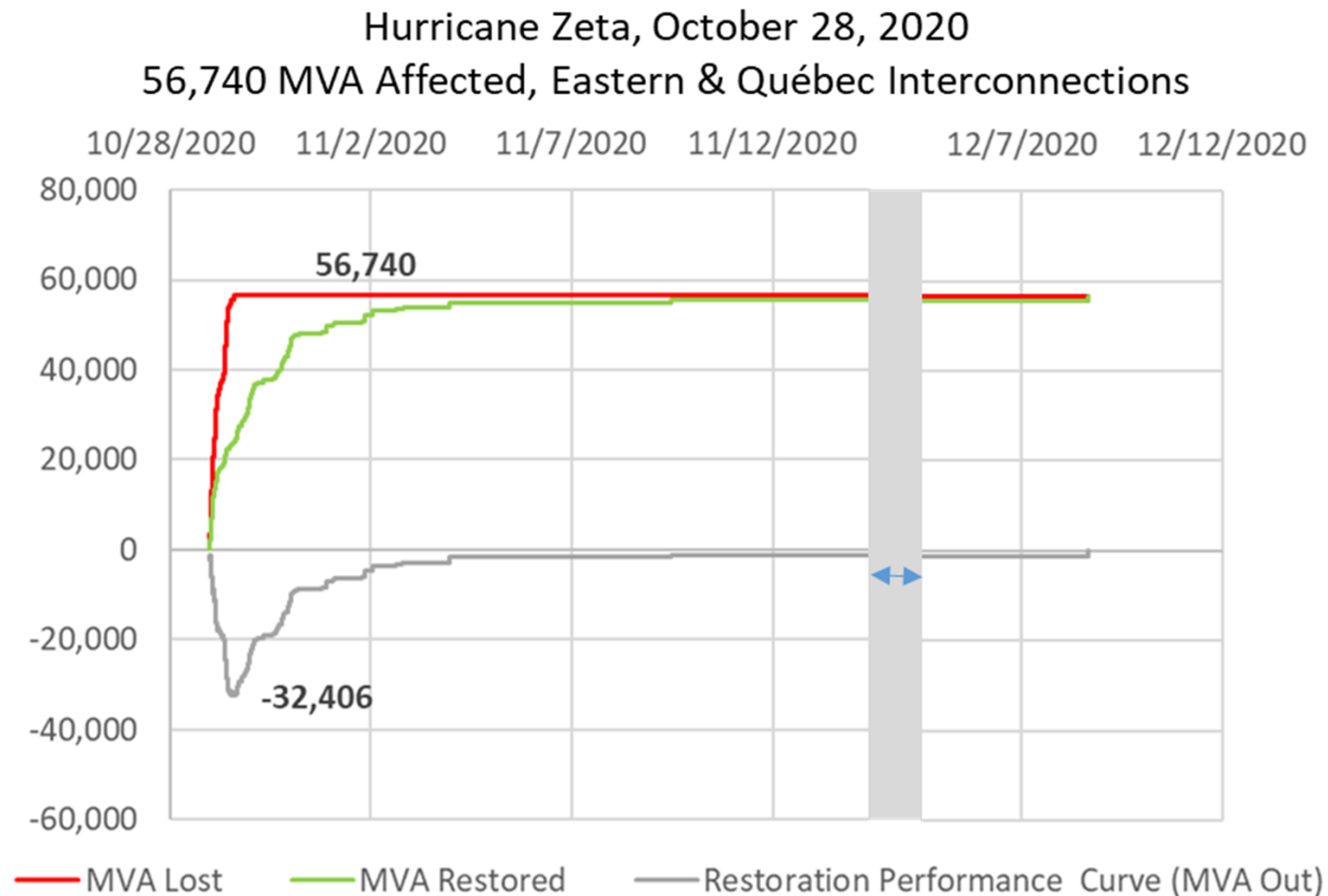
Hours Without Operator-Initiated Load Shed (%/Year)





Protection System
Human Error
AC Substation Equipment

# Resilience Metric Example: Transmission Outage Restoration



# Long-Term: Some Areas Are Showing Signs of Anticipated Shortfalls



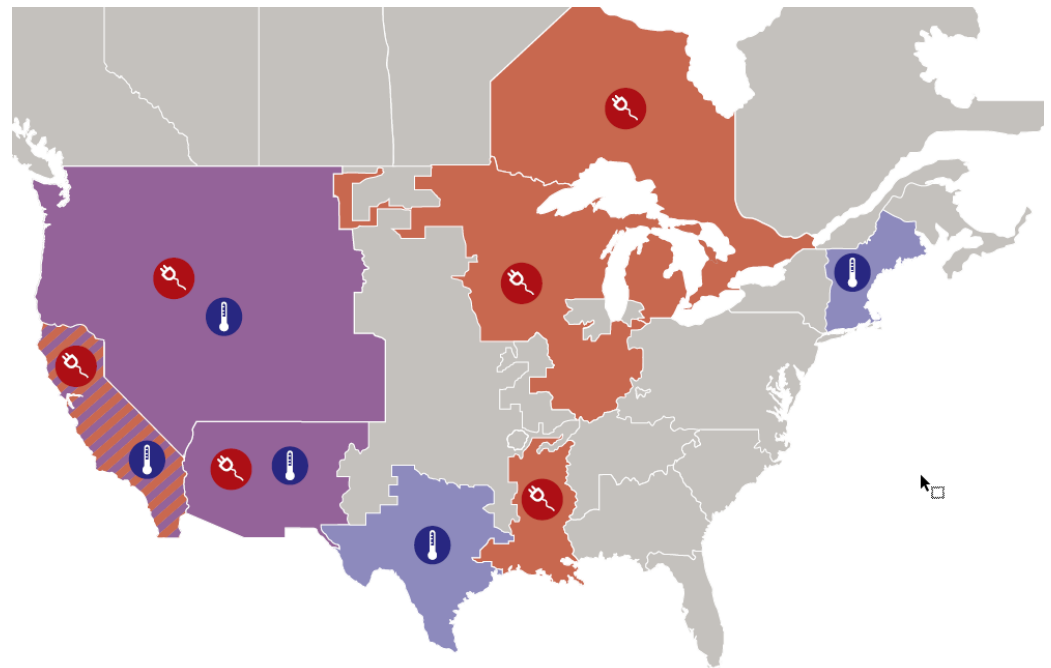
## Resource Adequacy and Energy Sufficiency

- **MISO, California, and Ontario** | projecting capacity shortfalls
- **California, U.S. Northwest and Southwest** | projecting periods of insufficient energy



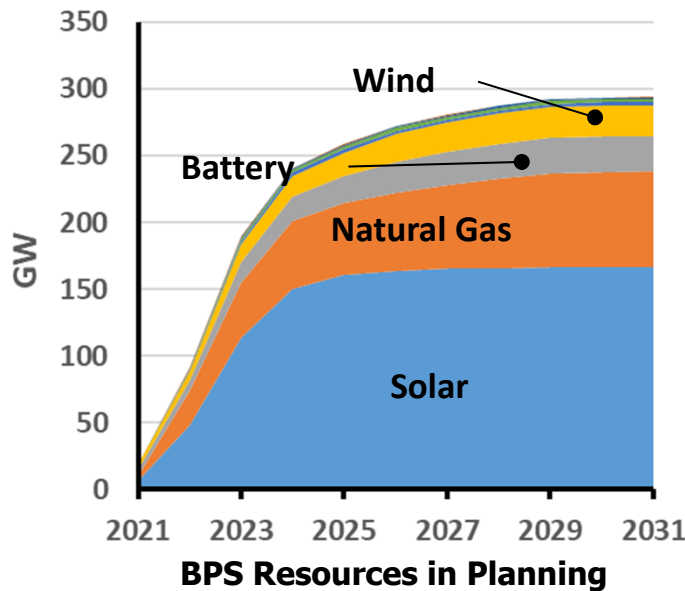
## Extreme Weather Risks

- **Texas, California, and U.S. Northwest** | Insufficient flexible generation for peak demand
- **New England, California, and Southwest** | Natural gas infrastructure limitations



Long-Term Reliability Assessment Risk Map  
2022 - 2026

- Future resource mix will be *more variable* and *less fuel-diverse*

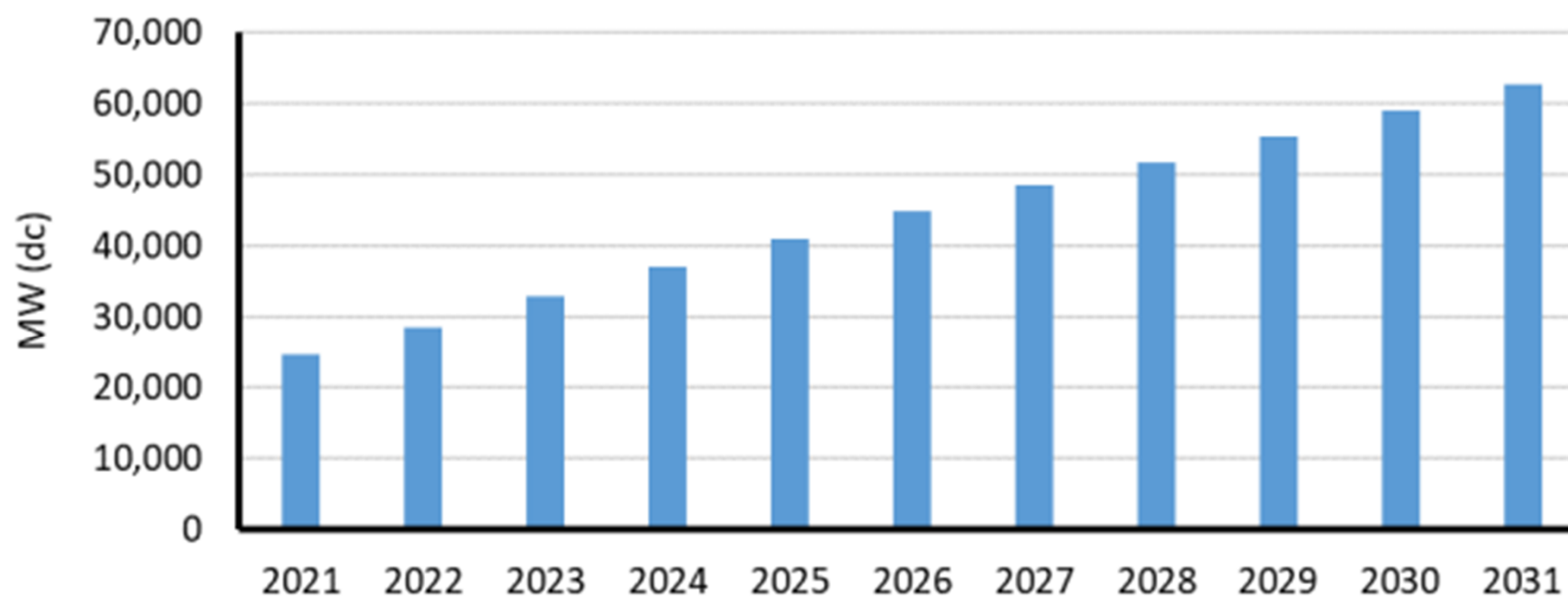


**2021 Capacity at Peak Demand**

Type	Capacity (GW)	Contribution %
Natural Gas	467	47%
Coal	220	22%
Nuclear	108	11%
Solar and Wind	60	6%
All others	136	14%

Contributions at hour of peak demand. Variable energy resource (solar, wind, and some hydro) typically count less than installed nameplate capacity.

- ERO priorities for reducing risks during grid transformation
  - Improve BES resilience for wide area long-duration extreme temperatures
  - Focus on energy sufficiency
  - Enhance suite of reliability standards: cyber, cold weather, energy sufficiency, and inverter performance



**Figure 21: Cumulative Distributed Solar PV Capacity in Assessment Areas**

### Problem Statement:

- Unassured fuel supplies can result in insufficient amounts of energy on the system to serve electrical demand and ensure the reliable operation of the bulk power system due to:
  - variable renewable energy resources
  - fuel location
  - volatility in forecasted load

This is described in the “[Ensuring Energy Adequacy with Energy Constrained Resources](#)” (Dec 2020) white paper



# Questions and Answers

