

# NERC

NORTH AMERICAN ELECTRIC  
RELIABILITY CORPORATION

# Human and Organizational Performance

## An Event Causal Assignment Analysis

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WECC Human Performance Forum  
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**RELIABILITY | RESILIENCE | SECURITY**



- Electric Reliability Organization Event Analysis Program

- A program that includes reviewing off-normal events occurring on the bulk power system.
- Requires industry participation and support to be effective.
- Used to identify and publish lessons learned (NERC website) and support system reliability.
- Event reporting supports identifying trends, identifying themes of occurrence, studying impact-risk relationships, and improving operating culture.



- Trends are identified by cause codes that include the following:

Engineering and Design	Equipment and Material
Human Performance	Management and Organization
Communication	Training
Other	Overall Configuration
No cause found	Information to determine cause LTA

# Event Numbers



**NUMBER OF UNIQUE  
QUALIFIED EVENTS**

**1,855**



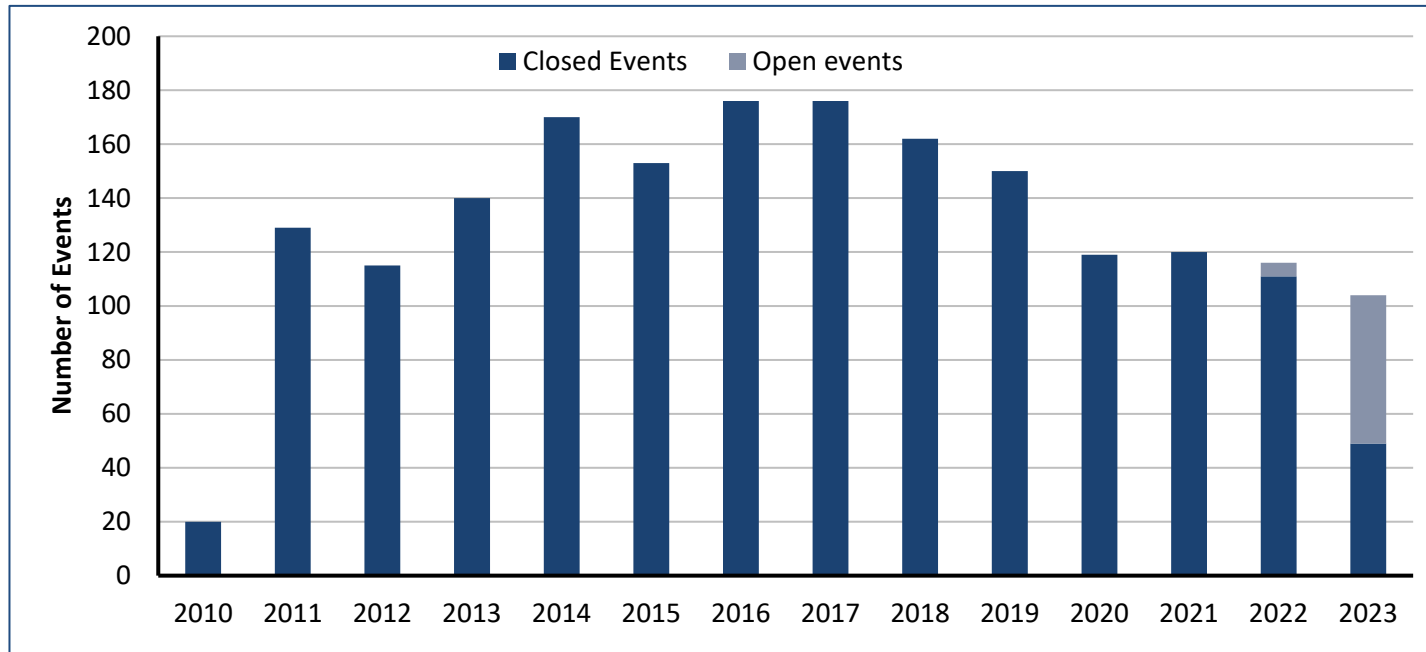
**NUMBER OF EVENTS  
CAUSE CODED**

**1,790**



**NUMBER OF EVENTS  
IDENTIFIED ROOT CAUSE**

**1,007**

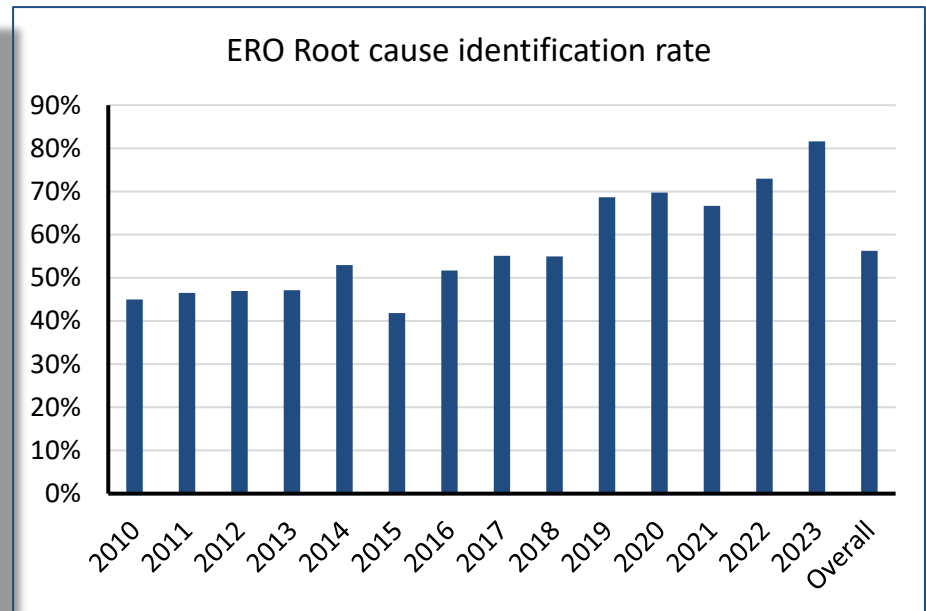
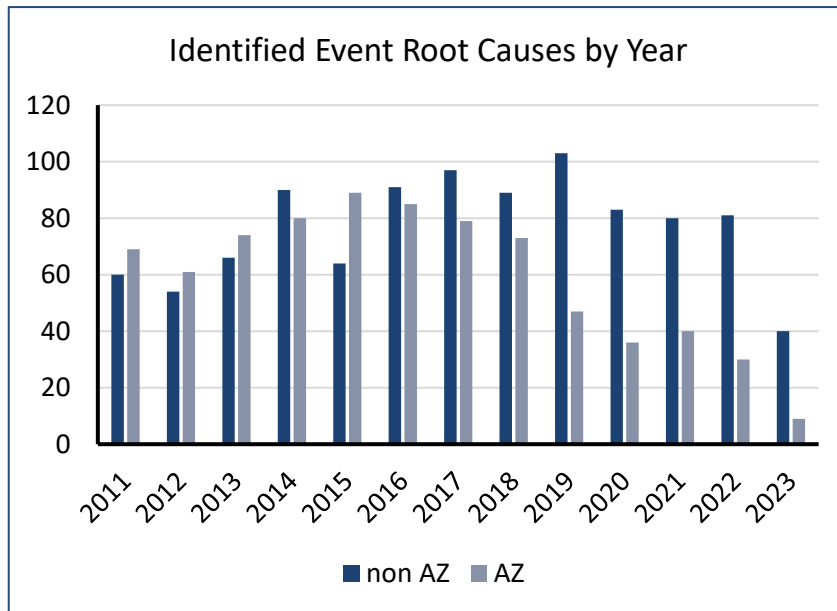


**2.1**

*Per Week*

# Root Cause Identification Rate

- Root cause identification continues to improve
- Overall average is 55.4%
- 2018–2022 (rolling average of last 5 completed years) is 65.9%



*\*AZ Codes represent when a specific correctable/actionable root cause cannot be determined for an event*

- Human Performance refers to individual human performance
  - Refers to when a person makes a decision as an individual, not as part of a team
  - A substitution test would show different results, excluding the operating environment from influencing individual action
- Organizational Performance refers to practices, policies, procedures, management decisions, etc.
  - This would include work that is done as part of a team effort
  - Substitution test would show similar result indicting the operating environment leading the individual to action

# Types of Human Error\*

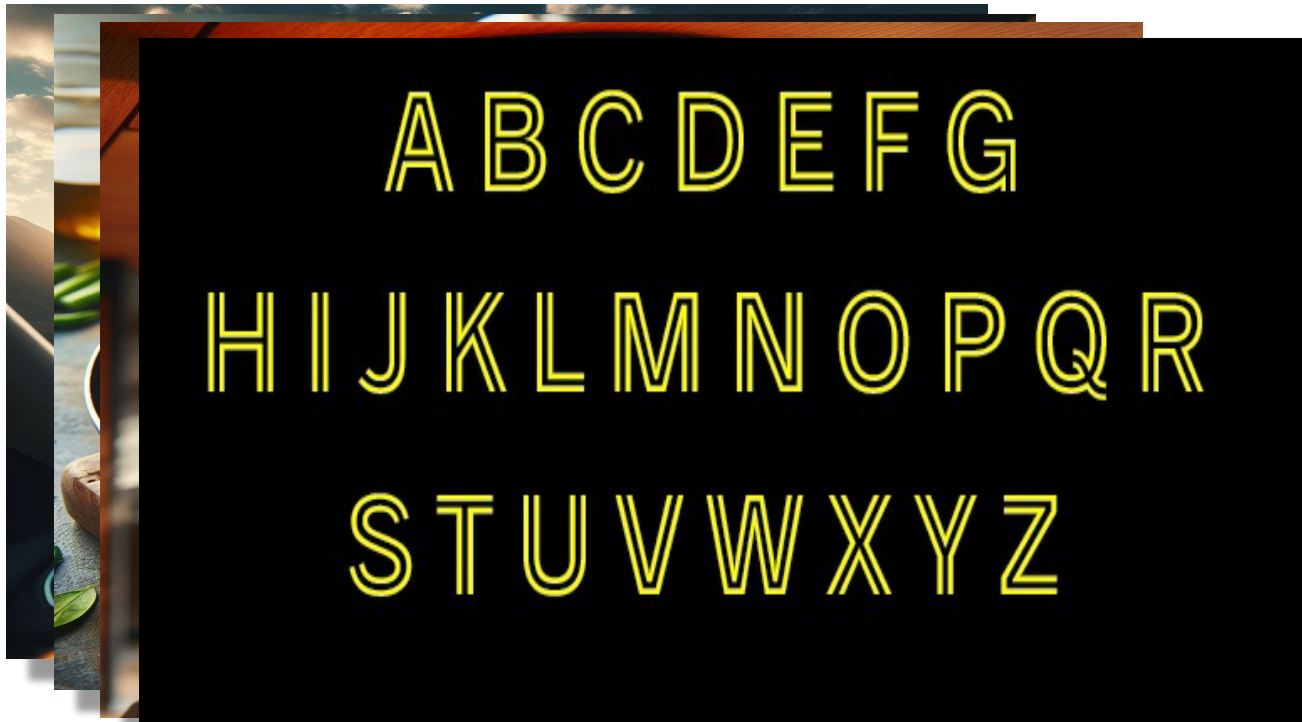
- Skill-Based Mode
- Rule-Based Mode
- Knowledge-Based mode
- Work Practices Error\*\* (This is when a person can't perform the task or deliberately causes an error.)

\* Based on Rasmussen's model

\*\* Not Based on Rasmussen's model



- Skill-Based Mode—associated with highly practiced actions in a familiar situation



- Main error driver—Distraction
- Error Rate 1:10,000



- Rule Based Mode – based on the selection of stored rules derived from one's recognition of the situation



- Main error driver – Incorrectly identified the problem
- Error Rate 1:1,000

# Knowledge Based Mode

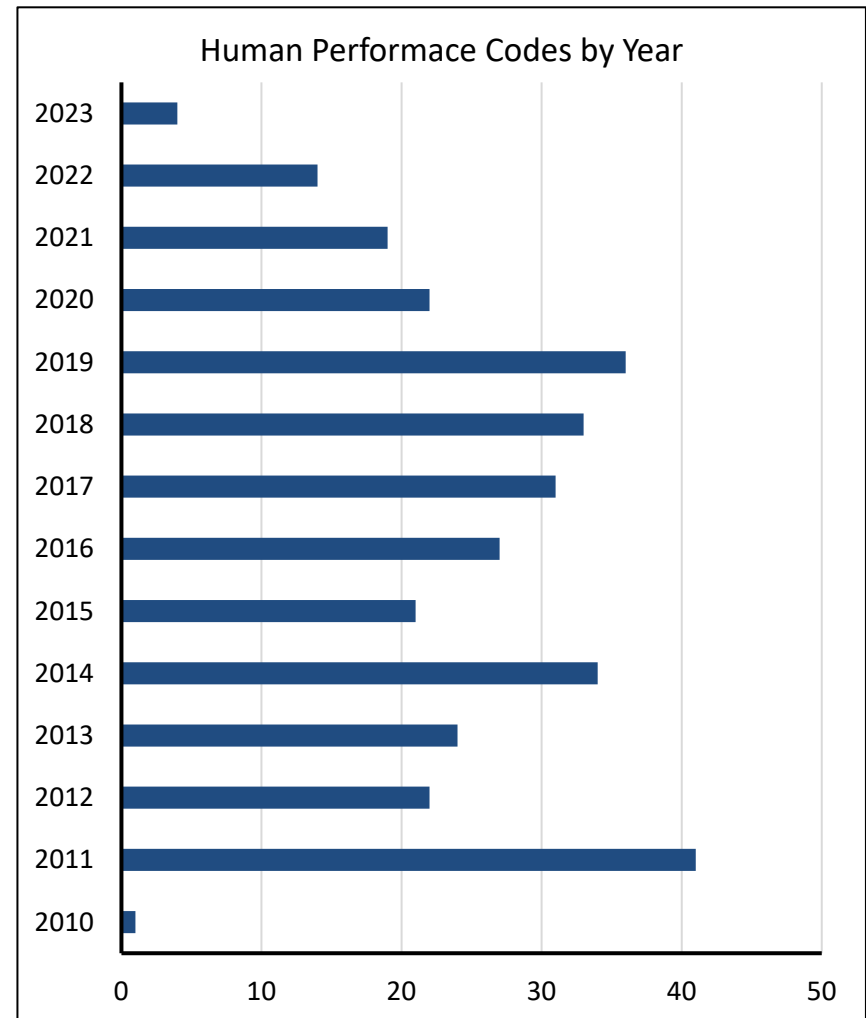
- Knowledge-Based Mode—Behavior based on unfamiliarity, so individuals must rely on experience, perceptions, and perspectives



- Main Error Driver—Lack of a good mental model
- Error Rate 1:2

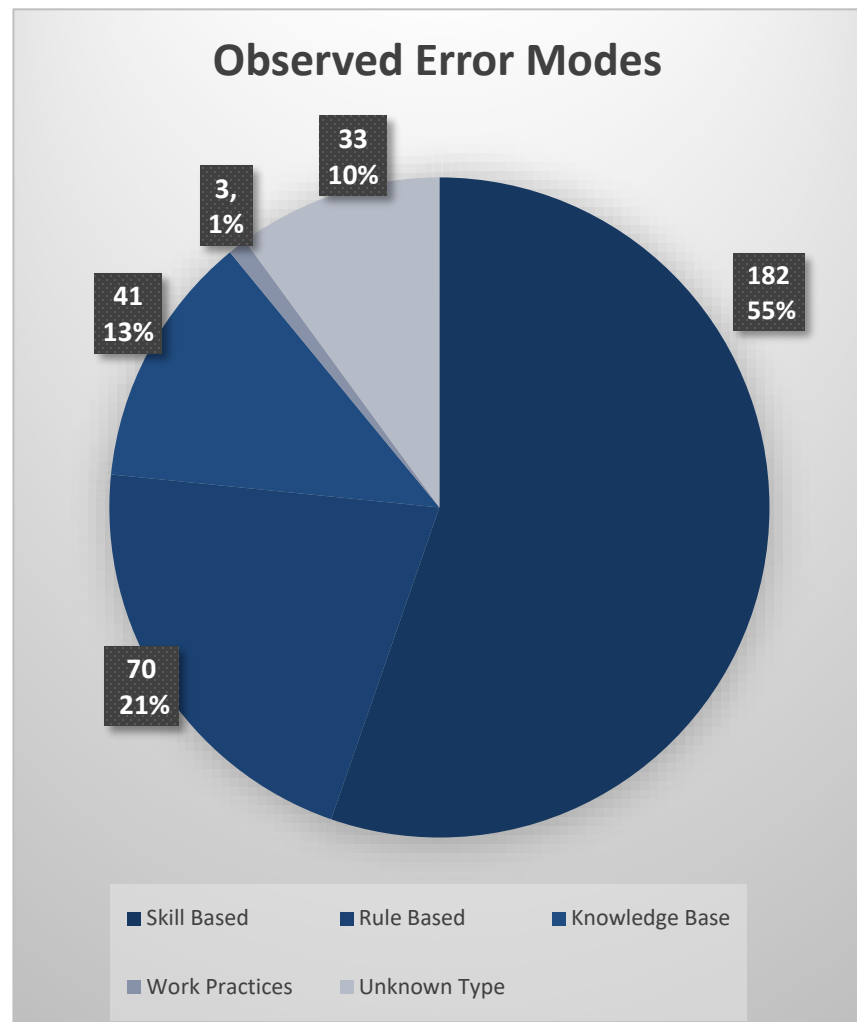
# Human Performance Issues

- Human Performance has been identified as either a root cause or a contributing factor 329 times since 2010
- Average of ~26.2 events per year
- So more than once every other week, someone is making a mistake with consequences for the grid



# Where are the problems

- Skill-Based Error (182 times)
- Rule-Based Error (70 times)
- Knowledge-Based Error (41 times)
- Unknown mode (33 times)
- Work Practices Error (3 times)



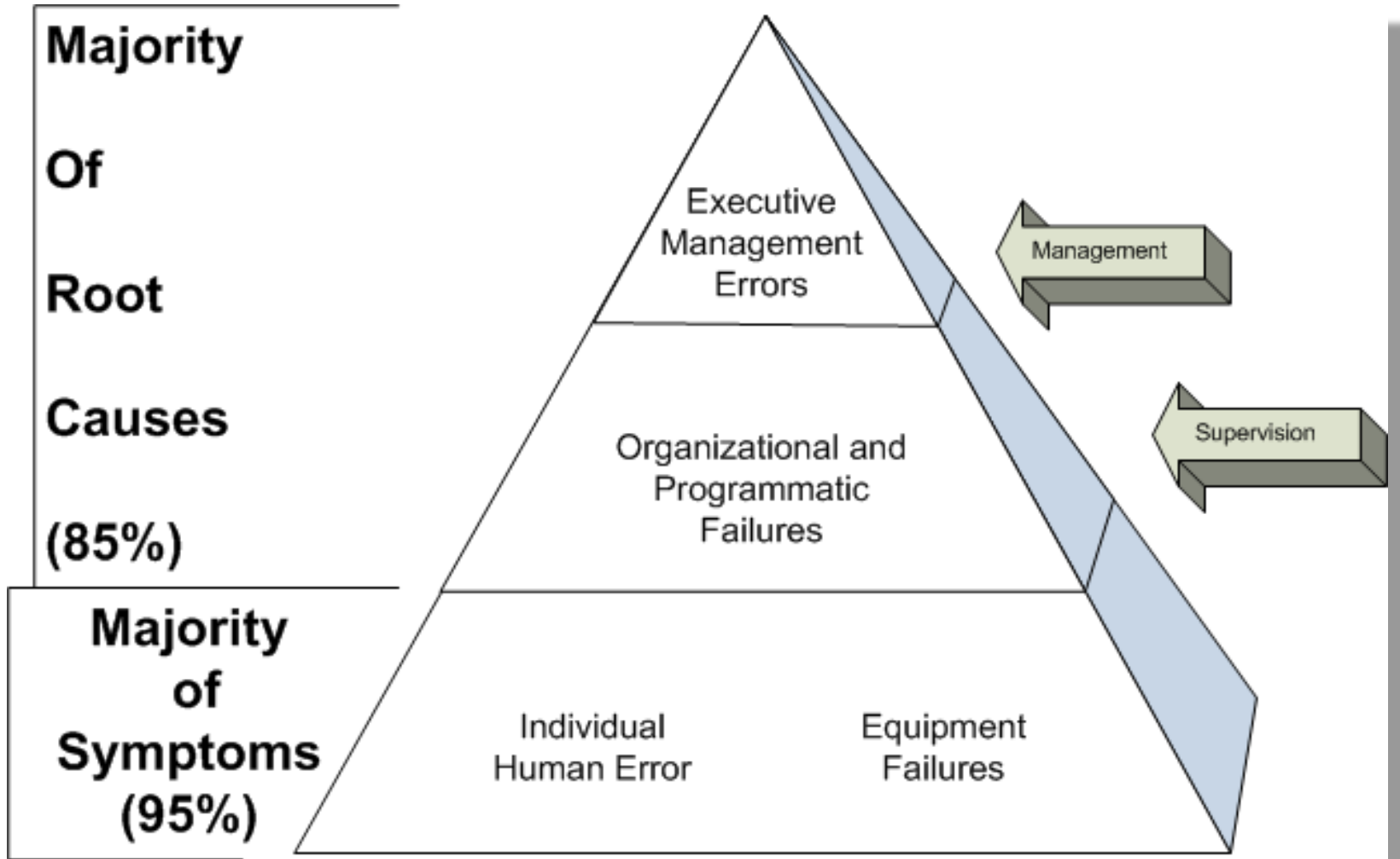
Out of 329 times a human performance code was identified, the top five codes were:

- Check of work Less than Adequate (LTA) (71 times, skill based)
- Individual Human Performance (33 times, unknown mode)
- Incorrect performance due to mental lapse (27 times, skill based)
- Situation incorrectly identified or represented resulting in wrong rule used (27 times, Rule based)
- General Skill Based Error (25 times)

# So is it just the Human?



# What do others see?

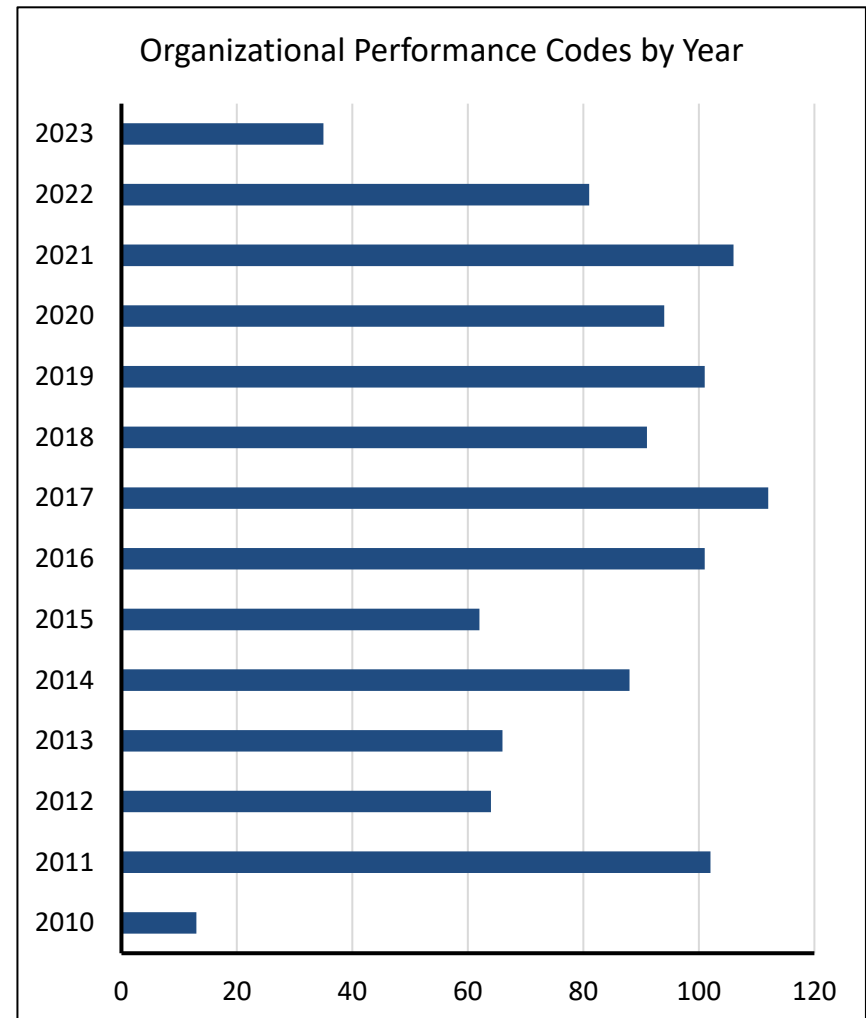


*The PII Performance Pyramid TM*



# Organizational Performance Issues

- Organizational Performance has been identified as a root or contributing factor 1,116 times
- Average of ~89 events per year
- This is over 3x the rate of Individual Human Performance issues

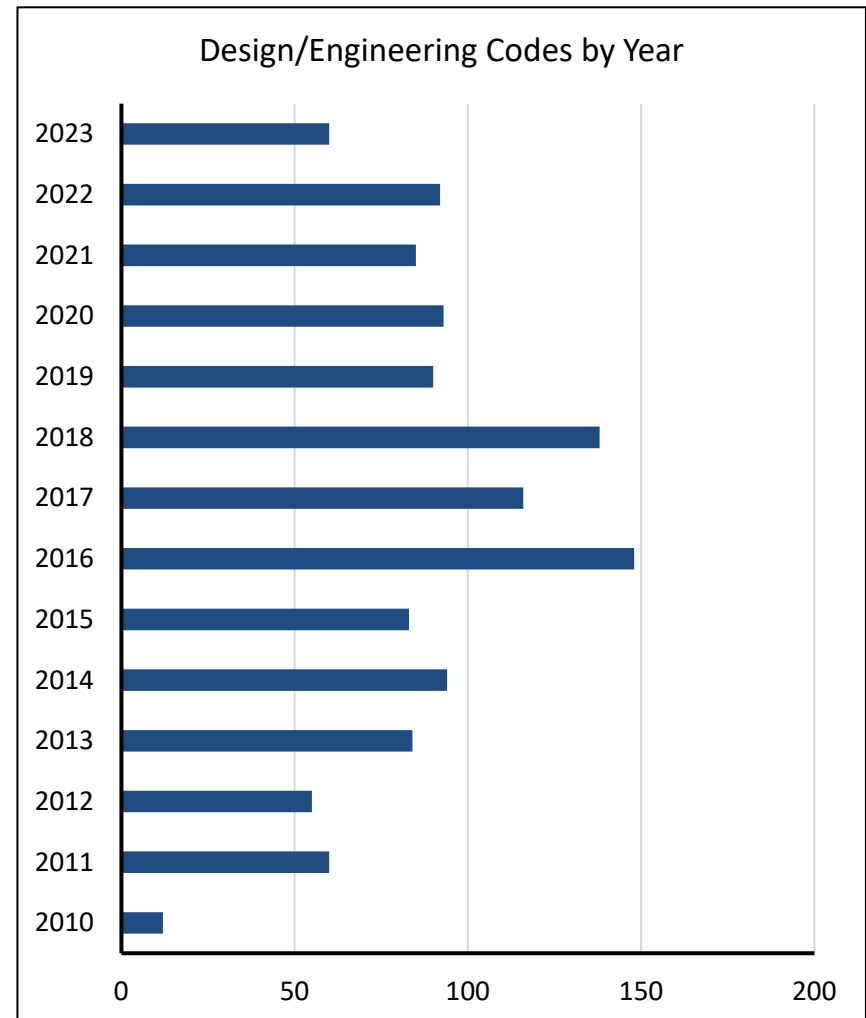


Out of the 1,116 times organization performance has been indicated as factor, the top five are the following:

- Job scoping did not identify special circumstances and/or conditions (135 times)
- Corrective action responses to a known or repetitive problem was untimely (99 times)
- System interactions not considered or identified (97 times)
- Risks/consequences associated with change not adequately reviewed/assessed (74 times)
- Previous industry or in-house experience was not effectively used to prevent recurrence (62 times)

# Design/Engineering Issues

- Design/Engineering has been identified as a root or contributing factor 1,210 times
- Average of ~95 events per year
- This is over 3x the rate of Individual Human Performance issues



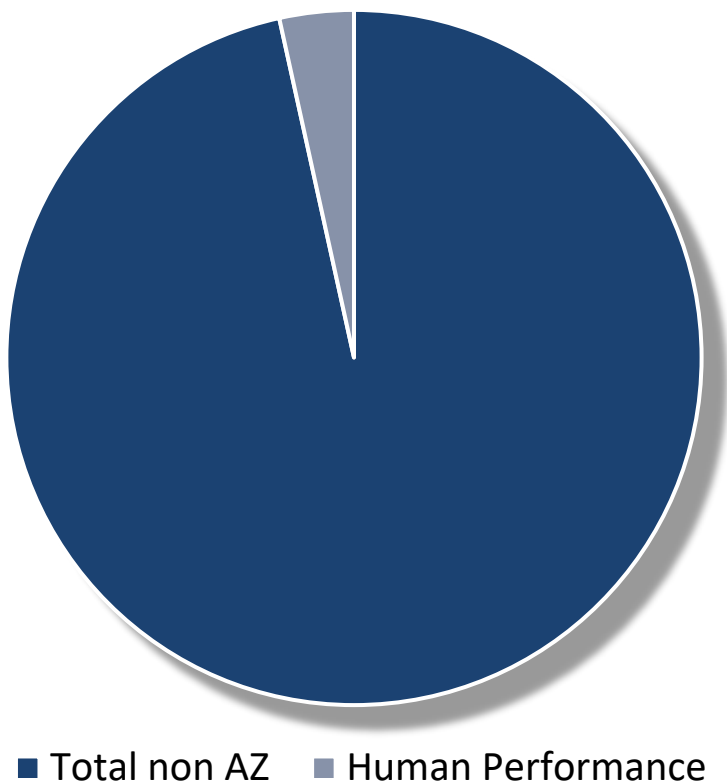
## Design/Engineering Issues – Top 5

Out of the 1,210 times Design and Engineering has been indicated as factor, the top five are the following:

- Design output scope LTA (528 times)
- Errors not detectable (134 times)
- Independent review of design/documentation LTA aka, peer checking (126 times)
- Design output not correct (111 times)
- Testing of design/installation LTA (70 times)

## So is it the Human?

### Human Performance vs All Other Root Causes

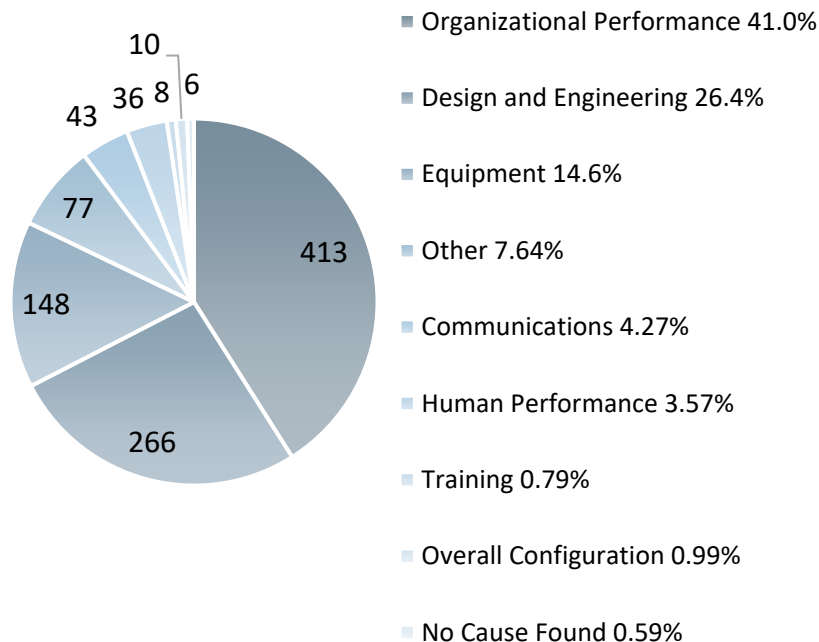


- Only 3.6% of identified event root causes indicate that the event is due to an Individual Human Performance issue

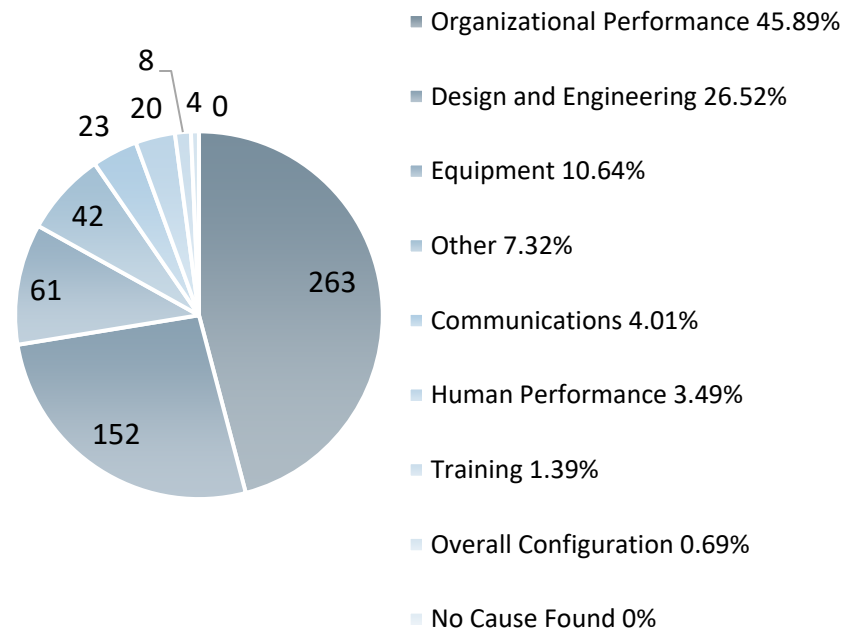
# Where are our issues?

- 41.0% Organizational Performance (45.9% past 5 years)
- 26.4% Design and Engineering (26.5% past 5 years)
- 3.6% Human Performance (3.5% past 5 years)

**Current Identified Root Causes All Time**

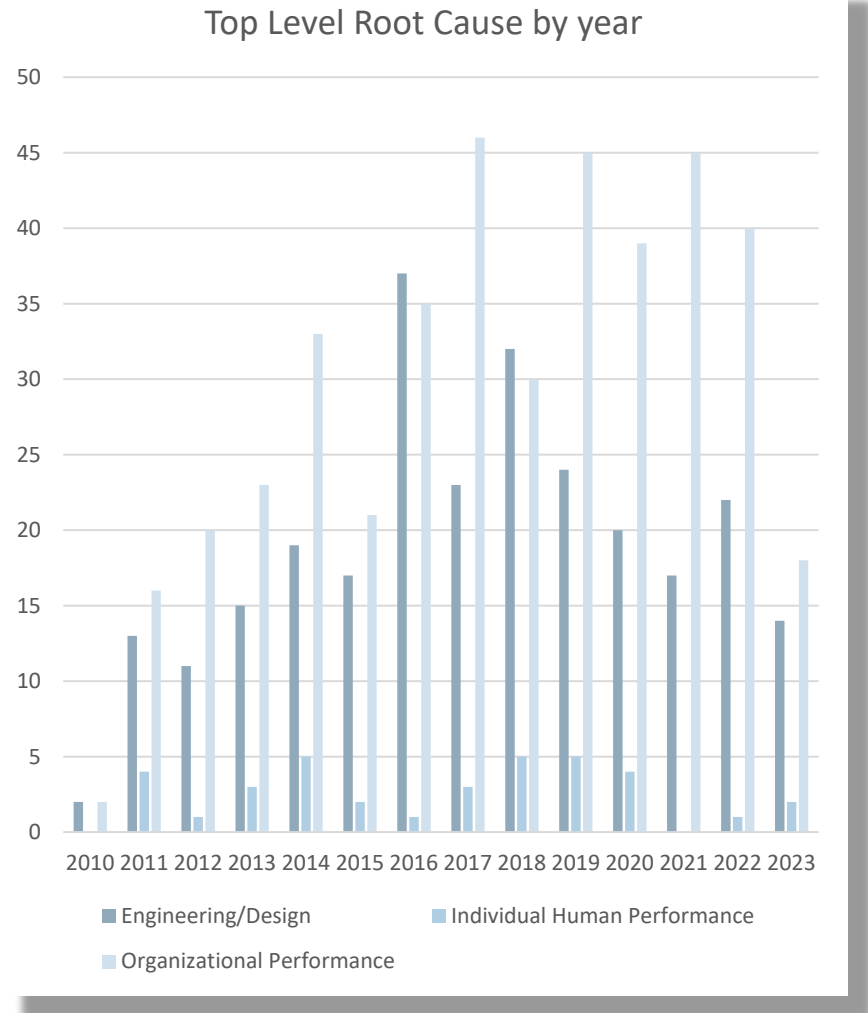


**Current Identified Root Causes 2017-Present**



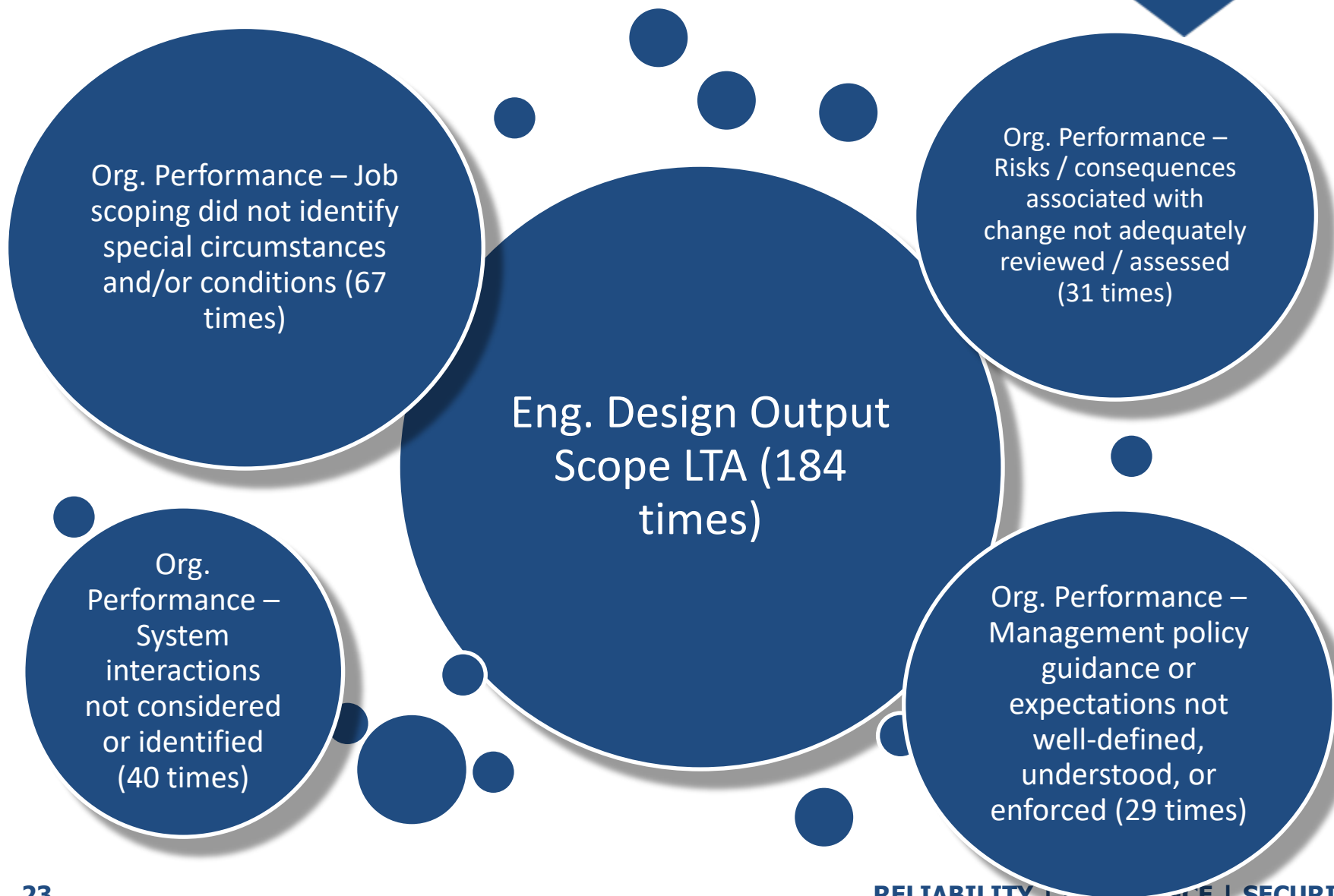
# Human Performance vs. Organization Performance

- Human performance remains fairly constant at a very low level
- Engineering has decreased over the past few years
- Organizational Performance issues remain a major driver of Categorized events





# Top HP/OP Event Root Causes





- “Human Performance issues” are usually a symptom of larger challenges within a company.
- Best ways to reduce events are by performing the following:
  - Working to improve engineering, especially improving the understanding of all the ways a design could fail and ensure you have a robust peer review process
  - Working with supervisors and crews to improve job scoping and understanding of how systems interact with each other
  - Ensuring that all potential impacts or dependencies are identified, reviewed, and (if needed) modified to accommodate changes when they are made
  - Ensure that policies and expectations are well defined and understood by your employees and contractors

- Doing what is easy vs doing what is hard
  - It is easy to blame the individual human, a failed component, or weather
  - It is harder to admit our processes, procedures, and policies need improvement
- Yet, It is by identifying and doing what is hard that results in significant improvement for a more Reliable, Resilient, and Secure industry.

*“We choose to go to the Moon in this decade and do the other things, not because they are easy, but because they are hard.” – President John F. Kennedy*



- [ERO Event Analysis Program Website](#)
- [ERO Event Analysis Process Document](#)
- [ERO Cause Code Assignment Process](#)
- [Lessons Learned Website](#)



# Questions and Answers

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