

##### Electric Reliability Council of Texas

**Human Performance Improvement Task Force**

**OTWG Approved: [ Date ]**

|  |  |  |
| --- | --- | --- |
| **AUSTIN**7620 Metro Center Drive Austin, Texas 78744Tel. 512.225.7000Fax 512.225.7020 | [www.ercot.com](http://www.ercot.com/content/committees/board/tac/ros/cipwg/cipag/keydocs/2009/www.ercot.com) | **TAYLOR**2705 West Lake DriveTaylor, Texas 76574Tel. 512.248.3000Fax 512.248.3095 |

**Human Performance Improvement Task Force**

The Human Performance Improvement Task Force (HPITF) is a task force reporting to the Reliability and Operations Subcommittee (ROS).

**Background**

According to NERC, human error is often cited as the main cause for up to 80 percent of all incidents and accidents in complex, high-risk systems that exist in the aviation, petrochemical, healthcare, construction, mining, and nuclear power industries. Many of the major events that occur in the bulk power system are initially labeled as being caused by individual human error. When the causes of these human errors are broken down further, they reveal that the majority of the errors associated with events stem from latent organizational weaknesses, which are not attributable to one individual.

People, even the very best people, will make mistakes. We have not fully understood an event if we do not see the human’s actions as reasonable (when they are). Through careful and thorough analysis of events and near misses, and most importantly, the subsequent understanding of the root and contributing causes, organizations can prevent future occurrences.

Sound administrative and cultural controls can withstand human error. However, these controls are weakened when conditions are present that provoke error. Eliminating error precursors at the job site, workplace, or organization reduces the frequency or numbers of active errors. Events can be avoided through an understanding of the reasons mistakes occur and application of the lessons learned from past events and near misses. At the NERC level, the systematic investigation and evaluation of events in the bulk power system is uncovering many of the latent errors that are dormant in the system, as indicated in the figure below from the NERC 2018 State of Reliability Report.



*Management or Organizational Challenges Contributing to an Event*

Through the NERC events analysis initiative and the use of Human Performance analysis and applications, the lessons learned and good industry practices are being applied to further improve the reliability of the bulk power system.

**Human Performance and Skilled Workforce**

The BPS is becoming more complex, and as the industry faces turnover in technical expertise, it will have difficulty staffing and maintaining necessary skilled workers. The addition of significant internal procedural controls needed to maintain compliance with NERC Reliability Standards requirements has brought additional complexity to many skilled worker positions. In addition, inadequate HP makes the grid more susceptible to both active and latent errors that negatively affect reliability. Weaknesses in HP may hamper an organization’s ability to identify and address precursor conditions to promote effective mitigation and behavior management.

**Transmission Outages Related to Human Performance**

NERC TADS collects performance data on transmission outages due to Human Error.

**Human Error:** Relative human factor performance including any incorrect action traceable to employees and/or contractors to companies operating, maintaining, and/or assisting the TO.



**Figure 5.8: Transmission Outages Initiated by Human Error**

**Human Performance and Generation Outages**

NERC GADS collects performance data generation outages due to Human Error (see **Figure 5.9**). GADS is able to calculate the amount of potential production lost due to any particular cause code. Over the past five years, total potential production loss has decreased for all fuel types and shows an improving performance trend. While the total potential electricity production loss is relatively small (21 TWH out of 4,300 TWH), the total reduction in Human Error-related outages may be due to a decreasing coal-fired generation fleet. Staff shortage errors have greatly reduced over the analysis period and there has been a marked reduction in procedural human errors across all fuel types.



**Figure 5.9: Potential Production Lost due to Forced Outages Caused by Human Error**

**Trends of Events Involving Human Performance as a Root or Contributing Cause**

Management or Organization Challenges is an overarching set of event cause codes. Of all events in 2018, a total of 76 involved HP (see **Figure 5.10**). This is down from 108 in 2017, and as high as 174 in 2014. The top 5 detailed root cause codes for 2014–2018 time frame are the following:

* Job scoping did not identify special circumstances and/or conditions
* System interactions not considered or identified
* Risks/consequences associated with change not adequately reviewed/assessed
* Means/methods not provided for assuring adequate quality of contract services
* Inadequate work package preparation



**Figure 5.10: Human Error Root and Contributing Causes by Year, 2014–2018**

**Human Error and Protection System Misoperations**

**Figure 5.11** shows the number of misoperations due to the two different types of Human Error categorized by NERC: As-left personnel errors and Incorrect Settings/Logic/Design Errors. Together, these account for roughly 40% of misoperations over the last five years.



**Figure 5.11: Protection System Misoperations Due to Human Error by Region, 2014–2018**

**Assessment**

The ERO has identified work force capability and HP challenges as possible threats to reliability. Workforce capability and HP is a broad topic but can be divided into management, team, and individual levels.

NERC and the NATF held the seventh annual HP conference in Atlanta, Georgia, improving Human Performance and Increasing Reliability on the BPS, at the end of March 2018. RF conducted a workshop specifically looking at Human Error and its relation to protection system misoperations.

**Actions and Mitigations in Progress**

* Annual NERC/NATF Human Performance Conference
* Event cause analysis training
* Monitoring and Situational Awareness Conference

**Recommendations**

The ERO and the forums should continue to focus on HP training and education through conferences and workshops that increase knowledge and provide information to further mitigate risk scenarios related to transmission and generation outages.

Human Performance and Skilled Workforce was also identified as high likelihood risk impact by the NERC Reliability Issues Steering Committee (RISC). The February 2018 RISC recommendation to the NERC Board of Trustees provided these descriptors of the human performance risk profile:

1. Organizations not implementing improvements based on past events, experiences, good industry practices, or keeping an eye on the implementation of new technologies that can hinder future operations improvements; gaps in skillsets or organizational improvement must be a priority.

2. Significant increase in operational complexity resulting in more extensive training needs associated with new technology and related compliance control strategy.

3. Turnover of key skilled or experienced workers (e.g., relay technicians, operators, engineers, IT support, and substation maintenance) that will lead to more protection and control system misoperations.

4. Complicated new multi-discipline control and protection schemes that are beyond the skillset of the existing workforce.

5. A lack of training programs that prevent closing skillset gaps quickly.

6. Inadequate management oversight or controls leads to organizational weaknesses and inefficiencies.

7. Ineffective corrective actions lead to repeated HP errors.

8. Legacy systems and new technology result in disparity of the skillsets needed for BPS reliability.

**Purpose & Scope**

The purpose of the ERCOT HPITF is to formalize an approach to Human Performance Improvement (HPI) through the development of a HPI working group (HPIWG) who will report to the OTWG. The following are guiding questions to aid in the development of a scope document for the HPIWG:

* What best practices exist in the industry related to HPI?
* How do other ISO/NERC regional authority groups share information about HPI practices?
* What processes need adoption in the ERCOT BES for HPI?
* What is the benefit of establishing an HPI driven Corrective Action Program at ERCOT?

Potential areas that the HPITF may explore include, but are not limited to, the following:

* HPI in control room operations and situation awareness
* HPI in protection system performance
* HPI in system events
* HPI in workforce purpose, engagement, and turnover

The HPITF should prepare a report of its findings and recommendations to the OTWG by September 30, 2019.

**Membership**

HPITF membership shall consist of representatives from Transmission and/or Distribution Service Providers (TDSPs), Transmission Operators, Resource Entities, and Qualified Scheduling Entities (QSEs). Representation by ERCOT ISO is required. Public Utility Commission of Texas (PUCT), the Texas Reliability Entity (TRE), NERC and any other appropriate governing agency may be represented.

Any prospective member must sign the appropriate ERCOT Non-Disclosure Agreement (NDA) and receive approval from ERCOT ISO. To facilitate this process, you may email the ERCOT ISO Legal department at NDA@ercot.com. Any prospective member must also agree to the terms of the Antitrust Admonition.

**Chair and Vice-Chair**

The Chair and Vice-Chair positions shall be nominated by the HPITF for approval by OTWG to a term not to exceed 12 months, on a one year, rolling basis until the establishment of the HPIWG and disestablishment of the HPITF. The Vice-Chair shall act as Chair in the absence of the Chair.

**Meetings**

The HPITF shall meet as often as necessary to perform their duties and functions.

All HPITF meetings shall be called by the Chair and/or Vice-Chair and all such meeting notices shall be sent and posted to the ERCOT website at least one week prior to the meeting.

The Chair shall preside at all meetings and is responsible for preparation of agendas for such meetings which will be posted to the ERCOT website in advance of the meeting. In the absence of the Chair and the Vice-Chair, the group shall select another HPITF member to preside at the meeting. The Chair, or the presiding member, shall be guided by input from the membership in the conduct of the meetings.

Notes of HPITF meetings shall be recorded and distributed, along with other communications to all members of the HPITF. Additionally, such information will be posted on the ERCOT website as authorized by the HPITF and author of document.