

# NERC

NORTH AMERICAN ELECTRIC  
RELIABILITY CORPORATION

# Introduction to Misoperation Information Data Analysis System (MIDAS)

**RELIABILITY | ACCOUNTABILITY**



- Introduction
  - Trinh Ly, Engineer, Performance Analysis
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- Brief history on Misoperation data collection
- Who?
- When?
- Where?
- How?
- Regional Contacts
- Questions

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RF	Bill Crossland	<a href="mailto:bill.crossland@rfirst.org">bill.crossland@rfirst.org</a>
SERC	David Greene	<a href="mailto:dgreene@serc1.org">dgreene@serc1.org</a>
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TRE	David Penney	<a href="mailto:David.Penney@TEXASRE.org">David.Penney@TEXASRE.org</a>
WECC	Suzanne Brignone	<a href="mailto:sbrignone@wecc.biz">sbrignone@wecc.biz</a>

- PRC-004-4 Protection System Misoperation Identification and Correction
  - <http://www.nerc.com/pa/Stand/Reliability%20Standards/PRC-004-4.pdf>
- Section 1600 Data Request
  - [http://www.nerc.com/pa/RAPA/ProtectionSystemMisoperations/PRC-004-3%20Section%201600%20Data%20Request\\_20140729.pdf](http://www.nerc.com/pa/RAPA/ProtectionSystemMisoperations/PRC-004-3%20Section%201600%20Data%20Request_20140729.pdf)

- The purpose of this Data Request is to continue consistent reporting of Misoperation data to NERC through a standardized template for benchmarking and analysis. ERO Enterprise will analyze the data to:
  - Develop meaningful metrics to assess Protection System performance;
  - Identify trends in Protection System performance that impact reliability;
  - Develop remediation techniques to reduce the rate of Misoperations;
  - Provide focused assistance to entities in need of guidance; and
  - Publicize lessons learned to the industry.

# Who Reports Misoperation Data?

- Jurisdictions
  - US, Canada, and Mexico
- Entities
  - Generator Owner (GO)
  - Transmission Owner (TO)
  - Distribution Provider (DP)

- Quarterly Reporting
- ERO Enterprise MIDAS Tool
  - Misoperation Data Beginning: Q2 2016
  - Submission Begins: July 1, 2016

Reporting Quarter	Entities Reporting Range
Q1	April 1 – May 30
Q2	July 1– August 29
Q3	October 1– November 29
Q4	January 1– March 1

*Email reminders will be sent out prior to the end of the 60 days.*



- Submit Data to NERC
- Receive confirmation email
- Regions will process the data
- Receive successful email or error email

- Operation Summary
  - Total Protection System Operations by Voltage Class by Region
- Protection System Misoperations
  - Misoperation Category
  - Cause(s) of Misoperation
  - Other optional fields
- Protection System Misoperations webpage:  
<http://www.nerc.com/pa/RAPA/Pages/Misoperations.aspx>
- MIDAS Training Videos:  
<https://vimeopro.com/nerclearning/midas-video-library>

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Reliability Assessments  
Performance Analysis  
Protection System Misoperations  
Reliability Indicators  
Demand Response Availability Data System  
Generating Availability Data System  
Transmission Availability Data System  
Electricity Supply & Demand  
Spare Equipment Database  
Reliability Guidelines  
Bulk Electric System (BES) Definition, Notification, and Exception Process Project  
Committees  
Operating Committee (OC)  
Planning Committee (PC)  
Webinars

Compliance and Enforcement  
Standards  
Electricity ISAC  
►Reliability Assessment & Performance Analysis  
Reliability Risk Management  
Training, Education, and System Operator Certification

Protection System Misoperations Archives

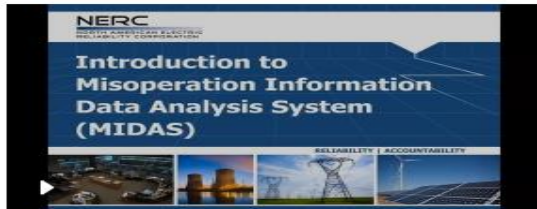
**Protection System Misoperations**

Type	Title	Modified
	Data Request Consideration of Comments	8/11/2014 10:06 AM
	Draft Protection System Misoperations Section 1600 Data Request for Public Comment	8/8/2013 3:43 PM
	Final Draft Protection System Misoperations Section 1600 Data Request	9/23/2014 5:45 PM
	Q&A on Consistent Protection System Misoperation Reporting	6/18/2013 9:48 AM
	MIDAS Reporting Template	6/10/2016 2:00 PM
	MIDAS Reporting Template*	5/6/2016 8:11 AM

Protection System Misoperations webpage:

<http://www.nerc.com/pa/RAPA/Pages/Misoperations.aspx>

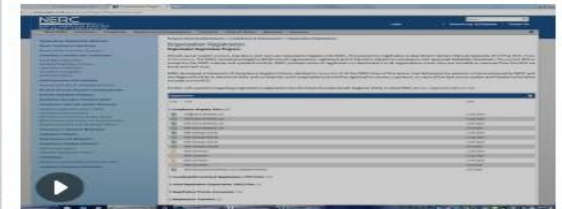
## MIDAS: REPORTING ENTITIES



1) Introduction to MIDAS (3m 14s)



2) Downloading the Submission Workbook (47 sec)



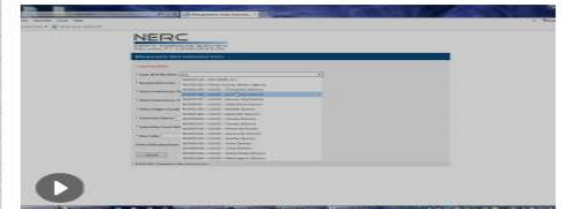
3) Filling Out the Operations Tab (3m 37s)



4) Filling Out the Report Tab (11m 10s)



5) The Definitions and Data Description Tabs (58 sec)



6) Submitting a New Report through the MIDAS Submission Website (3m)

MIDAS Training Videos:

<https://vimeopro.com/nerclearning/midas-video-library>

# Operations Summary Tab

A	B	C	D	E
Data Reporting	Data Reporting Quarter	Regional Entity Name (or Lead Regional Entity, if	NERC Compliance Registry Number (NCR)	Jurisdiction

F	G
Voltage Class	Total Number of Operations Occurred in
<100 kV	0
100 kV	0
115 kV	0
120 kV	0
138 kV	0
161kV	0
230 kV	0
345 kV	0
500 kV	0
735 kV	0
765 kV	0
HVdc	0
Total Protection System Operations	0

<b>Data Reporting Year</b>	<b>Data Reporting Quarter</b>	<b>Regional Entity Name (or Lead Regional Entity, if MRRE)</b>	<b>NERC Compliance Registry Number (NCR) (ex: NCR00123)</b>
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<b>Jurisdiction</b>	<b>Voltage Class</b>	<b>Total Number of Operations Occurred in</b>
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# Misoperation Entry Form Tab

**Misoperation ID (CONCATENATED FIELD OF COLUMNS (B,C,E,F,H,I) DO NOT ENTER DATA)**

**Region Where Misoperation Occurred (select from dropdown)**

**NERC Compliance Registry Number (NCR) (ex:NCR00123)**

**Misoperation Category (select from drop down)**

**Cause(s) of Misoperation (select from drop down)**

**Incorrect Setting/Logic Errors/Design Errors and Relay Failure/Malfunctions Sub Cause Code (Optional, select from drop down)**

**Communication Sub Cause of Misoperation (Optional, select from drop down)**

1. The correct operation of a Protection System associated with isolating a faulted system Element.
2. The correct operation of a Protection System associated with isolating equipment for non-Fault conditions such as power swings, over excitation, or loss of field (excluding control functions performed by a protective relay; e.g., when a reverse power relay is used to trip a breaker during generator shutdown).
3. The unintended operation of a Protection System for a Fault outside the zone it is designed to protect.
4. The unintended operation of a Protection System for a non-Fault condition.



5. Any failure of a Protection System to operate for its intended function such as clearing a Fault within the zone it is designed to protect.

## Notes:

- a. When reclosing is applied (automatic or manual), a sequence of reclosing and tripping associated with isolating a faulted system Element is counted as a single operation. Multiple unintended operations of an Element due to this sequence of reclosing and tripping would also be counted as a single operation.
- b. Transformer operations are reported by the high-side voltage. Generator operations are reported by the generator step-up transformer high-side voltage.
- c. Operations which are initiated by control systems (not by Protection Systems), such as those associated with generator controls, turbine/boiler controls, static var compensators (SVCs), flexible ac transmission systems (FACTS), high-voltage dc (HVdc) transmission systems, circuit breaker mechanisms, or other facility control systems, are not reported as operations of a Protection System.

1. A permanent Fault occurs on Line A and all line breakers operate and go through a complete reclose sequence (trip, close, trip, close, and trip). This event is considered one operation. Analysis would indicate that this was a correct operation.
2. A permanent Fault occurs on Line B and all line breakers operate correctly but, at the same time, a breaker on Line C operates. This event is considered two operations, since two transmission Elements were involved. Analysis would identify that the Line B operation was correct, and the Line C operation was a Misoperation.
3. A breaker(s) on Line D opens under a non-fault condition due to a failed relay. This event is considered one operation. Analysis would identify the Line D operation as a Misoperation.

## 4. Line faults with one breaker failure.

- a. No breaker failure relaying: There would be one operation associated with the line fault, and one additional operation for each required remote backup clearing operation.
- b. Breaker failure relaying with local tripping and no transfer tripping of remote ends: There would be one operation for the Fault with the breaker failure, one operation for the breaker failure local clearing, and an additional operation for each required remote back up clearing. For example, if the line fault occurred and the breaker between two lines on a breaker-and-a-half bus failed, there would be three operations. One operation associated with the fault, one operation for the breaker failure local clearing, and one operation for the remote end trip of the second line connected to the failed breaker.
- c. Breaker failure with transfer tripping of remote ends: For the example scenario in 4b, there would be two operations. One for the fault, and a second for the breaker failure protection

Misoperation Category	
Failure to Trip - During Fault	A failure of a Composite Protection System to operate for a Fault condition for which it is designed. The failure of a Protection System component is not a Misoperation as long as the overall performance of the Composite Protection System is correct.
Failure to Trip - Other than Fault	A failure of a Composite Protection System to operate for a non-Fault condition for which it is designed, such as a power swing, undervoltage, overexcitation, or loss of excitation. The failure of a Protection System component is not a Misoperation as long as the performance of the Composite Protection System is correct.
Slow Trip - During Fault	A Composite Protection System operation that is slower than intended for a Fault condition if the duration of its operating time resulted in the operation of at least one other Element's Composite Protection System.
Slow Trip - Other than Fault	A Composite Protection System operation that is slower than required for a non-Fault condition, such as a power swing, undervoltage, overexcitation, or loss of excitation, if the duration of its operating time resulted in the operation of at least one other Element's Composite Protection System.
Unnecessary Trip - During Fault	An unnecessary Composite Protection System operation for a Fault condition on another Element.
Unnecessary Trip - Other than Fault	An unnecessary Composite Protection System operation for a non-Fault condition. A Composite Protection System operation that is caused by personnel during on-site maintenance, testing, inspection, construction or commissioning activities is not a Misoperation.

**Note that: (1) Failure to automatically reclose after a fault is not a Misoperation.**

**(2) Transformer operations are reported by the high-side voltage. Generator operations are reported by the generator step-up transformer high-side voltage.**

**(3) All Misoperations due to the same equipment and cause within a 24-hour period are to be recorded as one Misoperation.**

**(4) Operations which are initiated by control systems (not by Protection Systems), such as those associated with generator controls, turbine/boiler controls, SVCs, FACTS, HVdc transmission systems, circuit breaker mechanisms, or other facility control systems, are not Misoperations.**

# Definitions Tab – Cause(s) of Misoperation

Cause(s) of Misoperation	
AC system	This category includes Misoperations due to problems in the ac inputs to the Protection System. Examples would include Misoperations associated with CT saturation, loss of potential, or rodent damaged wiring in a voltage or current circuit.
As-left personnel error	This category includes Misoperations due to the as-left condition of the Protection System following maintenance or construction procedures. These include test switches left open, wiring errors not associated with incorrect drawings, carrier grounds left in place, or settings placed in the wrong relay, or incorrect field settings left in the relay that do not match engineering approved settings.
Communication failures	This category includes Misoperations due to failures in the communication systems associated with protection schemes inclusive of transmitters and receivers. Examples would include Misoperations caused by loss of carrier, spurious transfer trips associated with noise, Telco errors resulting in malperformance of communications over leased lines, loss of fiber optic communication equipment, or microwave problems associated with weather conditions.
DC system	This category includes Misoperations due to problems in the dc control circuits. These include problems in the battery or charging systems, trip wiring to breakers, or loss of dc power to a relay or communication device.
Incorrect settings	This category includes Misoperations due to issued setting errors, including those caused by modeling errors, associated with electromechanical and solid state relays, and the protection element settings in microprocessor-based relays (excluding logic errors discussed in the Logic error cause code).
Logic errors	This category includes Misoperations due to issued logic setting errors associated with programming microprocessor relay inputs, outputs, custom user logic, or protection function mapping to communication or physical I/O points.
Design errors	This category includes Misoperations due to incorrect physical design. Examples would include incorrect configuration on ac or dc schematic or wiring drawings, or incorrectly applied protective equipment (hardware or firmware).
Relay failures/malfunctions	This category includes Misoperations due to improper operation of the relays themselves. These may be due to component failures, physical damage to a device, firmware problems, or manufacturer errors. Examples would include Misoperations caused by changes in relay characteristic due to capacitor aging, misfiring thyristors, relay power supply failure, or internal wiring/logic error. Failures of auxiliary tripping relays fall under this category.
Unknown/unexplainable	This category includes Misoperations where no clear cause can be determined. Requires extensive documentation of investigative actions if this cause code is utilized. Do not use this cause code if the analysis is still in progress.
Other/Explainable	This category includes Misoperations that were determined to have an identified cause but they do not fit into any of the above categories. For example, temporary changes in network topology that because of their low probability of occurrence are not accounted for in the design of the Protection System, or environmental issues such as damage due to water from a leaking roof or animal intrusion.

Tab 1 - Operation Summary

Field Name	Required Field (Y/N)	Field Description
Data Submission Year	Y	The calendar year for which the operation data is reported.
Data Submission Quarter	Y	The calendar quarter for which the operation data is reported.
Regional Entity Name	Y	The entity's Regional Entity. If the entity is registered in multiple Regional Entities, the Regional Entity area where the Misoperation occurred.
NERC ID	Y	The entity's NERC compliance registry number.
Voltage Class	Y	Lists the 12 Voltage Classes
Total Number of Operations (FRCC)	Y	The total number of operations FRCC has for each voltage class

Tab 2 - Misoperation Entry Form

Field Name	Required Field (Y/N)	Field Description
Misoperation ID	Y	An entity-specific Misoperation identifier. Please enter a company unique identifier (alphanumeric including underscore) for each unique Misoperation. If you are resubmitting a Misoperation from a prior quarter, please use the same Misoperation ID as the Misoperation from the prior quarter.
Region Where Misoperation Occurred	Y	The location where the misoperation occurred.
NERC Compliance Registry Number	Y	The entity's NERC compliance registry number. Ex:99999 Click this link if you need to lookup your NERC Compliance Registry Number: <a href="http://www.nerc.com/pa/comp/Pages/Registration.aspx">http://www.nerc.com/pa/comp/Pages/Registration.aspx</a>
Jurisdiction	Y	The country the Misoperation occurred in.
Misoperation Date	Y	The date of the Misoperation in MM/DD/YYYY format.
Misoperation Time	Y	The time of the Misoperation in 24hr HH:MM:SS format.
Time Zone	Y	The time zone in which the Misoperation occurred, see Definitions tab for detailed definitions.
Facility Name (Location of Misoperation)	Y	The name of the facility (i.e., substation or generating station) where the Misoperation occurred.
Equipment Name (protected by Protection System that Misoperated)	Y	The name of the generator, transmission line, transformer, bus, or equipment protected by the Protection System that misoperated.
Equipment Type	Y	The type of equipment being protected (e.g., line, transformer, etc.).
Facility Voltage	Y	The system voltage of the protected Element. If the Element is a transformer, the high-side voltage. If the Element is a generator, the GSU transformer high-side voltage.
Equipment Removed from Service (Permanently or Temporarily) as the result of the Misoperation	Y	The names of the equipment becoming unavailable due to the Misoperation (Equipment refers only to circuits, transformers, buses, but not breakers UNLESS the breaker is the only Element). Breaker should be used only if a single breaker tripped and did not disconnect any Element at one of its terminals (one breaker in a multiple breaker protected line, bus tie breaker, etc.).



Misoperations Data Submission Form

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*\* required fields*

\* Type NCR Number:

\* Resubmittal Only: ☐ Yes ☐ No

\* Select Submission Quarter:

\* Select Submission Year:

\* Select Region (Lead Region if MRRE):

\* Submitter Name:

\* Submitter Email Address:

\* Key Code:

Select Misoperations File:

- Link and Key Code – to be provided via email by July 1, 2016

Region	Contact	Email
FRCC	Hassan Hamdar	<a href="mailto:hhamdar@frcc.com">hhamdar@frcc.com</a>
MRO	Rich Quest	<a href="mailto:RP.Quest@MidwestReliability.org">RP.Quest@MidwestReliability.org</a>
NPCC	Rafael Sahiholamal	<a href="mailto:rsahiholamal@npcc.org">rsahiholamal@npcc.org</a>
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SERC	David Greene	<a href="mailto:dgreene@serc1.org">dgreene@serc1.org</a>
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# Questions and Answers