

TADS Dependent and Common Mode
Automatic Outage Survey

February 6, 2012

To: TADS reporting TOs

[who have entered TADS “Event IDs” with three or more Dependent or Common Mode automatic outages]

The newly formed Performance Analysis Subcommittee and long standing Transmission Analysis Working Group have endorsed conducting a survey. **Within 30 days by March 6, 2012 please complete the attached voluntary survey (Appendix A).** Please return your completed surveys to Jim Robinson at Jim.Robinson@nerc.net (610-841-3362).

For calendar years 2008 to 2011 numerous Transmission Owners have entered TADS Event IDs which include multiple Dependent and Common Mode automatic outages. The report found at link http://www.nerc.com/files/2011_RARPR_FINAL.pdf provides the background on this topic. Several committees reviewed this report. The NERC BoT reviewed the report and endorsed public posting on the NERC website. A portion of the report is provided below.

Executive summary (page 3) . . .

Transmission Availability Performance

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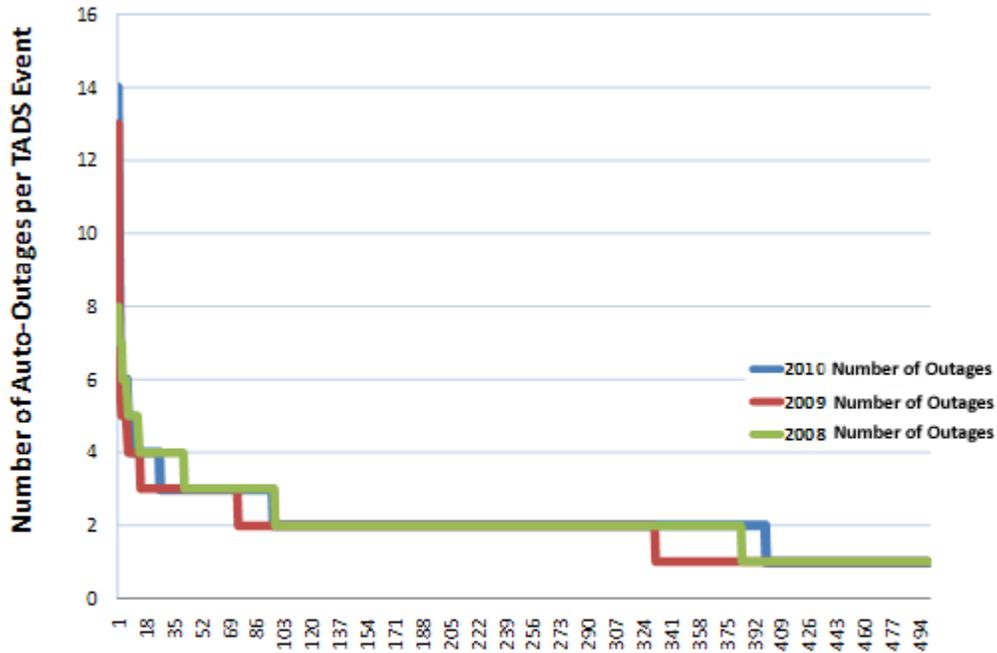
“Unexpectedly, almost one-third of all sustained, automatic outages are dependent or common mode events. Though a number of protection systems are intended to trip three or more circuits, many events go beyond their design basis. In addition, a number of multiple outage events were initiated by protection system misoperations. These events, which go beyond their design expectations and operating procedures, represent a tangible threat to reliability. A deeper review of the root causes of dependent and common mode events, which include three or more automatic outages, is a high priority for NERC and the industry. More focus into this problem would improve the design basis assumed for reliable operation of the system. . . .”

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Transmission Outage Events

“Figure 28 [below] illustrates the relationship between the number of automatic outages per TADS event. All three years, 2008, 2009, and 2010, follow a similar trend. The largest number

of automatic outages per event is fourteen in 2010, thirteen in 2009, and eight in 2008. There are around 70 to 100 events that contain between three and fourteen automatic outages (see below). There are around 330 to 400 events that contain two or more automatic outages. Each of the other events contains only one automatic outage. In the figure, the total number of events in 2008 to 2010 ranged from 3,920 to 4,569 events per year. . .”



Top 500 out of 12,612 events from 2008-2010: • 4,569 events in 2008
 • 3,920 events in 2009
 • 4,123 events in 2010

[Figure 28]

Transmission Outage Modes

. . . The “outage mode code” relates one automatic outage to other automatic outages. The TADS Appendix 7 definition of each outage mode code is provided below:

Single Mode

A single element outage which occurs independently of another automatic outage.

Dependent Mode Initiating

A single element outage that initiates at least one subsequent element automatic outage.

Dependent Mode

An automatic outage of an element which occurred as a result of an initiating outage, whether the initiating outage was an element outage or a non-element outage.

Common Mode

One of at least two automatic outages with the same initiating cause code where the outages are not consequences of each other and occur nearly simultaneously.

Common Mode Initiating

A common mode outage that initiates one or more subsequent automatic outages.

Over 70% of sustained and momentary automatic outages are single mode. This reinforces the long held belief that the majority of all sustained and momentary automatic outages are single mode. However, a significant percent of automatic outages, 29.6% sustained and 22.6% momentary, are in the dependent or common mode family. Based on the design criteria of withstanding single mode outages, the discovery of significant non-single mode outages might be a reliability risk.

An investigation into the root causes of dependent and common mode events which include three or more automatic outages, identified in the 2008 to 2010 data, is a high priority. Some protection systems are designed to trip three or more circuits, but some events go beyond what is designed. In addition, protection system misoperations are associated with a number of multiple outage events.

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A deeper investigation into the root causes of dependent and common mode events which include three or more automatic outages is a high priority. . . .”

Appendix A
TADS Dependent and Common Mode
Automatic Outage Survey
Calendar Years 2008, 2009, 2010 & 2011

1. For calendar year 2008 to 2011 TADS data, please describe the circumstances for each Event ID with three or more Automatic Outages (see Note 1 & 2 at the end of this document). Please provide the TADS “Event Type Number” for each “Event ID” using the TADS 2012 related definitions at the TADSWG website links below. [The link content is no longer DRAFT. It has been approved.]

Using the link below, see pages 3 to 8 and examples on pages 11 to 29.

<http://www.nerc.com/docs/pc/tadswg/DRAFT-TADS Data Reporting Instr Manual with proposed Event Type Numbers v20100510a.pdf>

Also see Section B definitions #15 to #22 in the document below.

<http://www.nerc.com/docs/pc/tadswg/DRAFT-TADS Appendix 7 Definitions with proposed Event Type Numbers v20100510a.pdf>

TADS’ training on the above content was completed during 4th quarter of 2011.

2. For the data your company submitted to TADS which included these Dependent or Common mode outages, which specific Event IDs represent outages that were designed to normally clear three or more circuits for a single fault with Normal Clearing?
 - a. Do you agree that these outages should be classified as “Normal Clearing”?
 - b. Any load loss? If any, how many MWs? Was the loss controlled or uncontrolled? Please specify how many MWs were firm load loss. If not firm load loss, please specify what they were.
3. Is it an appropriate conclusion that once we remove the outages you list in response to (2), above, that the other Event IDs would be the result of abnormal clearing, OR the result of multiple faults on multiple circuits?
 - a. If not, why not?
4. For each Event not included in (2) what were the corrective actions taken (if any) to mitigate a future similar event?
 - a. What are the possible ‘lessons learned’ for others in the industry?

- b. How were the corrective actions determined?
- 5. For Events with an Outage Initiated by Human Error please describe the circumstances.
 - 6. For Events with an Outage Initiated by Failed AC Substation Equipment:
 - a. Which type of equipment failed (circuit breaker, transformer, regulator, reactive device, or others)?

NOTE 1: Please logon to webTADS. Under the 'Reporting' menu you can find an 'Automatic Outage Report' called 'Event Detail'. For your company it will list the Event ID, and in the ninth column the 'Number of Outages' for each Event. For each given Event ID if the 'Number of Outages' is "3" or more, please respond to this survey for each of those Event IDs.

This survey request [02/6/2012] does not include Event IDs with "1" or "2" Number of Outages. Please skip those Event IDs.

NOTE 2: For each of these "Event IDs" with three or more TADS Automatic Outages, if you have already provided all the information above in the form of an EOP disturbance report, PRC mis-operation report, or EAWG report you do not need to complete the above survey for that "Event ID". Instead, please send us a copy of the appropriate reports. We wish to minimize the amount of duplicate information reporting. However, if the existing reports do not cover each of the above topics, please complete the information requested in questions 1 to 6 above.

Thank you!