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## **C-25 RETIRED**

# **Task Force on System Studies**

**May 29, 2019**

### **Procedure to Collect Power System Event Data for Analysis of System Performance**

Approved by the Task Force on System Studies in May 2002  
Task Force on System Protection on May 21, 2001

Revised: September 25, 2007

## 1.0 Purpose

This procedure provides a mechanism to collect power system event data following a power system disturbance for the purpose of analyzing the performance of system components and the dynamic performance of the NPCC **bulk power system**. From time to time planned or unplanned disturbances will occur on the **bulk power system**. These disturbances may have local effects only in proximity to a single facility or they may produce a dynamic response that could provide valuable information on the security and robustness of the **bulk power system**.

This procedure describes the process to collect event data from three time frames; instantaneous, dynamic, and steady state. The data in the first two time frames is recorded by the various types of Disturbance Monitoring Equipment including Dynamic Disturbance Recorders (DDRs), Digital Fault Recorders (DFRs), and Sequence of Event Recorders (SERs). Pre-event data in the steady state time frame can be captured from real time databases.

Dynamic simulations may be desired to study an event by modeling the response of the system and duplicating captured dynamic field recordings. This data would be used to reconstruct the steady state conditions in a power flow model and would be combined with accepted dynamics data to simulate and analyze the event.

A related NPCC document, *C-39 Procedure to Collect Major Disturbance Event Sequence Data*, defines the procedure to collect detailed sequence of events data associated with major disturbances when an ad-hoc regional investigation team has been formed. C-39 focuses on the detailed information provided by DFRs and SERs typically used for the purpose of evaluating **protection system** performance. Standardized forms are included with the procedure for the collection of relevant data.

The relationship between C-25 and C-39 is a function of the nature of the disturbance and the type of information which is required for analysis. Implementation of either or both procedures may be necessary. (Terms in bold typeface are defined in the *NPCC Glossary of Terms (Document A-7)*)

## 2.0 Disturbance Monitoring Equipment

Dynamic Disturbance Recorders (DDRs) record data as RMS values of power system quantities sampled several times per second and collected for a period of time that ranges from 20 seconds to continuous. The power system dynamic phenomena that are examined using DDR data last for many seconds. When

DDR data is requested it will normally be requested from all locations which produced recordings of the event.

Digital Fault Recorders (DFRs) record data as instantaneous values of power system quantities collected many times per cycle for a period of time on the order of seconds. This data is used in the analysis of protection system and circuit breaker operation. When DFR data is requested it will normally be requested for only specific locations in proximity to the events of interest.

Sequence of Event Recorders (SERs) capture data consisting of a list of times of occurrence of station events. Such data is normally best interpreted by the station owner.

### **3.0 Data Request and Notification**

DDR, DFR, SER, and steady state pre-event network data may be requested from the participating Areas and Regions for any power system disturbance. Data Collection Contacts are listed on the NPCC website at <http://www.npcc.org>. A request to obtain captured data is made using the standard request form provided in Appendix A. Requests to capture steady state pre-event data should be made at the same time that the request for dynamic recordings is made, and using the single form provided in Appendix A. The Data Collection Contact Lists identify a single point of contact in each organization or Area that will coordinate all requested data acquisition.

The data request will include the date, time, and a brief description of the event. The description may include an explanation of why the data is being requested. Any additional information pertinent to the event or the request should be attached.

Requests for data capture should be made within the time frames specified in the Data Collection Contact List prior to an anticipated event and as soon as possible following an unanticipated event. Data collected from an event are retained for a period of not less than three (3) years. The data will be supplied as soon as practical and within 30 days of the request.

### **4.0 Eligibility to Request Data**

Any organization involved with **bulk power system** operation, planning, or protection may request event data through this procedure. This will be done through the respective Area or Regional Data Collection Contacts listed on the NPCC website. A data provider may request confirmation of the data request on company letterhead and/or verification by an authorized company official. A data provider shall not unreasonably withhold data.

## **5.0 Real Time Dynamic Recordings**

Real time recordings can be collected from DDRs, DFRs, and SERs. DDR and DFR data are to be exchanged in the IEEE PSRC Comtrade format. Information on the Comtrade format is available in IEEE C37.111-1999, "IEEE Standard for Common Format for Transient Data Exchange (COMTRADE) for Power Systems" or its successor standard. Data files are to be named in conformance with IEEE C37.232 "Recommended Practice for Naming Time Sequence Data Files". If data cannot be converted to COMTRADE, data may be exchanged in other formats upon mutual agreement of the data requestor and the data provider.

## **6.0 Steady State Condition Data Capture**

A data requestor may ask that pre-event system data be captured for a particular event. This is data normally maintained through Energy Management System (EMS) data acquisition. Many modern EMSs have state estimators that execute power flows from telemetered data. These systems provide a convenient means by which to save a power flow case from real time data. All available data that is required to establish a base case power flow model should be provided. The collected data should allow the user to represent a greater level of network detail, at least for the area closely affected by the event. A lesser level of detail may be sufficient for parts of the system remote to the event.

The preferred method for transferring system information is in PTI PSS/E raw data or IEEE common format. NPCC members recognize that not all Areas, within or outside the NPCC Region, have means to transfer data in this form. For this purpose, Appendix B provides a convenient general format for transferring minimum data requirements for preparing a power flow base case. Other data formats, such as raw data from other commercial power flow simulation tools, are acceptable, provided the file format can be made known to the data requestor. If absolutely no common format for electronic data transfer means is available, then the data provider is requested to send information and data in any form available. It may be necessary to bundle dynamics data with the power flow data submitted. The dynamics data should be consistent with the power flow data.

## **7.0 Analysis and Use of Captured Data**

The data collected through this procedure may be used to support individual member, Area, or Regional council initiatives. The data collection process can be initiated independently for DDR, DFR, SER, or steady state network data.

DFR and SER data provided through this procedure may be used to support individual analysis of protection system and circuit breaker operation. In some instances this data will be needed to reconstruct a sequence of events that led to a farther-reaching dynamic response in the interconnected system.

Data capture requests do not necessarily mean that an event reconstruction and analysis will be undertaken. Upon analysis of the dynamic recordings a recommendation may be made for more detailed evaluations through event reconstruction simulations by individual NPCC members, NPCC Task Forces, or NPCC Working Groups.

Areas shall maintain records of recorded information and make reasonable efforts to identify events. Data and analyses derived from Disturbance Monitoring Equipment will be used to develop, maintain, and enhance steady state and dynamic system and equipment models.

The data requestor shall notify the data provider and ask for written consent from the data provider before making other use of the data, or public release of the data.

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Prepared by: Task Force on System Studies

References: *Criteria for Review and Approval of Documents* (Document A-1)

*NPCC Guide for Application of Disturbance Recording Equipment*  
(Document B-26)

*Procedure to Collect Major Disturbance Event Sequence Data*  
(Document C-39)

*NPCC Disturbance Monitoring Equipment (DME) Survey*, installed and planned DME as of September 3, 2004, prepared by the SP-6 Working Group.

*Synchronized Event Data Reporting*, October 27, 2006, prepared by the SP-6 Working Group.

IEEE C37.232, “*IEEE Recommended Practice for Naming Time Sequence Data Files.*” This standard was approved on March 22, 2007.

**Applicable NERC Reliability Standards**

PRC-002-1 – *Define Regional Disturbance Monitoring and Reporting Requirements*, adopted by the NERC Board of Trustees, August 2, 2006; Requirement R4 and Measurement M2.

PRC-018-1 – *Disturbance Monitoring Equipment Installation and Data Reporting*, adopted by the NERC Board of Trustees, August 2, 2006; Requirements R5 and R6 and Measurements M3 and M4.

## Appendix A

### NPCC Data Capture Request Form Collection of Real Time Data for Inter Area Dynamic Analysis

TO: Data Collection Contacts
FROM: <i>Name</i> <i>Title/Department</i> <i>Company</i> <i>Address</i>  <i>Phone</i> <i>FAX Number</i> <i>E-Mail (if available)</i>
DATE: _____
Please provide the requested information for the event as follows:
EVENT DATE: _____
EVENT TIME: _____
<input type="checkbox"/> Check here if this is an anticipated future event such as a staged fault or other such field test.
BRIEF DESCRIPTION: _____
_____
_____
_____
Supply attachment if appropriate.
<input type="checkbox"/> Dynamic Recording Device data (plots/charts etc.)
<input type="checkbox"/> Capture steady state system conditions for pre-event power flow
<input type="checkbox"/> <b>Digital Fault Recorder (DFR)/Sequence of Event Recorder (SER) data</b>

## Appendix B

### Transferring System Data

The most convenient method of transferring power flow data is PTI or IEEE format. For those who cannot organize their system into PTI or IEEE format, use the simple format below. Outages, bus splits, phase shifter settings, and all other changes to the network should be described in clear simple terms.

For those using PTI, it is helpful to zone the network so variable loads can be scaled while not changing constant loads. This simplifies maneuvering the network between load levels.

#### Generation Dispatch

```

      _____ Bus number
    | _____ Unit identifier
    | | _____ Status (1 in service, 0 out of service)
    | | | _____ MegaWatts
    | | | | _____ Optional Comments
    | | | | |
14695 1 1 655 / 19BR 12 345
14697 2 1 355 / 19GRENEC 345
14789 1 0 0 / 19TC 8 S 120
  
```

#### Area Interchange

```

      _____ Area number
    | _____ Area name
    | | _____ Area interchange
    | | |
19 DECO -245
  
```

#### System Load

```

      _____ Area number
    | _____ Total area load MW
    | | _____ Total area load MX
    | | |
19 8403 1952
  
```