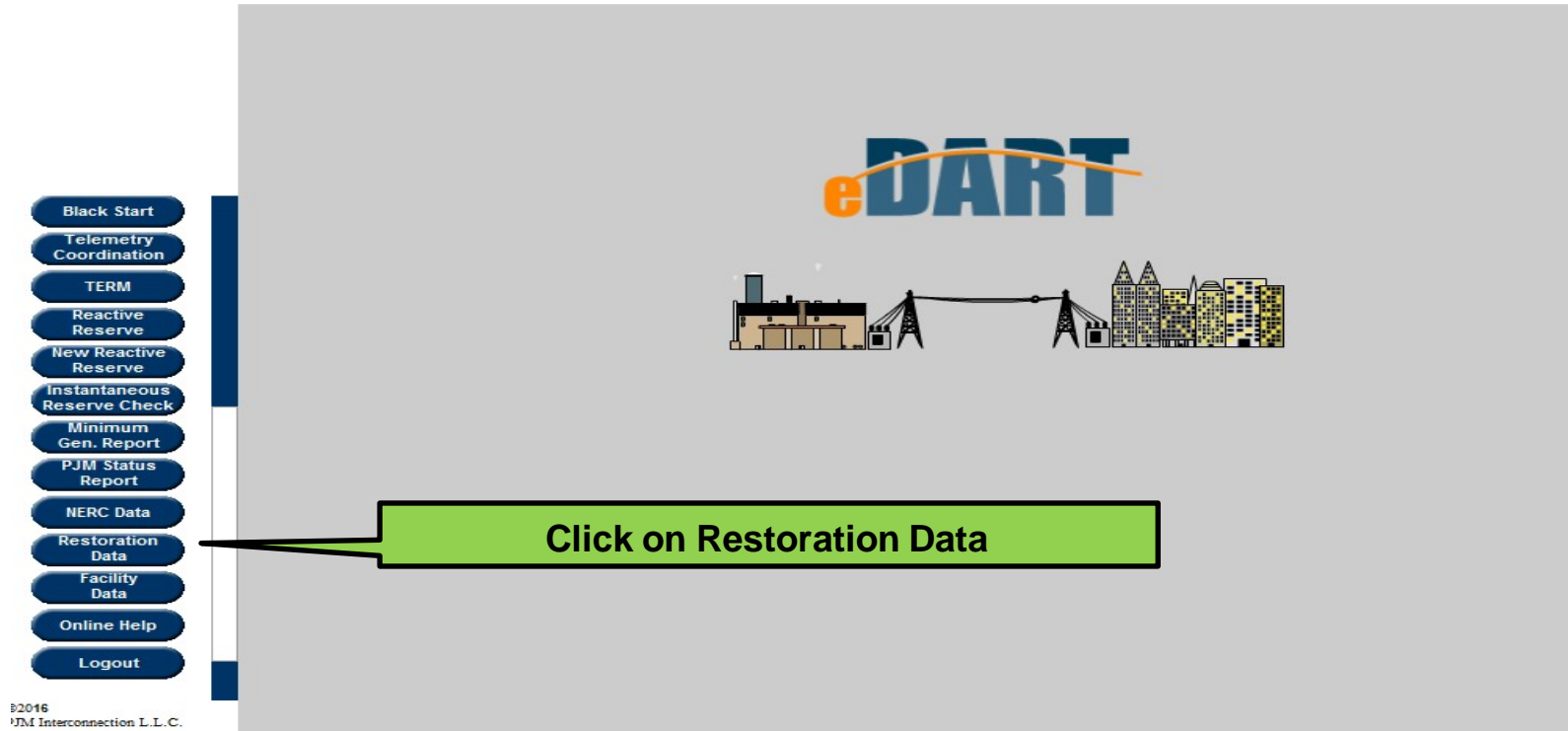


# eDART System Restoration



- PJM may initialize a drill for one or multiple control areas
- PJM may initialize a drill for one or many types of transmission equipment
- Each transmission company able to view restored equipment of other transmission companies that are participating in the drill but they are not able to restore equipment that they do not own
- Each transmission company able to restore transmission equipment that they own



Black Start

Telemetry Coordination

TERM

Reactive Reserve

New Reactive Reserve

Instantaneous Reserve Check

Minimum Gen. Report

PJM Status Report

NERC Data

Restoration Data

Facility Data

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**Click on Restoration Data**

**eDART**

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Gen. Tickets

Trans. Tickets

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Current Drill

Reports

“Current Drill” button present only if a System Restoration Drill is in progress.

Click on Reports to view the list of completed restoration drills

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4

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**Company Ongoing Restoration Report**

User Name: Initial Timestamp: 02/28/2016 07:36 Company:  

		Voltage	Equipment Name	Restoration Timestamp	Restore	OverWrite
1						
		115 KV	Test Transformer 1		<input type="checkbox"/>	
		115 KV	Test Transformer 1		<input type="checkbox"/>	
		230 KV	Test Transformer 2		<input type="checkbox"/>	
XFMR	STATION 2	230 KV	Test Transformer 2		<input type="checkbox"/>	
XFMR	STATION 3	500 KV	Test Transformer 3		<input type="checkbox"/>	
XFMR	STATION 3	500 KV	Test Transformer 3		<input type="checkbox"/>	
XFMR	STATION 4	115 KV	Test Transformer 4		<input type="checkbox"/>	
XFMR	STATION 4	115 KV	Test Transformer 4		<input type="checkbox"/>	
XFMR	STATION 4	115 KV	Test Transformer 4		<input type="checkbox"/>	
XFMR	STATION 4	115 KV	Test Transformer 4		<input type="checkbox"/>	
XFMR	STATION 5	115 KV	Test Transformer 5		<input type="checkbox"/>	
XFMR	STATION 5	115 KV	Test Transformer 5		<input type="checkbox"/>	
LINE	STATION 6	230 KV	Test Line 1		<input type="checkbox"/>	
LINE	STATION 6	230 KV	Test Line 3	02/28/2016 10:08	<input checked="" type="checkbox"/>	<input type="checkbox"/>
LINE	STATION 6	230 KV	Test Line 2			
XFMR	STATION 7	115 KV	Test Transformer 6			

Reporting Company  
Ongoing Restoration  
Report

Yellow highlight indicates equipment that was returned to service, and then removed from service again.

- User may check the **Restore** checkbox and click **Submit** button to restore equipment.
  - Timestamp will be automatically populated.
  - **Overwrite** checkbox will appear automatically.

Type	Station	Voltage	Equipment Name	Restoration Timestamp	Restore	OverWrite
XFMR	STATION 1	115 KV	TEST TRANSFORMER 1		<input type="checkbox"/>	
XFMR	STATION 1	115 KV	TEST TRANSFORMER 2		<input type="checkbox"/>	

[Submit Form](#)
[Select All](#)
[Refresh](#)
[Help](#)
[Main Menu](#)

Type	Station	Voltage	Equipment Name	Restoration Timestamp	Restore	OverWrite
XFMR	STATION 1	115 KV	TEST TRANSFORMER 1	11/08/2016 12:46	<input checked="" type="checkbox"/>	<input type="checkbox"/>
XFMR	STATION 1	115 KV	TEST TRANSFORMER 2		<input type="checkbox"/>	

[Submit Form](#)
[Select All](#)
[Refresh](#)
[Help](#)
[Main Menu](#)

- Once equipment is restored, user may overwrite timestamp by checking the **Overwrite** checkbox and clicking **Submit**.
  - Timestamp will be overwritten to current time.
  - Restored checkbox will be checked.
  - Overwrite checkbox will be unchecked

Type	Station	Voltage	Equipment Name	Restoration Timestamp	Restore	OverWrite
XFMR	STATION 1	115 KV	TEST TRANSFORMER 1	11/08/2016 12:46	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
XFMR	STATION 1	115 KV	TEST TRANSFORMER 2		<input type="checkbox"/>	<input type="checkbox"/>

[Submit Form](#)
[Select All](#)
[Refresh](#)
[Help](#)
[Main Menu](#)

Type	Station	Voltage	Equipment Name	Restoration Timestamp	Restore	OverWrite
XFMR	STATION 1	115 KV	TEST TRANSFORMER 1	11/08/2016 12:56	<input checked="" type="checkbox"/>	<input type="checkbox"/>
XFMR	STATION 1	115 KV	TEST TRANSFORMER 2		<input type="checkbox"/>	<input type="checkbox"/>

[Submit Form](#)
[Select All](#)
[Refresh](#)
[Help](#)
[Main Menu](#)

- Once equipment is restored, user may un-restore equipment by unchecking **Restore** and **Overwrite** checkboxes.
- User may also uncheck **Restore** checkbox and check **Overwrite** checkbox to restore equipment.

XFMR	STATION 1	115 KV	TEST TRANSFORMER 1		<input type="checkbox"/>	
XFMR	STATION 1	115 KV	TEST TRANSFORMER 2		<input type="checkbox"/>	

[Submit Form](#)
[Select All](#)
[Refresh](#)
[Help](#)
[Main Menu](#)

- More information on restoring, overwriting and un-restoring equipment may be found by selecting **Help**.

**Company Ongoing Restoration Report**

User Name: Initial Timestamp: 02/28/2016 07:36 Company: PJM TEST

Go To Filter Refresh Apply Filter

Type	Station	Voltage	Equipment Name	Restoration Timestamp	Restore
1					
LINE	STATION 1	138 KV	TEST TRANSFORMER 1		<input type="checkbox"/>
LINE	STATION 1	138 KV	TEST TRANSFORMER 2		<input type="checkbox"/>
LINE	STATION 1	230 KV	TEST TRANSFORMER 3		<input type="checkbox"/>

Submit Form Select All Refresh **Help** Main Menu

**Restoration Data Help**

**How to Restore, Unrestore and Overwrite Timestamps for Equipment**

To place a piece of equipment back in service check "Restore" box

**Restore**  
☒

To update the "Restoration Timestamp" to the current time check "Restore" and "Overwrite Timestamp" boxes

**Restoration Timestamp** **Restore** **Overwrite Timestamp**  
10/12/2003 15:47 ☒ ☒

To place a piece of equipment back out of service uncheck "Restore" box

**Restore**  
☐

**Close Window**

- User may view completed drills by clicking on the **Reports** button from Main Menu.



- User will be allowed to view reports for other companies

Black Start

Telemetry Coordination

TERM

Reactive Reserve

New Reactive Reserve

Instantaneous Reserve C

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Restoration Data Report

Drill ID	Initial Timestamp	Completed Timestamp
<a href="#">45</a>	05/09/2015 14:43	05/09/2015 16:59
<a href="#">25</a>	05/09/2015 14:29	05/09/2015 14:38
<a href="#">5</a>	04/12/2015 10:24	04/12/2015 10:26
<a href="#">4</a>	04/26/2015 07:39	04/12/2015 09:24
<a href="#">3</a>	07/22/2015 14:48	04/26/2015 07:37
<a href="#">2</a>	03/15/2015 16:22	03/15/2015 16:23
<a href="#">1</a>	10/03/2015 11:25	03/15/2015 16:22

Back

Click on Previous drill ID #

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## Completed Restoration Report

Drill ID:
Initial Timestamp: 05/09/2015 14:43

Company: TEST COMPANY
Completed Timestamp: 05/09/2015 16:59

Go To Filter
Apply Filter

1	Type	Station	Voltage	Equipment Name	Restoration Timestamp
	XFMR	STATION 1	230 KV	TEST TRANSFORMER	
	XFMR	STATION 2	230 KV	TEST TRANSFORMER 1	
	XFMR	STATION 3	500 KV	TEST TRANSFORMER 1	
	XFMR	STATION 3	500 KV	TEST TRANSFORMER 2	
	XFMR	STATION 4	115 KV	TEST TRANSFORMER 1	
	XFMR	STATION 4	115 KV	TEST TRANSFORMER 1	
	XFMR	STATION 4	115 KV	TEST TRANSFORMER 1	
	XFMR	STATION 4	115 KV	TEST TRANSFORMER 1	
	XFMR	STATION 4	115 KV	TEST TRANSFORMER 1	
	XFMR	STATION 4	115 KV	TEST TRANSFORMER 1	

Select company you would like to view.

Select Go to Filter to filter by more options.

By default, the reports are sorted by Type. To sort by a different field, place a 1 above it and select Apply Filter.



- User can filter list of completed drills by company equipment and drill dates.
- Select **Submit Form** after desired filtering criteria have been entered.



**Restoration Report Filter**

**Company:**  
Test Company ▼

**Type:** ▼ **Station:** ▼ **Voltage:** ▼ **Equipment:** ▼

**From:**  **To:**

Date (mm/dd/yyyy) Hour (hh24:mi) Date (mm/dd/yyyy) Hour (hh24:mi)

**Submit Form** **Back**

> CAM

> eData

> EES

> eFTR

> eMKT

> eMTR

> eRPM

> eSchedules

> eSuite Messages

> Load Response

> eLRS

> MSRS

> OASIS

Non - eSuite Tools

> eDART

> eGADS

> eFuel

> RPM-ACR

Network Model

Telemetry Coordination

TERM

Reactive Reserve

Instantaneous Reserve Check

Minimum

Completed Restoration Report

Drill ID: 45

Company: TEST COMPANY

Initial Timestamp: 05/09/2015 14:43

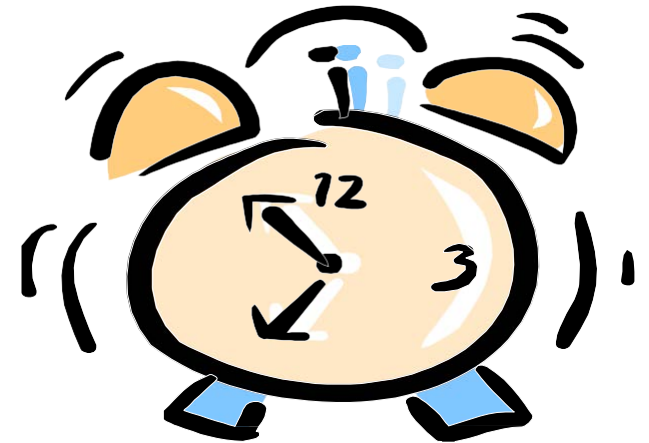
Completed Timestamp: 05/09/2015 16:59

Go To Filter

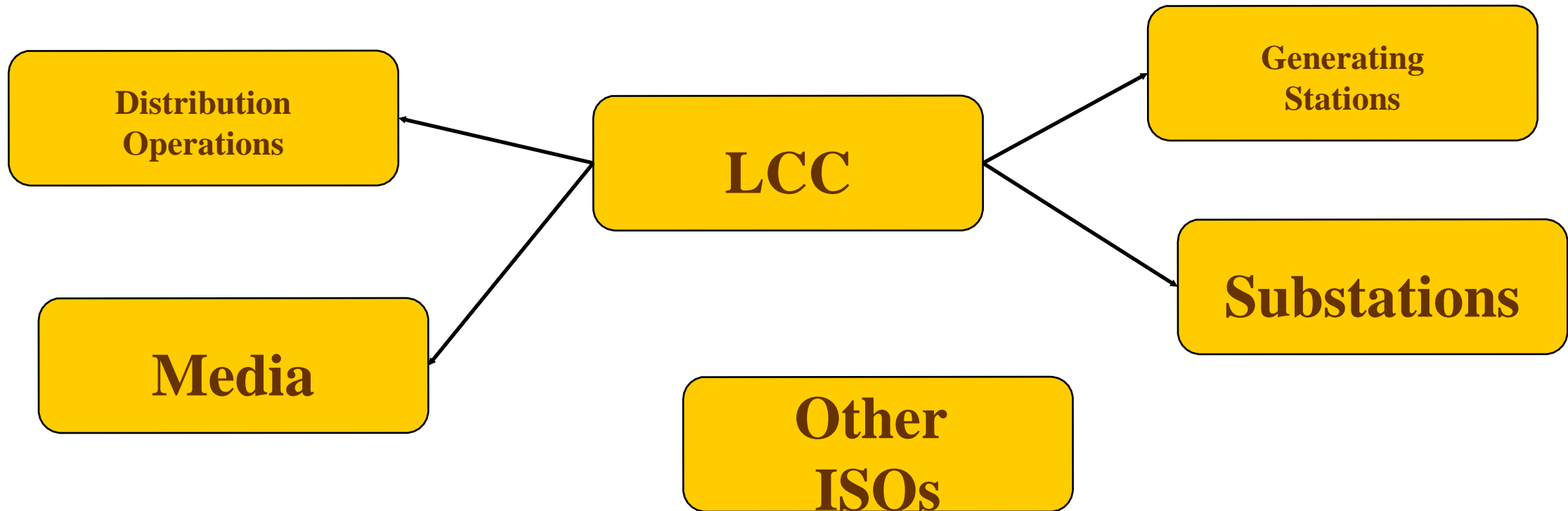
Type	Station	Voltage	Equipment Name	Restoration Timestamp
XFMR	STATION 1	230 KV	TEST TRANSFORMER 1	05/09/2015 14:44
XFMR	STATION 1	230 KV	TEST TRANSFORMER 2	05/09/2015 14:44
LINE	STATION 1	230 KV	TEST LINE 1	05/09/2015 14:47
LINE	STATION 1	230 KV	TEST LINE 2	05/09/2015 14:44
BRKR	STATION 1	230 KV	TEST BREAKER 1	05/09/2015 14:44
BRKR	STATION 1	230 KV	TEST BREAKER 2	05/09/2015 14:44
BRKR	STATION 1	230 KV	TEST BREAKER 3	05/09/2015 14:44
BRKR	STATION 1	230 KV	TEST BREAKER 4	05/09/2015 14:44
BRKR	STATION 1	230 KV	TEST BREAKER 5	05/09/2015 14:47
BRKR	STATION 1	230 KV	TEST BREAKER 6	05/09/2015 14:47
BRKR	STATION 1	230 KV	TEST BREAKER 7	
BRKR	STATION 1	230 KV	TEST BREAKER 8	
BRKR	STATION 1	230 KV	TEST DISCONNECT 1	
BRKR	STATION 1	230 KV	TEST DISCONNECT 2	
BRKR	STATION 1	230 KV	TEST DISCONNECT 3	
BRKR	STATION 1	230 KV	TEST DISCONNECT 4	
BRKR	STATION 1	230 KV	TEST DISCONNECT 5	
BRKR	STATION 1	230 KV	TEST DISCONNECT 6	
BRKR	STATION 1	115 KV	TEST LINE 3	
BRKR	STATION 1	115 KV	TEST LINE 4	
BRKR	STATION 1	115 KV	TEST LINE 5	
BRKR	STATION 1	115 KV	TEST BREAKER 9	
BRKR	STATION 1	115 KV	TEST BREAKER 10	
BRKR	STATION 1	115 KV	TEST BREAKER 11	
BRKR	STATION 1	115 KV	TEST DISCONNECT 7	
BRKR	STATION 1	115 KV	TEST DISCONNECT 8	
BRKR	STATION 1	115 KV	TEST DISCONNECT 9	
BRKR	STATION 1	115 KV	TEST DISCONNECT 10	
BRKR	STATION 1	115 KV	TEST DISCONNECT 11	
BRKR	STATION 1	115 KV	TEST TRANSFORMER 1	
BRKR	STATION 1	115 KV	TEST TRANSFORMER 2	
BRKR	STATION 1	115 KV	TEST TRANSFORMER 3	

Restoration Timestamp will be populated for each piece of equipment that was restored in the selected drill

- System Restoration Drills conducted twice a year (Spring and Fall).
- Various drill scenarios incorporated
  - Partial Blackout
  - Complete Blackout
- Drills range from 8 to 16 hours.



- You are encouraged to involve as many as possible in System Restoration Drills



- Differences in Real-time Restoration
  - EMS updates to Transmission and Generation Data.
  - More unexpected events
    - Equipment failures
    - High voltage
    - Frequency collapse
    - Overloads (No analysis programs)
  - Restoration time WILL be longer than in drills.
    - Personnel to substations, CTs



## Disclaimer:

PJM has made all efforts possible to accurately document all information in this presentation. The information seen here does not supersede the PJM Operating Agreement or the PJM Tariff both of which can be found by accessing:

<http://www.pjm.com/documents/agreements>

For additional detailed information on any topics discussed, please refer to the appropriate PJM Manual which can be found by accessing

<http://www.pjm.com/documents/manuals.aspx>

- PJM Manual 36 – System Restoration
- NERC Operating Committee Electric System Restoration Reference Document
- NERC Operating Standard EOP-005