

# **Transmission ITP**

## **Equipment Outages**

**PJM State & Member Training Dept.**

# Objectives



At the end of this presentation the Learner will be able to:

- Identify how weather may influence outage planning
- Explain how to communicate a transmission equipment outage request to PJM
- Describe the Network Model to Transmission Outage Ticket Linkage process and requirements
- Explain how to modify outage requests with PJM
- Coordinate operations with neighboring systems and PJM
- Explain the notification and coordination requirements, given a real-time outage

# Agenda



- Outage Planning and Weather
- Outage Reporting Guidelines
- eDART
- Communications and Notifications

# Outage Planning and Weather

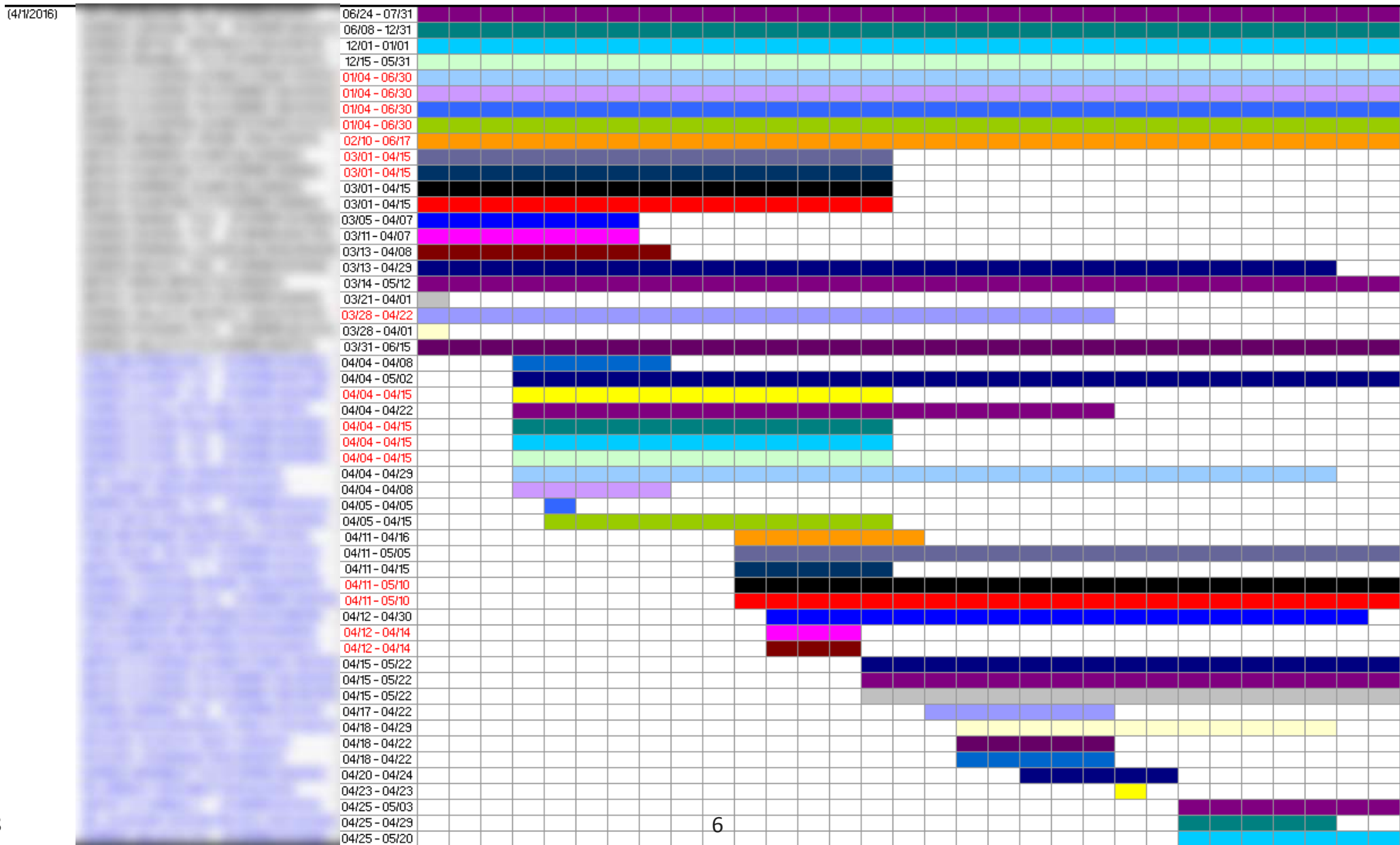
## *Considerations:*

- Projected load levels for the day
  - PJM has guidelines for outages during peak load periods
    - Outages that could have an adverse impact to reliability should be shifted to the shoulder months (i.e., spring and fall)
- Severe Weather
  - There is a risk of losing additional facilities that could cause overloads on the system when combined with a maintenance outage

# Seasonal Impacts

- Pushing outages to the shoulder months has other impacts
  - Numerous outages now fighting for a spot in an already full schedule
  - More coordination is required to ensure there are no conflicting outages (outages that should not occur at the same time)
  - Reliability of the system still has to be maintained
    - Some outages may be at risk to be cancelled
  - Generation outages also typically occur during this time of year
    - This may cause additional conflicts

# Seasonal Impacts (500 & 765kV example)



# Agenda



- Outage planning and Weather
- Outage Reporting Guidelines
- eDART
- Communications and Notifications

# Outage Reporting Guidelines

## Peak Period Outage Scheduling Guidelines

- Transmission owners should avoid scheduling any outage\*:
  - In excess of 5 days in duration with a restoration time greater than 72 hours
- The peak periods are defined as:
  - Occurs from the 24th Wednesday of the calendar year through the 36th Wednesday of the same year

**\*these may result in increased risk to system reliability during peak summer and winter periods**



# Outage Reporting Guidelines

- Peak Period Outage Scheduling Guidelines (con't)
  - These outages include those that may result in:
    - Actual or post-contingency thermal or voltage issues with insufficient generation for control
    - Constraints that are load sensitive with limited controlling actions
    - Stability issues or bottled generation

# Outage Reporting Guidelines

- Peak Period Outage Scheduling Guidelines (*con't*)
  - Transmission owners shall screen for peak period outages prior to submittal in eDART and look to reschedule during shoulder months
    - The transmission owners are encouraged to schedule non-impactful outages during peak seasons
  - PJM shall screen for peak period outages when performing outage analysis
  - PJM may grant exception to ensure RTEP upgrades are installed within specified timeframes or as special circumstances warrant

# Outage Reporting Guidelines

- Coordinating Outage Requests with Planned Nuclear Generation Outages
  - When a Transmission Owner submits an Outage Request that will open a Nuclear Generating Station's Unit Breaker the following guidelines shall be observed:
    - All Nuclear Unit breaker Outage Requests shall be coordinated closely with the Nuclear Station to coincide with a Unit outage
    - In the case that the Outage Request cannot be delayed until the next Unit Outage, the Nuclear station should be given at least six weeks notice
      - The schedule for opening the Unit Breaker must be closely coordinated with the station
      - The length of time that the breaker remains open should be minimized
    - PJM will work with the Nuclear Station's and the Transmission Owner's outage needs

# Outage Reporting Guidelines *(Con't)*

- Coordinating Outage Requests with Planned Nuclear Generation Outages
  - The Nuclear Generating Stations coordinate the scheduling of a Unit Breaker outage and internal plant equipment outages and testing to minimize station risk
    - Adherence to outage schedule and duration is critical to the plant during these evolutions
    - Any emergent plant or transmission system conditions may require schedule adjustments, which should be minimized
    - Any change to the outage schedule that impacts the Unit Breakers shall be communicated to the nuclear generator operator

# Outage Reporting Guidelines

- Outages for Relay Protection

- An outage or degradation of either the primary or back-up relay protection associated with any facility 345 kV and above
  - When there is an outage of the primary relay, indicate the back-up clearing time if it is different from the primary time
- An outage or degradation of other primary relay protection associated with any lower voltage facility near generating plants with stability issue
- An outage of any other major relay protection scheme significant to EHV operation
- An outage of an automatic recloser protection associated with an EHV circuit 345 kV and above, or any hotline work (reclosers in or out) on EHV facilities 345 kV and above
  - PJM dispatcher is informed prior to auto-reclosers being taken out of service
  - All unplanned outages shall be communicated to PJM Dispatch and submitted via eDART

# Outage Reporting Requirements

- Transmission owners:
  - Shall submit tentative dates of all planned transmission outages of reportable transmission facilities as far as in advance as possible
  - Reasonable effort to submit one year in advance
- Transmission Owners are required to provide notice of all transmission outages:
  - Prior to the first day of the month, preceding the month of the outage
- Transmission Owners are also required to report “Hot Line Work” performed on facilities 345 kV and above

# Hot Line / In-Service Work

- Why do In-service Work?
  - Reliability
  - Economics
- Type of In-service Work
  - Relay calibrations
  - Relay carrier/transfer trip test
  - Hot line work
  - Restrictions preventing auto-reclosure
- Operator Concerns
  - Increased probability of tripping
  - Awareness of work in area

# On Time Rules – 4 “Buckets”

- Hotline Ticket Rule (Bucket 1): Transmission Owners are required to
  - Provide notice of all hotline transmission work, five days or less, by 0800 three days **prior to** the start of the outage (345kV and above)

Hotline work starting on March 16<sup>th</sup> must be submitted by 07:59 on March 13<sup>th</sup> to be on time

On Time						5 day or less hotline transmission work		
Wed March 11th	Thurs March 12th	Fri March 13th	Sat March 14th	Sun March 15th	Mon March 16th	Tues March 17th	Wed March 18th	Thurs March 19th



# On Time Rules – 4 “Buckets”

- 1-Month Rule (Bucket 2): Transmission Owners are required to
  - Provide notice of all transmission outages, five days or less, *prior to* the first day of the month preceding the month of the outage

A 5-day outage starting in June must be submitted by 23:59 on April 31 to be on time

On Time					5-day outage							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan

# On Time Rules – 4 “Buckets”

- 6-Month Rule (Bucket 3): The TO is required to
  - Submit all outage requests in excess of 5 days in duration, **prior to** the 1st of the month, six months in advance of the start of the outage
- If a 6-day outage begins in October, the outage must be submitted by 23:59 on March 31 to be on time

On Time										6-day outage		
Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

# On Time Rules – 4 “Buckets”

- 30-Day Rule (Bucket 4): Outages scheduled for
  - The following Planning year (i.e. June 1 – May 31), exceeding 30 days in duration
    - Submitted via eDART *prior to* February 1 for use in the annual FTR auction, unless the 6-month rule is more restrictive

# On Time Rules – 4 “Buckets”

## Example 1:

- An outage greater than 30 days starts in September. It must be submitted by:

6-month rule: Must be submitted by February 29 @ 23:59

On Time		1	2	3	4	5	6	30+ Day	Outage			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan

30-day rule: Must be submitted by January 31 @ 23:59

On Time								30+ Day	Outage			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan

- Since the 30-day rule is more conservative, it applies

# On Time Rules – 4 “Buckets”

## Example 2:

- An outage greater than 30 days starts in July. It must be submitted by:

**6 month rule: December 31 of the year prior @ 2359**

On Time	1	2	3	4	5	6	30+ Day	Outage				
Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

**30 day rule: January 31 @ 2359**

	On Time						30+ Day	Outage				
Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

- Since the 6 month rule is more conservative, it applies

# Late Transmission Tickets

If a ticket was submitted “late,” reviewing the ticket will show that a comment is now displayed with the date/time the ticket should have been submitted to have been considered on time

Review/Revise Transmission Ticket

User: studenttrans90 Company: SBT Trans Comp 0 Status: Submitted Ticket ID: 69176

Company Ticket ID:

RTEP Queue #:

Ticket Start

05/18/2015 13:00

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

Ticket End

05/22/2015 23:59

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

Switch Date

05/18/2015 13:00

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

Change Dates

Location/Description of Work (4000 char. max)

Replacing the conductor of the AMUS-ASH1 230 kVline

PJM Comments

Mitigated Comments

Information/Hotline Work

Emergency

Vegetation Trip

Cut In

Direct Billing

Direct Billing Decline

Potentially Incomplete: No

At Risk: No

Congestion Expected: No

Submitted On-Time: No

Market Sensitive: No

Automatic Re-Close: No

Mitigated: N/A

Cause

Inspection/Maintenance

Install Antenna

LA Replace/Repair

NERC Alert

NERC Alert - Emergency

NERC Alert - Near Term

New Construction

Normally Open

Other

Overhaul Tap Changer

Relay Maintenance (Impact to primary clearing)

Relay Maintenance (No impact to primary clearing)

Relay Replacement (Impact to primary clearing)

Relay Replacement (No impact to primary clearing)

Repair/Replace Conductor

Ticket History

	TimeStamp	Usr. Name
Submitted	05/18/2015 10:12	studenttrans90
Received		
Approval		
Latest Revision		

Ticket was Submitted at 05/18/2015 10:12. For outages starting at 05/18/2015 13:00, the ticket needs to be submitted by 04/01/2015 00:00.

Outage Type

Continuous

Availability

Duration

Restoration Plan Review Needed

N/A

PJM©2018

22

7/10/2018

# Agenda



- Outage planning and Weather
- Outage Reporting Guidelines
- eDART
- Communications and Notifications

# eDART

- eDART stands for **E**lectric **D**ispatcher **A**pplications and **R**eporting **T**ool
  - eDART is an internet tool for submitting Generation and Transmission operations and planning data to PJM and retrieving operations data from PJM



# Creating a Transmission Ticket

- Creating a New Transmission Outage Ticket - Business Rules
  - Ticket Start Date/Time must be prior to Ticket End Date/Time
  - Ticket must be submitted a minimum of 3 business days in advance of Ticket Start Date
    - Unless Emergency
  - Equipment Start and End Date/Time must be within Ticket Start and End Date/Time



# Creating a Transmission Ticket

New Transmission Ticket

User: studenttrans34 Company: SBT Trans Comp 0

Company Ticket ID:

RTEP Queue #:

Ticket Start

08/01/2016

08:00

Ticket End

08/05/2016

16:00

Switch Date

08/01/2016

08:00

Date (mm/dd/yyyy)

Hour (hh24:mi)

Date (mm/dd/yyyy)

Hour (hh24:mi)

Date (mm/dd/yyyy)

Hour (hh24:mi)

Location/Description of Work (4000 char. max)

Information/Hotline Work

Emergency

Vegetation Trip

Cut In

Direct Billing

Direct Billing Decline

Cause

Add SF-6 Gas

C.B. Overhaul

C.B. Replacement

CB Maintenance

Cable Repair

Contingency Planning

Cut-in

Outage Type

Continuous

Availability

Duration

Restoration Plan Review Needed

N/A

Add to Project

Type

LINE

Station Name

BEAVER

Voltage

69 KV

Equipment Name

BEAVER-POOL

Tier 1

Tier 2

Tier 3

Generate

Add Equipment

Station Equip.

Submit Form

View Conflicts

Gen Off Conflicts

Main Menu

Default Status Change Only	Primary	Status	Include	Type	Station Name	Voltage	Equipment Name	Start Date	Start Hour	End Date	End Hour	Resulting Default Status
No		O	Yes	LINE	BEAVER	69 KV	BEAVER-POOL	08/01/2016	08:00	08/05/2016	16:00	No Change
No		O	Yes	BRKR	POOL	69 KV	POOL CB 4	08/01/2016	08:00	08/05/2016	16:00	No Change
No		O	Yes	BRKR	BEAVER	69 KV	BEAVER CB 3	08/01/2016	08:00	08/05/2016	16:00	No Change
No		O	Yes	BRKR	BEAVER	69 KV	BEAVER CB 1	08/01/2016	08:00	08/05/2016	16:00	No Change

# Creating a Transmission Ticket

- Location/Description of Work
  - Location of main work
    - i.e., KEENEY 51 TR or TMI-HOSENSACK 5026 line
  - Brief description of work
    - i.e., Overhaul, Relay Work, Repair, Line Work
  - Switching
    - Identify the word “SWITCHING”
    - List CBs or equipment that will be off for switching and approximate duration
      - i.e., Keeney ring CBS 240, 241 open 30 min for switching
    - If switching will last more than 1 hour, it is required to detail the switching instructions in the equipment list

# Creating a Transmission Ticket

- Informational/Hotline Work: Work is being performed on selected equipment, however that equipment remains energized
  - Breaker clearances not required
- Emergency: Outage due to equipment problem or tripping and must be taken immediately
  - 3 day notice NOT required for emergency job
- Vegetation Trip: If outage was a tripping caused by tree contact, this checkbox must be checked
  - These are reported to NERC

# Creating a Transmission Ticket

- Cut In: Energization of a new facility
- Direct Billing:
  - TO will pay for the localized generator controlling actions
- Direct Billing Decline:
  - TO will not pay for the localized generator controlling actions, but the late RTEP outage cannot be rescheduled

# Creating a Transmission Ticket

- Outage Type: Indicates when work will be performed on equipment
  - Selectable from: Daily (including weekends), Daily (no weekends), Daily (weekends only), Continuous, Continuous (no weekends), EMS Tripped
- Availability: Time period from when equipment is requested to go back in service to when it is energized
  - Selectable from: Immediate, 30 min, 1 hr, 2 hr, 4 hr, 8 hr, Duration, 24 hr, 48 hr, or 72 hr

# Creating a Transmission Ticket

- Circuit Breaker Tiers

- A Tier is defined as a “level” of CB or disconnect clearance for a piece of equipment
- All CB or disconnect clearance points for an outage must be defined on the outage ticket
  - Tier selection helps accomplish this
- Each outage ticket is referenced by a “Primary” piece of equipment
  - Tier CB and disconnects are associated with primary equipment
  - Important: Lines are listed by the first (alphabetical) Station Name

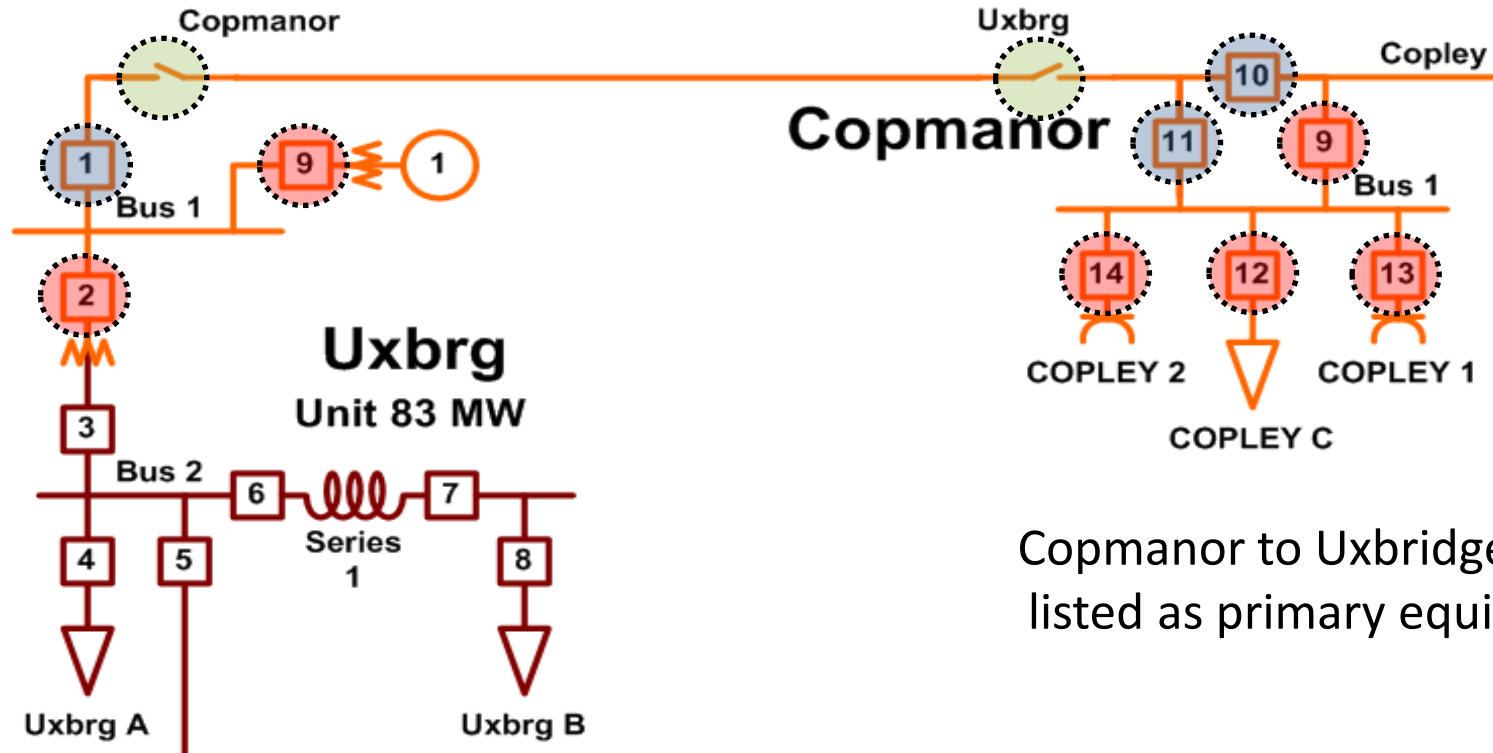
# Creating a Transmission Ticket

- Circuit Breaker Tiers
  - Used to quickly retrieve clearance points (CBs or Disconnects)
  - Limitations on tiers
    - Available for all equipment EXCEPT Busses
    - Will not get clearance points beyond local substations at each end of line
    - Will not get clearance points at voltage levels other than that of the selected line



# Creating a Transmission Ticket

## Tier Example



Copmanor to Uxbridge line is listed as primary equipment

Tier 1 shaded green

Tier 2 shaded blue (includes tier 1)

Tier 3 shaded red (includes tier 1 and 2)

# Creating a Transmission Ticket

- Bus Outages

- No busses modeled explicitly in PJM EMS
- List breakers that will be open associated with bus
  - Can use tiers to accomplish this quickly
- Mention BUS outage in Description of Work
- Only list associated equipment (lines, transformers) if they are outaged due to bus outage

# Creating a Transmission Ticket

- Bus Outages
  - Request outage of Plymouth Meeting #3 bus
  - Lines remain energized from remote end
    - The lines will still be included on the ticket



# Importance of Checking Cut-In Checkbox

- Additional focus also being made to ensure the following values have been implemented before allowing energization of cut-in equipment
  - Thermal Ratings
  - Impedances
  - Contingency Definitions
  - Telemetry
  - Congestion Priority
- If identified later in a PJM analysis that a ticket should have been marked as cut-in, there could be approval/energization delays

**New R, X, B Adjustment Request**

User: deloar Company:

Type:  Station Name:  Voltage: 230 KV Equipment Name:

	R (p/u, 100MVA Base)	X (p/u, 100MVA Base)	B (p/u Total)
Initial	0.0042	0.03934	0.0774
New	0.0042	0.03934	0.0774
% Difference	0%	0%	0%

Comments:

**Transmission Facilities**

The following lists identify facilities by transmission owner. The lists specify a limited set of attributes associated with a given facility, providing an overview of whether and how the facility is managed by PJM as part of regional and interregional operations.

[Transmission Facilities Online Help](#) [PDF](#)

<a href="#">AE (XLS)</a>	<a href="#">DAYEDC (XLS)</a>	<a href="#">PE (XLS)</a>
last updated on 12.22.2015	last updated on 12.22.2015	last updated on 12.22.2015
<a href="#">AEPST (XLS)</a>	<a href="#">DEOHIO (XLS)</a>	<a href="#">PEPCO (XLS)</a>
last updated on 12.22.2015	last updated on 12.22.2015	last updated on 12.22.2015
<a href="#">AP_CA (XLS)</a>	<a href="#">DLCO (XLS)</a>	<a href="#">PPL (XLS)</a>
last updated on 12.22.2015	last updated on 12.22.2015	last updated on 12.22.2015
<a href="#">ATSI (XLS)</a>	<a href="#">DOMEDC (XLS)</a>	<a href="#">PSEG (XLS)</a>
last updated on 12.22.2015	last updated on 12.22.2015	last updated on 12.22.2015
<a href="#">BC (XLS)</a>	<a href="#">DPL (XLS)</a>	<a href="#">RECO (XLS)</a>
last updated on 12.22.2015	last updated on 12.22.2015	last updated on 12.22.2015
<a href="#">COMED (XLS)</a>	<a href="#">EKPC (XLS)</a>	<a href="#">ROCHTX (XLS)</a>
last updated on 12.22.2015	last updated on 12.22.2015	last updated on 12.22.2015
<a href="#">CPU (XLS)</a>	<a href="#">GPU (XLS)</a>	<a href="#">UGI-UI (XLS)</a>
last updated on 12.22.2015	last updated on 12.22.2015	last updated on 12.22.2015

If you have any questions about the transmission facilities list, please contact [Customer Service](#) at 610-666-8980.

**New TERM Ticket**

User: deloar Company: Company Ticket ID:

Reason for Changes:

Comments:

Type:  Station Name:  Voltage:  Equipment Name:  End:

Temp	Normal		Long Term		Short Term		Load Dump	
	Day	Night	Day	Night	Day	Night	Day	Night
66								
66								
77								
68								
69								
80								
41								
32								

Impedance: R =  X =

Congestion Mngt. Priority:

# Linking Network Model Requests to Transmission Outage Tickets

## Transmission Ticket View (Linking Network Model Requests to Trans. Tickets)

**Network Model Request/Cut-In Ticket Report**

☐ Network Model View ☒ Transmission Ticket View

Company: **Electric Company**

Occurring During: From: 04/06/2016 To: 10/06/2016  
(MM/DD/YYYY) (MM/DD/YYYY)

☒ Cut-In Tickets Only  
☐ Missing Network Model Request

Ticket Status: Submitted ☒ Received ☒ Denied ☐ Approved ☒ Cancelled by Company ☐ Cancelled by PJM ☐ Revised ☒ Active ☒ Completed ☐

[Apply Filter](#) [Clear Filter](#) [Main Menu](#)

Ticket ID	Ticket Status	Company	RTEP#	Station	Voltage	Equipment	Description	Start Date	End Date	Latest Update	Network Model Request(s)								
<a href="#">66725</a>	Submitted	Electric Company		123BLUES,COLORS	230 KV	123-COL,DUM123,DIS1232		08/01/2016 09:00	09/01/2016 09:00	08/10/2015 15:16	<table border="1"><thead><tr><th>Remove</th><th>Request</th><th>RTEP#</th><th>Status</th></tr></thead><tbody><tr><td><input type="checkbox"/></td><td><a href="#">4246</a></td><td></td><td>Modeled</td></tr></tbody></table> <a href="#">Add</a>	Remove	Request	RTEP#	Status	<input type="checkbox"/>	<a href="#">4246</a>		Modeled
Remove	Request	RTEP#	Status																
<input type="checkbox"/>	<a href="#">4246</a>		Modeled																
<a href="#">66486</a>	Submitted	Electric Company		0234GRAY	69 KV	12T		05/13/2016 11:11	05/28/2016 11:11	04/17/2015 11:59	<table border="1"><thead><tr><th>Remove</th><th>Request</th><th>RTEP#</th><th>Status</th></tr></thead><tbody><tr><td><input type="checkbox"/></td><td><a href="#">2941</a></td><td></td><td>Submitted</td></tr></tbody></table> <a href="#">Add</a>	Remove	Request	RTEP#	Status	<input type="checkbox"/>	<a href="#">2941</a>		Submitted
Remove	Request	RTEP#	Status																
<input type="checkbox"/>	<a href="#">2941</a>		Submitted																
<a href="#">66046</a>	Submitted	Electric Company		124FOUR,APPLES	13 KV,230 KV	PAPER2,23TIE	XML Upload testing ticket	10/01/2014 00:00	10/14/2019 00:00	02/23/2015 10:04	No Request Needed: <input type="checkbox"/> <a href="#">Add</a>								
<a href="#">60592</a>	Submitted	Electric Company		ISLAND	115 KV	110-1	Automatically created ticket using Future Facilities Form	12/02/2009 11:11	04/19/2020 07:00	10/20/2011 07:22	No Request Needed: <input type="checkbox"/> <a href="#">Add</a>								

[Submit](#) [Export to CSV](#) [Main Menu](#)

- Will be replacement source for 6 week cut-in report
- Default filter 6 weeks pre to post
- The ticket linkage should **definitely** be complete at least six weeks before the start of the ticket
- Important for outage schedulers to ensure linkages are maintained
- Any cut-in tickets must have linkage to move forward w/ approvals (unless they are marked as not needed on the ticket)
- Use “Add” button to link Network Model request to outage ticket

# eDART Network Model to Cut-In Transmission Outage Ticket Linkage

**Add Network Model Request**

Include	RTEP#	Request #	Build	Title	Company
<input type="checkbox"/>		<a href="#">2346</a>	Spring 2007	title	Electric Company
<input type="checkbox"/>		<a href="#">2345</a>	Fall 2007	New Build	Electric Company

Request #:

- Clicking “Add” will open form to do linkage
- The Network Model requests for builds within one year before the outage ticket start date and one year after the end date, including any of the stations in the outage tickets, will be displayed for potential linkage selection
- User can also manually enter Network Model request numbers, separated by commas, if adding multiple
- Click “Add” to submit selections

# Viewing Linked Network Model Requests from Outage Tickets

- A “Modeling Requests” is on all Trans. Tickets with linked Network Model Requests
  - this will pull up a report of all linked requests w/ hyperlinks to view print versions of the requests
- Any files attached to the Network Model requests will be available for download (one lines, construction diagrams, etc.)

**Review/Revise Transmission Ticket**

User: Company: **Electric Company** Status: **Submitted** Ticket ID: **66725**

Company Ticket ID: RTEP Queue #:

Ticket Start: 08/01/2016 09:00 Ticket End: 09/01/2016 09:00 Switch Date: 08/01/2016 09:00 [Change Dates](#)

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

**Location/Description of Work (4000 char. max)**

**Information/Hotline Work**

Emergency ☐ Vegetation Trip ☐ Cut In ☐ Direct Billing ☐ Direct Billing Decline ☐ Potentially Incomplete: Yes No At Risk: No Congestion Expected: No Submitted On-Time: Yes Market Sensitive: No Automatic Re-Close: No Mitigated: N/A

**Cause**

☒ Add SF-6 Gas  
☐ C.B. Replacement  
☐ CB Maintenance  
☐ Cable Repair  
☐ Contingency Planning  
☐ Cut-in  
☐ Disconnect/Ground Sw. Maintenance  
☐ Double Test  
☐ Emergency  
☐ Excludable Outage  
☐ External  
☐ Fire on Equipment/in Vicinity  
☐ Gas/Oil Testing/Replacement  
☐ High System Voltage  
☐ Hot Spot Repair

**Ticket History**

	TimeStamp	Usr. Name
Submitted	08/10/2015 15:16	SUPER3
Received		
Approval		
Latest Revision		

**PJM Comments**

Please include additional information in the work description.

**Mitigated Comments**

**Outage Type**

Continuous - No Weekends Availability: Immediate

**Planned:** Other Planned Outage **Operational:** N/A

**Restoration Plan Review Needed** Yes

**Buttons:** Print Version Date Time Log History Log Notifications Log Cancel Ticket Duplicate Ticket View Conflicts Gen Off Conflicts Show All Tickets Modeling Requests

**Tier 1 Tier 2 Tier 3**

Primary	Status	Include	Type	Station Name	Voltage	Equipment Name	Start Date	Start Hour	End Date	End Hour
<input checked="" type="radio"/>	<input type="radio"/>	Yes	LINE	123BLUES	230 KV	123BLUES-COLORS	08/01/2016	09:00	09/01/2016	09:00
<input type="radio"/>	<input type="radio"/>	Yes	BRKR	COLORS	230 KV	COLORS DUM 123 CB	08/01/2016	09:00	09/01/2016	09:00
<input type="radio"/>	<input type="radio"/>	Yes	BRKR	123BLUES	230 KV	123BLUES DIS 1232	08/01/2016	09:00	09/01/2016	09:00

PJM©2018

Internet Explorer

## Network Modeling Requests for Ticket ID 66725

Network Model Link						
Request #	Title	RTEP#	Company	Status	Build	Attachments
<a href="#">4246</a>	title		Electric Company	Modeled	Fall 2006	<input type="checkbox"/> one_line.pdf

[Download](#)[\(Un\)Check All](#)[Close Window](#)

# High Level Cut-in ticket Linkage Process Flow

- For any remaining cut-in ticket not linked, that are scheduled to occur within the next six weeks,
  - Your outage schedulers and company's DMS rep will be asked to make the linkage, or mark the ticket as not needing a link . . .
  - via the Transmission Ticket View of the Linkage Form
    - Check the Missing Network Model Link checkbox for easy gap filtering



# PJMs Functionality in Transmission Outage Ticket

- Cut-In outage tickets can't be changed to status of Approved or Active if no Network Model request is linked or the ticket is not identified as not needing one

The screenshot shows the PJM Transmission Outage Ticket interface. On the left, under the 'Attachments' section, there is a button labeled 'Modeling Tickets' which is highlighted with a red box. To the right of this button is a list of 'Cause Types' including: Add SF-6 Gas, B. Overhaul, B. Replacement, Cable Repair, CB Maintenance, Contingency Planning, Cut-in, Disconnect/Ground Sw. Maintenance, Doble Test, Emergency, Excludable Outage, External, Fire on Equipment/in Vicinity, Gas/Oil Testing/Replacement, High System Voltage, Hot Spot Repair, Inspection/Maintenance, Install Antenna, LA Replace/Repair, NERC Alert, NERC Alert - Emergency, NERC Alert - Near Term, New Construction, Normally Open, Other, Overhaul Tap Changer, Relay Maintenance (Impact to primary clearing), Relay Maintenance (No impact to primary clearing), Relay Replacement (Impact to primary clearing), and Relay Replacement (No impact to primary clearing). A red arrow points from the 'Modeling Tickets' button to a legend on the right side of the slide.

**Modeling Tickets**

Gray Text (Disabled)  
not a cut-in or  
verified that no NMR  
(s) are needed

**Modeling Tickets**

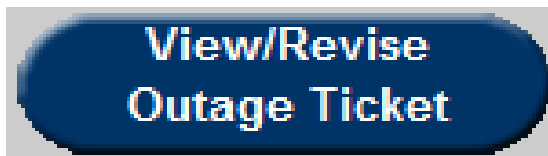
Red Background (Disabled)  
cut-in ticket that needs  
NMR linked or  
verification that no  
NMR is needed

**Modeling Tickets**

Gray Background (Enabled)  
NMR(s) is linked

# Revise a Transmission Ticket

- Viewing or Revising an Existing Transmission Outage Ticket
  - Transmission Outage Ticket is “locked” to changes when the Ticket is Approved
    - In order to make changes or to unlock the form you must first notify PJM verbally
    - If the ticket has a status of Submitted, then any field may be changed



# Transmission Ticket Statuses

- Submitted
  - Original status of ticket upon submittal by company
- Received
  - Ticket status changed to Received by PJM upon initial review of ticket by Dispatch
  - Notifications sent to other Transmission owners through eDART

# Transmission Ticket Statuses (Con't)

- Transmission Ticket Status Denied
  - Ticket status changed to Denied by PJM if outage request is not approved
  - Notifications sent to other Transmission Owner through eDART
    - Verbal notification given to outage submitter
- Transmission Ticket Status Approved
  - Ticket status changed to Approved by PJM if outage request is approved following detailed analysis by Reliability Engineer
  - Ticket is locked to changes
  - Notifications sent to the Transmission Owners and other Transmission Owners that have requested information for this outage through eDART

# Transmission Ticket Statuses (Con't)

- Cancelled by Company
  - Ticket status changed to Cancelled by Company if company initiates cancellation of ticket
  - Notifications sent to all who had been previously notified through eDART
    - Verbal notification required to PJM if change affects current or next operating day
- PJM Admin Closure
  - Ticket was not closed out/canceled for reliability issues, it was closed because it had to be
  - PJM will include comments on the ticket if they are necessary

# Transmission Ticket Statuses *(Con't)*

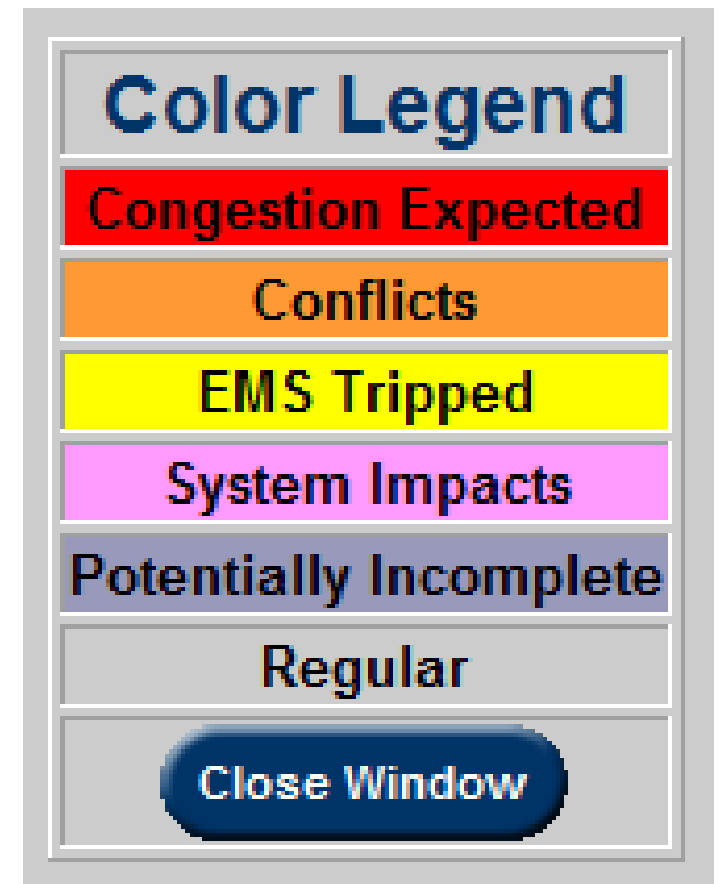
- Revised
  - Ticket status changed to Revised if any data on ticket has changed (unless ticket is active)
  - Ticket must be Received and Approved again
    - Notifications resent
- Active
  - Ticket status changed to Active upon input of an actual outage start date by PJM
    - Verbal notification required to PJM at actual start of outage ticket

# Transmission Ticket Statuses *(Con't)*

- Complete
  - Ticket status changed to Complete upon input of an actual end date by PJM
    - Verbal notification required to PJM at actual end of outage ticket

# Color-Coding of eDART Tickets

- Certain types of eDART tickets are given special Color-Coding to identify that they may require additional follow-up or attention
- If an eDART has more than one color status, it will take on the status with the highest color on the chart





# Color-Coding of eDART Tickets

## The “Congestion Expected” Flag

- PJM will check this flag when a studied outage causes the potential for off-cost operation
- Allows PJM operators to filter these outages out if necessary

**Review/Revise Transmission Ticket**

User: studenttrans44 Company: SBT Trans Comp 0 Status: Submitted Ticket ID: 70455

Company Ticket ID:  RTEP Queue #:

Ticket Start: 03/07/2017 08:00 Ticket End: 03/10/2017 12:00 Switch Date: 03/07/2017 08:00 [Change Dates](#)

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

**Location/Description of Work(4000 char. max)**  
Crawford-Doyle No. 2 230kV line out of network operation to replace 5 H-frame Structures with steel.

**PJM Comments**

**Mitigated Comments**

**Information/Hotline Work**  
☐ Emergency  
☐ Vegetation Trip  
☐ Cut In  
☐ Direct Billing  
☐ Direct Billing Decline

**Potentially Incomplete:** No  
**At Risk:** No  
**Congestion Expected:** No  
**Submitted On-Time:** Yes  
**Market Sensitive:** No  
**Automatic Re-Close:** No  
**Mitigated:** N/A

**Cause**  
☐ NERC Alert - Emergency  
☐ NERC Alert - Near Term  
☐ New Construction  
☐ Normally Open  
☐ Other  
☐ Overhaul Tap Changer  
☐ Pre-Contingency Switching  
☐ Relay Maintenance (Impact to primary clearing)  
☐ Relay Maintenance (No impact to primary clearing)  
☐ Relay Replacement (Impact to primary clearing)  
☐ Relay Replacement (No impact to primary clearing)  
☐ Repair/Replace Conductor  
☐ Repair/Replace Insulator  
☐ Repair/Replace Pole  
☐ Repair/Replace Tower

**Ticket History**

	Time Stamp	Usr. Name
Submitted	01/31/2017 14:00	studenttrans44
Received		
Approval		
Latest Revision		

**Outage Type**  
Continuous

**Availability**  
Duration

**Restoration Plan Review Needed**  
N/A

**Type** **Station Name** **Voltage** **Equipment Name**

[Print Version](#) [Date Time Log](#) [History Log](#) [Notifications Log](#) [Cancel Ticket](#) [Duplicate Ticket](#) [View Conflicts](#) [Gen Off Conflicts](#) [Show All TERM](#)

[Station Equip.](#) [Submit Form](#) [Refresh](#) [Gen. Outage Lookup](#) [Comments Log](#) [Projects](#) [Files](#) [Main Menu](#)

○ Tier 1 ○ Tier 2 ○ Tier 3

Default Status Change Only	Primary	Status	Include	Type	Station Name	Voltage	Equipment Name	Start Date	Start Hour	End Date	End Hour	Resulting Default Status
No	<input type="radio"/>	O	Yes	LINE	CRWFRD	230 KV	CRAWFORD-DOYLE2	03/07/2017	08:00	03/10/2017	12:00	No Change
No	<input type="radio"/>	O	Yes	BRKR	DOYLE	230 KV	DOYLE CB 4	03/07/2017	08:00	03/10/2017	12:00	No Change
No	<input type="radio"/>	O	Yes	BRKR	CRWFRD	230 KV	CRAWFORD CB 7	03/07/2017	08:00	03/10/2017	12:00	No Change
No	<input type="radio"/>	O	Yes	BRKR	DOYLE	230 KV	DOYLE CB 5	03/07/2017	08:00	03/10/2017	12:00	No Change
No	<input type="radio"/>	O	Yes	BRKR	CRWFRD	230 KV	CRAWFORD CB 8	03/07/2017	08:00	03/10/2017	12:00	No Change

# Color-Coding of eDART Tickets

- An outage that is suspected to cause congestion will also be highlighted in red when viewed on the “Status Report” page....



Review/Revise Tickets										
<div>Apply FilterGo to FilterColor Legend</div>										
1										
Ticket ID	Company Ticket ID	Ticket Status	Company	Station	Voltage	Equipment	Start Date	End Date	Timestamp	Submit On Time
381086		Cancelled by Company	PPL Electric Utilities Corp. dba PPL Utilities (LSE)	BUSHKILL	230 KV	BUSHKILL-KITTATIN K1019	01/28/2011 08:00	01/28/2011 13:00	07/08/2009 09:26	Yes
<a href="#">381086</a>		Cancelled by Company	PPL Electric Utilities Corp. dba PPL Utilities (LSE)	BUSHKILL	230 KV	BUSHKILL-KITTATIN K1019	01/28/2011 08:00	01/28/2011 13:00	07/08/2009 09:27	Yes

# Color-Coding of eDART Tickets

## The “Conflict” Flag

- This functionality looks at eDARTs to identify outage combinations that should never occur
  - List of scenarios to be made available within eDART for review (Initial source is PJM Planning Studies)
- Some scenarios may be cross-company
- If an outage is submitted violating a scenario, immediate feedback on impacted previously submitted tickets will be provided

Conflicts										
Ticket ID	Company Ticket ID	Ticket Status	Company	Station	Voltage	Equipment	Start Date	End Date	Timestamp	Submit On Time
<a href="#">62000</a>		Conflicted	Energy	SANDUNE	230 KV	SANDUNE LINE 11222	05/10/2011 11:00	05/22/2011 12:00	05/01/2011 12:58	No
<a href="#">62225</a>		Cancelled by Company	Energy	SANDUNE	34 KV	SANDUNE-BNY CB	05/19/2011 11:00	05/23/2011 15:00	05/01/2011 11:15	No

# Color-Coding of eDART Tickets

Review/Revise Transmission Ticket

User: studenttrans44 Company: SBT Trans Comp 0 Status: Submitted Ticket ID: 70455

Company Ticket ID: RTEP Queue #:

Ticket Start

Ticket End

Switch Date

Change Dates

03/07/2017 08:00

03/10/2017 12:00

03/07/2017 08:00

Location/Description of Work(4000 char. max)

Information/Hotline Work

Cause

Crawford-Doyle No. 2 230kV line out of network operation to replace 5 H-frame Structures with steel.

Emergency  
Vegetation Trip  
Cut In  
Direct Billing  
Direct Billing Decline

NERC Alert - Emergency  
NERC Alert - Near Term  
New Construction  
Normally Open  
Other  
Overhaul Tap Changer  
Pre-Contingency Switching  
Relay Maintenance (Impact to primary clearing)  
Relay Maintenance (No impact to primary clearing)  
Relay Replacement (Impact to primary clearing)  
Relay Replacement (No impact to primary clearing)  
Repair/Replace Conductor  
Repair/Replace Insulator  
Repair/Replace Pole  
Repair/Replace Tower

PJM Comments

Mitigated Comments

Outage Type

Availability

Restoration Plan

Continuous

Duration

Review Needed

Type

Station Name

Voltage

Equipment Name

N/A

Print Version

Date Time Log

History Log

Notifications Log

Cancel Ticket

Duplicate Ticket

View Conflicts

Gen. Outage Lookup

Comments Log

Projects

Files

Main Menu

Tier 1

Tier 2

Tier 3

Station Equip.

Submit Form

Refresh

Default Status Change Only

Primary

Status

Include

Type

Station Name

Voltage

Equipment Name

No

No

No

No

No

No

No

Yes

Yes

Yes

Yes

Yes

Yes

Yes

BRKR

BRKR

BRKR

BRKR

BRKR

BRKR

BRKR

DOYLE

DOYLE

DOYLE

DOYLE

DOYLE

DOYLE

DOYLE

230 KV

230 KV

230 KV

230 KV

230 KV

230 KV

230 KV

CRAWFORD-D

DOYLE CB 4

CRAWFORD C

DOYLE CB 5

CRAWFORD C

DOYLE CB 5

CRAWFORD C

- ‘View Conflicts’ button will be added to the Tickets
- Ticket specific conflicts will be available for users to see by clicking on the ‘View Conflicts’ button

Conflicting Outages Report

Go to Filter

Color Legend

Conflict ABC

Ticket ID	Ticket Status	Company	Type	Station	Voltage	Equipment	Start Date	End Date	Timestamp	Submit On Time
449887	Approved	Energy	LINE	JACKJILL	115 KV	JACKJILL - 1CCRR LINE 101				Yes
449889	Approved	Energy	LINE	STPOTPAN	115 KV	STATION - POTPAN 10900 LINE				No
471927	Approved	Energy	LINE	CLAYSBUR	115 KV	CLASBUR-CURRYVIL 1R2R 1099				No

Conflict DEF

Ticket ID	Ticket Status	Company	Type	Station	Voltage	Equipment	Start Date	End Date	Timestamp	Submit On Time
449887	Approved	Energy	LINE	JACKRCKY	115 KV	JACK 966 JEBAKER 966-1				Yes
471927	Approved	Energy	LINE	CLAYSBUR	115 KV	CLASBUR-CURRYVIL 1R2R 1099				No

Go to Filter

Main Menu

# Color-Coding of eDART Tickets

## EMS Tripping Tickets

- Tripped equipment (from PJM EMS) automatically creates an eDART outage ticket
- All equipment 115kV and above
- Outage type = Tripping
- Ticket has Active status
- Start date/time = time of tripping
- End date = 7 days later
- Tier 1 equipment list is auto selected

## Color-Coding of eDART Tickets

- EMS Tripping Tickets created automatically by eDART are given a default cause of “Unknown”
- Tickets have the functionality to allow the Transmission Operator to
  - Associate cause for the purpose of performance compliance data gathering, and
  - Give PJM a better understanding of the reason for the outage
- “Pre-Contingency Switching” checkbox is for the outage being caused by pre-contingency switching

# Color-Coding of eDART Tickets

- Form in Transmission Outage Ticket to allow TO to assign Cause Type to all EMS Trip Tickets marked “Unknown”
- User either selects a Cause Type from drop down or checks “Pre-Contingency Switching”
- Button on Transmission Outage Ticket menu only visible if user’s company has EMS Trip Tickets marked “Unknown”
- Transmission Owner/Operator is expected to update ticket if “EMS Trip Update” Button is shown

Transmission Outage Main Menu

Create New Outage Ticket

View/Revise Outage Ticket

EMS Trip Update

Result Set is limited to 100 rows.

Ticket Status: Submitted ☐ Received ☐ Approved ☐ Revised ☐ Active ☐ Cancelled ☐ Completed ☐

Apply Filter

Ticket ID	Company Ticket ID	Ticket Status	Station	Voltage	Equipment	Start Date	End Date	Cause	Pre-Contingency Switching
<a href="#">63095</a>	test1	PJM Admin Closure	BETHSTL	115 KV	110-1	05/17/2006	05/21/2006	Unknown	<input type="checkbox"/>
<a href="#">63099</a>	test 2	PJM Admin Closure	BRANDONS	230 KV	2GEN XF	05/17/2006	05/21/2006	Unknown	<input type="checkbox"/>
<a href="#">70879</a>		Received	GRACETON	230 KV	GRA-SAF	03/30/2017	03/31/2017	Unknown	<input type="checkbox"/>
<a href="#">70892</a>		Received	GRACETON	230 KV	GRA-SAF	03/31/2017	04/01/2017	Unknown	<input type="checkbox"/>
<a href="#">70893</a>		Received	CONASTON	230 KV	CNS-GRA	03/31/2017	04/01/2017	Unknown	<input type="checkbox"/>
<a href="#">70878</a>		Submitted	CONASTON	230 KV	2324_GCB	03/28/2017	03/29/2017	Unknown	<input type="checkbox"/>

Submit Form

Main Menu



# Color-Coding of eDART Tickets

## “System Impact” Flag

- PJM has the capability to permanently link comments to specific outages in eDART
  - Allows the reliability engineers to pre-screen outages based on known impacts to generation, thermal overloads, voltage violations, stability restrictions, etc. before studying the outage
  - Serves a reminder for the PJM folks, could be useful to the TO’s as well. Outages that have System Impact notes available will be highlighted in purple on the “Status Report” page

Review/Revise Tickets						
<div>Apply FilterGo to FilterColor Legend</div>						
Ticket ID	Company Ticket ID	Ticket Status	Company	Station	Voltage	Equipment
381085		Cancelled by Company	PPL Electric Utilities Corp. dba PPL Utilities (LSE)	BUSHKILL	230 KV	BUSHKILL-KITTATIN K1019
381086		Cancelled by Company	PPL Electric Utilities Corp. dba PPL Utilities (LSE)	BUSHKILL	230 KV	BUSHKILL-KITTATIN K1019
426505	54603	Received	PPL Electric Utilities Corp. dba PPL Utilities (LSE)	BERKS	230 KV	BERKS 2 XFORMER
427008	54765	Received	PPL Electric Utilities Corp. dba PPL Utilities (LSE)	FACEROCK	69 KV	FACEROCK FIFO-695_TIE CB
427032	54775	Received	PPL Electric Utilities Corp. dba PPL Utilities (LSE)	FACEROCK	69 KV	FACEROCK KINZ_13_NBUS CB
427033	54776	Received	PPL Electric Utilities Corp. dba PPL Utilities (LSE)	FACEROCK	69 KV	FACEROCK MA16-697_TI CB
427100	54802	Revised	PPL Electric Utilities Corp. dba PPL Utilities (LSE)	MANOR	230 KV	MANOR-SAFEHARB 2302
427102	54805	Received	PPL Electric Utilities Corp. dba PPL Utilities (LSE)	MANOR	230 KV	MANOR-MILLWDPL MAN-



# Color-Coding of eDART Tickets

- The eDART ticket for those outages will have an additional button labeled “System Impacts”

Review/Revise Transmission Ticket

User: pilonc    Company: PPL Electric Utilities Corp. dba PPL Utilities (LSE)

Status: Received    Ticket ID: 427008

Company Ticket ID: 54765

Ticket Start

01/10/11    09:00

Date (mm/dd/yy)    Hour (hh24:mi)

Ticket End

01/26/11    14:00

Date (mm/dd/yy)    Hour (hh24:mi)

Switch Date

01/10/11    09:00

Date (mm/dd/yy)    Hour (hh24:mi)

Change Dates

Location/Description of Work (500 characters max)

Face Rock - Replace Span 695/Five Forks 1&2 Tie CB

PJM Comments

Information/Hotline Work

Emergency

Vegetation Trip

Cut In

Congestion Expected: No

Submitted On-Time: No

Market Sensitive: No

Ticket History

	Time Stamp	Usr. Name
Submitted	11/16/2010 11:21	issermo
Received	11/16/2010 11:45	PETERC
Approval		
Latest Revision		

Outage Type

Continuous

Availability

Duration

Type

Station Name

Voltage

Equipment Name

Cause

Add SF-6 Gas

C.B. Overhaul

C.B. Replacement

CB Maintenance

Cable Repair

Contingency Planning

NERC-TADS

Planned: Maintenance and Construction

Operational: N/A

NERC-TADS Reports

Print Version

Date Time Log

History Log

Notifications Log

Cancel Ticket

Duplicate Ticket

Tier 1

Tier 2

Tier 3

Station Equip.

Submit Form

Refresh

System Impacts

Gen. Outage Lookup

Comments Log

Main Menu

Status	Include	Type	Station Name	Voltage	Equipment Name	Start Date	Start Hour	End Date	End Hour
0	Yes	BRKR	FACEROCK	69 KV	FACEROCK FIFO-695_TIE CB	01/10/11	09:00	01/26/11	14:00

# Color-Coding of eDART Tickets

- Clicking on the “System Impacts” button will bring up a screen detailing the linked comments

Transmission Ticket System Impacts

Ticket ID: 427008

Title	Comments
Holtwood-Face Rock 696 Span Limits	If the 696 span is out of service, determine how many Holtwood units may be online based on the limits of the

Close Window

# Color-Coding of eDART Tickets

## The “Potentially Incomplete” Flag

- Added to transmission outage tickets to flag tickets that may need further review by PJM
- Potentially Incomplete is flagged if:
  - All outaged equipment in the ticket are breakers and the ticket is not Information/Hotline Work
  - Location/Description of Work field needs more information
- PJM will determine if non-BRKR facility should be added or more description text is necessary
  - Example: Ticket where BRKR on either side submitted w/o submitting LINE have company add LINE to the ticket

# Color-Coding of eDART Tickets

- Potentially incomplete ticket can be Cancelled or Denied but no other status change is allowed until Potentially Incomplete is unchecked
- PJM can remove flag once issue resolved and continue normal status change
- Potentially Incomplete tickets will be highlighted in Lavender

# Color-Coding of eDART Tickets

- PJM Comments automatically added when a ticket is flagged as Potentially Incomplete
  - If Location/Description of Work field has less than a pre-determined number of characters:
    - PJM Comments = "Please include additional information in the work description"
  - If all outaged equipment in the ticket are breakers and the ticket is not Information/Hotline Work:
    - PJM Comments = "Please include applicable non-BRKR facilities"
- Both comments are added if both of the conditions above persist

# Potentially Incomplete Tickets

- EMS Tripping -vs- Potentially Incomplete:
  - EMS Tripped process updated to override Potentially Incomplete logic to activate previously submitted tickets
  - If EMS Tripped process is activating a ticket currently in the Submitted status and Potentially Incomplete is TRUE, it will also set the Potentially Incomplete flag to FALSE

# Agenda



- Outage planning and Weather
- Outage Reporting Guidelines
- eDART
- Communications and Notifications

# Communications

- Verbal Notification required **to PJM** for:
  - Problems with entering tickets through eDART
  - Any change to ticket (dates, equipment) which affects the current or next operating day
  - Transmission trippings
    - Also submit an outage ticket
    - If return date is unknown, use end of estimated month at 23:59



# Communications

- Verbal Notification required **to PJM** for:
  - Switching, when it is ready to begin (permission to proceed):
    - Must be within a **half hour** before the equipment is removed from the system
    - To allow PJM to perform final reliability studies
    - If the equipment is not removed in a half hour you will have to call PJM back to reobtain approval
  - Actual start and end time of outage tickets
    - PJM will then update the ticket in eDART

# Communications

- Verbal Notification will be given from PJM for:
  - Denial of an outage request
  - Questions about submitted outage request
  - Any special requirements for outage
  - 500 kV and above switching messages
    - via All-Call

# Communications and Notifications

## Notifications - Receiving

- Notifications will be made based on updated Reportable Transmission Facilities list
  - Notifications can be found in eDART
- eDART will allow those who are notified to view Transmission Outage Tickets
- Notifications must be acknowledged by receiving company through eDART

# Communications and Notifications

## Real Time Outage Communication Process

- **PJM Member Company Actions:**

- Notifies PJM System Operator verbally 1/2 hour prior to scheduled outage of any Designated Transmission Facility
- If 500 kV or above outage, notifies PJM again verbally, just prior to switching to verify conditions
- Notifies PJM verbally when facility is out of service
- Ensures that outaged facilities are properly represented in real-time system models

# Communications and Notifications

## Real Time Outage Communication Process

- **PJM Actions:**

- Verifies outage will not adversely impact Control Area reliability
- If 500 kV or above, notifies other PJM Member Companies of outage via All-Call
- Notifies other affected Control Areas verbally

# Summary

- Overview on navigating eDART in order to create or edit transmission tickets
- Communication and Notifications associated with eDART that will be utilized when necessary

# Contact Information

**PJM Client Management & Services**

**Telephone: (610) 666-8980**

**Toll Free Telephone: (866) 400-8980**

**Website: [www.pjm.com](http://www.pjm.com)**



The Member Community is PJM's self-service portal for members to search for answers to their questions or to track and/or open cases with Client Management & Services

# Resources and References

- PJM. (2012). *PJM Manual 3: Certification and Training Requirements (rev. 41)*. Retrieved from <http://pjm.com/~media/documents/manuals/m3.ashx>