

# Nuclear Bus Voltage Limits

Nuclear Generation Owners Overview

In compliance with NERC standard NUC-001, Nuclear Generation Owners (NGOs), develop Nuclear Plant Interface Requirements (NPIRs)

- NPIRs, in part, define safe shutdown voltage limits

Applicable Transmission entities monitor the transmission system as not to violate the NPIRs

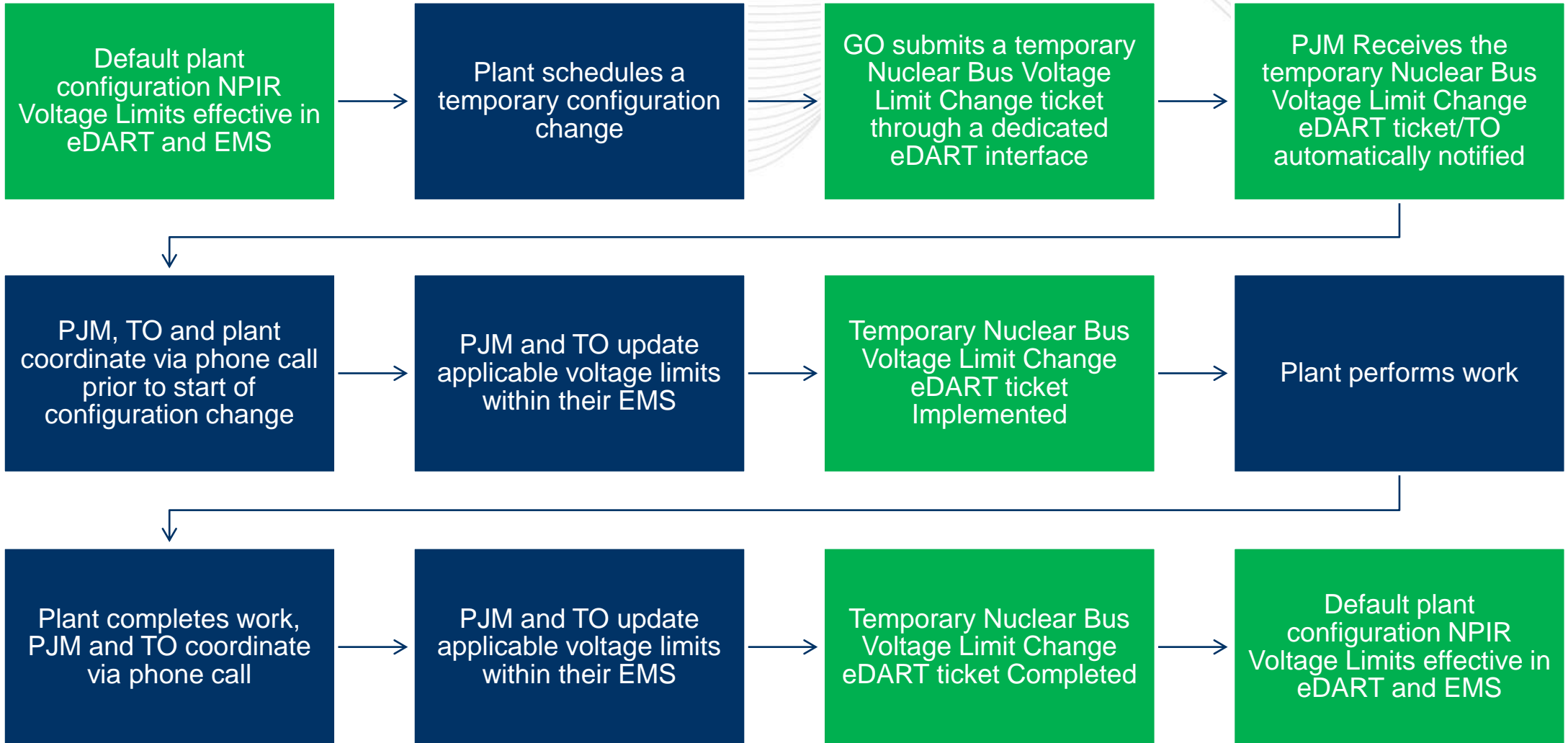
To gain efficiencies for TOs, NGOs, and PJM, Nuclear Bus Voltage Limits will be maintained in eDART

Stand alone application within eDART, limited to NGOs and applicable TOs

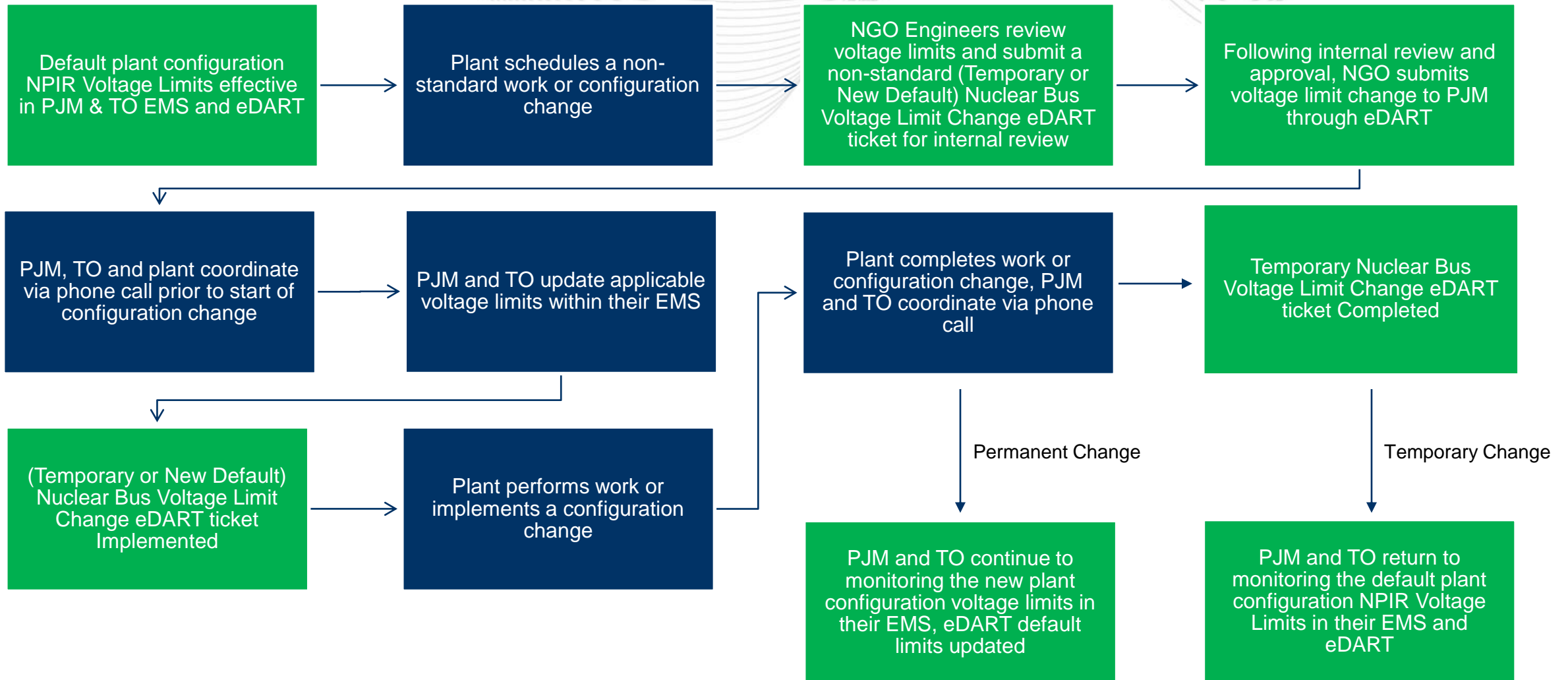
- New eDART ticket type: Nuclear Bus Voltage Limit Change
- Current limits and upcoming limit changes will be visible to all applicable entities
- eDART will be the primary input for NPIR voltage limit changes; Manual 3 Attachment C available as backup



# New Process for Temporary Pre-Approved Voltage Limit Changes



# New Process for Voltage Limit Changes Outside of NPIRs



- My eDART
- Upload
- Download
- Trans. Tickets**
- Network Model
- Black Start
- TERM
- Reactive Reserve

### Generation Reports

Generation Ack. Required	Owners Report	Tickets Active Tomorrow
D-Curve Report	Reactive Test Result	Voltage Schedules
<b>Nuclear Voltage Limit</b>		

Notifications: 59

### Nuclear Voltage Limit Main Menu

Unit Setup Report	Effective Limits	Review Tickets
Implemented w/o Approval	<b>Upcoming Tickets</b>	<b>Recently Completed</b>
<b>Late Tickets</b>	<b>Transmission Menu</b>	

Return to Transmission Outage Main Menu

Buttons highlighted in red indicate required actions or items for review

- My eDART
- Upload
- Download
- Hydro Calculator
- Gen. Tickets**
- Trans. Tickets
- Instantaneous Reserve Check
- Minimum Gen. Report

Owners Report	Maint. Margin Log	D-Curve Report
Black Start Test Upload	Black Start Test Download	Black Start Calculator
GO Survey	<b>Voltage Schedules</b>	<b>Nuclear Voltage Limit</b>

### Nuclear Voltage Limit Main Menu

Unit Setup Report	Effective Limits	Help
Create Ticket	Review Tickets	<b>Late Tickets</b>
Implemented w/o Approval	<b>Upcoming Tickets</b>	Recently Completed
<b>Generation Menu</b>		

Display PDF Help file

Return to Generator Tickets Main Menu

Buttons highlighted in red indicate required actions or items for review

The Unit Setup Report provides an overview of the pre-determined voltage limits for all unit groups.

- Indicates the Default monitored values on a per voltage level basis, including the PJM specific value shown in blue and indicated with the letter 'P'.
- Displays all unit group specific scenarios and the associated voltage limits.



## Nuclear Voltage Limit Unit Setup Report

Default monitored values are displayed on a per voltage level basis.  
The PJM specific values are shown in blue and indicated with the letter 'P'.

NUCLEAR TEST PJM TEST

Default/Scenario Name	Station	Voltage	Bus Name Keyword	Norm. Min kV	Norm. Max kV	Emerg. Min kV	Emerg. Max kV	Load Dump	Volt. Drop Warn. %	Volt. Drop Viol. %
Default	LACKAWAN	500 KV		536.5	550.0 (P: 547.0)	535.0 (P: 533.5)	550.0	475.0	5.0	8.0
Default	LACKAWAN	230 KV		230.0	242.0 (P: 239.0)	230.0 (P: 227.0)	242.0	217.0	2.0	5.0
Default	LACKAWAN	69 KV		69.0	72.0	66.0	75.0	60.0	1.0	4.0
LTC in manual	LACKAWAN	500 KV		536.5	550.0 (P: 547.0)	535.0 (P: 533.5)	550.0	475.0	9999	9999
Single unit operation	LACKAWAN	500 KV		536.5	540.0	535.0 (P: 533.5)	550.0	475.0	5.0	8.0
LTC in manual	LACKAWAN	230 KV		230.0	242.0 (P: 239.0)	230.0 (P: 227.0)	242.0	217.0	9999	9999

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The Create Ticket screen allows for creating and submitting new Nuclear Voltage Limit tickets that will be used by the Transmission Owner (TO) and PJM in their forward looking studies and in real-time.

- The submitter will be able to see the Default, Current and Adjusted limits.
- Additional fields include, Start Date and Time, End Date and Time and GO Comments.

## Nuclear Voltage Limit New Ticket

Company: **PJM TEST** Unit: **NUCLEAR TEST** ▼

Default limits represent the base limits PJM and the TO will operate to during normal station configuration.  
 Current limits represent the limits PJM and the TO are currently monitoring for. Adjusted limits show the limits associated with selected change.  
 PJM specific values are shown in blue and indicated with the letter 'P'.

Station	Voltage	Bus Name Keyword	Scenario	Type	Norm. Min kV	Norm. Max kV	Emerg. Min kV	Emerg. Max kV	Load Dump	Volt. Drop Warn. %	Volt. Drop Viol. %	
LACKAWAN	500 KV		No Change ▼	Default	536.5	550.0 (P: 547.0)	535.0 (P: 533.5)	550.0	475.0	5.0	8.0	
				Current								
				Adjusted	536.5	550.0 (P: 547.0)	535.0 (P: 533.5)	550.0	475.0	5.0	8.0	
LACKAWAN	230 KV		No Change ▼	Default	230.0	242.0 (P: 239.0)	230.0 (P: 227.0)	242.0	217.0	2.0	5.0	
				Current								
				Adjusted	230.0	242.0 (P: 239.0)	230.0 (P: 227.0)	242.0	217.0	2.0	5.0	
LACKAWAN	69 KV		No Change ▼	Default	69.0	72.0	66.0	75.0	60.0	1.0	4.0	
				Current								
				Adjusted	69.0	72.0	66.0	75.0	60.0	1.0	4.0	

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- The submitter will be able to select from multiple scenarios for each voltage level:
  - No Change
  - New Default – permanent change to the default values
  - Unlisted – temporary limits not covered by pre-approved scenarios
  - Unit specific pre-approved scenarios (i.e. LTC in manual)

### Nuclear Voltage Limit New Ticket

Company:  Unit:

Default limits represent the base limits PJM and the TO will operate to during normal station configuration.  
Current limits represent the limits PJM and the TO are currently monitoring for. Adjusted limits show the limits associated with selected change.  
PJM specific values are shown in blue and indicated with the letter 'P'.

Station	Voltage	Bus Name Keyword	Scenario	Type	Norm. Min kV	Norm. Max kV	Emerg. Min kV	Emerg. Max kV	Load Dump	Volt. Drop Warn. %	Volt. Drop Viol. %	
LACKAWAN	500 KV			Default	536.5	550.0 (P: 547.0)	535.0 (P: 533.5)	550.0	475.0	5.0	8.0	
				Current								
			<input type="text" value="LTC in manual"/>	Adjusted	536.5	550.0 (P: 547.0)	535.0 (P: 533.5)	550.0	475.0	9999	9999	
LACKAWAN	230 KV			Default	230.0	242.0 (P: 239.0)	230.0 (P: 227.0)	242.0	217.0	2.0	5.0	
				Current								
			<input type="text" value="No Change"/>	Adjusted	230.0	242.0 (P: 239.0)	230.0 (P: 227.0)	242.0	217.0	2.0	5.0	
LACKAWAN	69 KV			Default	69.0	72.0	66.0	75.0	60.0	1.0	4.0	
				Current								
			<input type="text" value="LTC in manual"/>	Adjusted	69.0	72.0	66.0	75.0	60.0	1.0	4.0	

Ticket Type: Temporary Est. Start Date:   GO Comments:

Est. End Date:   (MMDD/YYYY) (HH:MM) PJM Comments:

- The user will be able to manually enter values when the Unlisted/New Default scenarios are selected
  - Data validation rules will verify:
    - Normal Min kV  $\geq$  Emergency Min kV
    - Normal Max kV  $\leq$  Emergency Max kV
    - Emergency Max kV  $\geq$  Load Dump
    - Voltage Drop Warning  $\leq$  Voltage Drop Violation
  - The PJM dispatcher will enter the Voltage Drop Warning Percentage when reviewing the ticket

### Nuclear Voltage Limit New Ticket

Company: PJM TEST Unit: NUCLEAR TEST

Default limits represent the base limits PJM and the TO will operate to during normal station configuration.  
 Current limits represent the limits PJM and the TO are currently monitoring for. Adjusted limits show the limits associated with selected change.  
 PJM specific values are shown in blue and indicated with the letter 'P'.

Station	Voltage	Bus Name Keyword	Scenario	Type	Norm. Min kV	Norm. Max kV	Emerg. Min kV	Emerg. Max kV	Load Dump	Volt. Drop Warn. %	Volt. Drop Viol. %
LACKAWAN	500 KV		Unlisted <span style="font-size: small;">▼</span>	Default Current Adjusted	536.5	550.0 (P: 547.0)	535.0 (P: 533.5)	550.0	475.0	5.0	8.0
LACKAWAN	230 KV		No Change <span style="font-size: small;">▼</span>	Default Current Adjusted	230.0	242.0 (P: 239.0)	230.0 (P: 227.0)	242.0	217.0	2.0	5.0
LACKAWAN	69 KV		No Change <span style="font-size: small;">▼</span>	Default Current Adjusted	69.0	72.0	66.0	75.0	60.0	1.0	4.0

Ticket Type: Temporary Est. Start Date:  /  GO  
 Est. End Date:  /  (MMDDYYYY) (HHMM) Comments:

Submit Form
Help
Refresh
Main Menu



- The values are pre-populated for any pre-approved scenario

**Nuclear Voltage Limit New Ticket**

Company: PJM TEST Unit: NUCLEAR TEST ▼

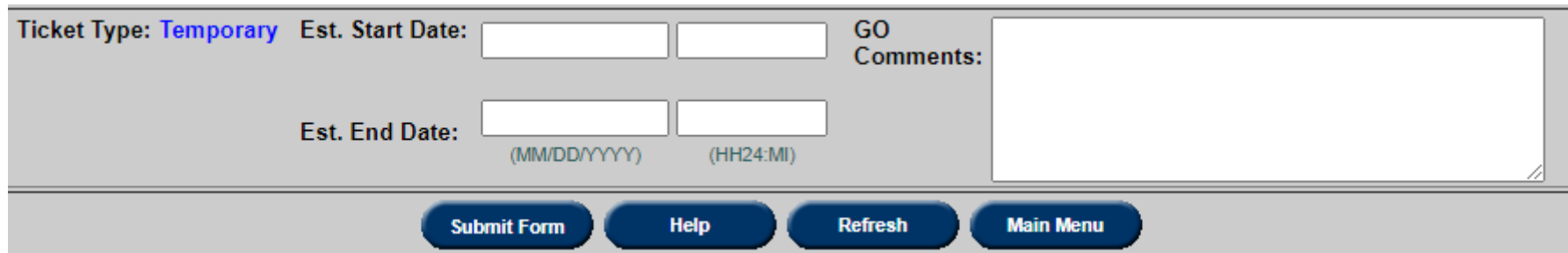
Default limits represent the base limits PJM and the TO will operate to during normal station configuration.  
Current limits represent the limits PJM and the TO are currently monitoring for. Adjusted limits show the limits associated with selected change.  
PJM specific values are shown in blue and indicated with the letter 'P'.

Station	Voltage	Bus Name Keyword	Scenario	Type	Norm. Min kV	Norm. Max kV	Emerg. Min kV	Emerg. Max kV	Load Dump	Volt. Drop Warn. %	Volt. Drop Viol. %
LACKAWAN	500 KV			Default	536.5	550.0 (P: 547.0)	535.0 (P: 533.5)	550.0	475.0	5.0	8.0
			LTC in manual ▼	Adjusted	536.5	550.0 (P: 547.0)	535.0 (P: 533.5)	550.0	475.0	9999	9999
LACKAWAN	230 KV			Default	230.0	242.0 (P: 239.0)	230.0 (P: 227.0)	242.0	217.0	2.0	5.0
			No Change ▼	Adjusted	230.0	242.0 (P: 239.0)	230.0 (P: 227.0)	242.0	217.0	2.0	5.0
LACKAWAN	69 KV			Default	69.0	72.0	66.0	75.0	60.0	1.0	4.0
			No Change ▼	Adjusted	69.0	72.0	66.0	75.0	60.0	1.0	4.0

Ticket Type: Temporary Est. Start Date:   GO  
Comments:

Est. End Date:    
(MM/DD/YYYY) (HH:MM)

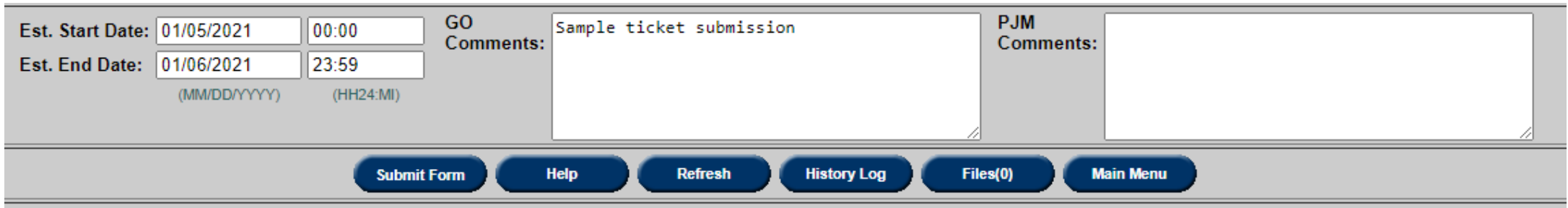
- PJM requires a start date/time, end date/time and GO Comments in order to submit the ticket for PJM review
  - For New Default – Ticket Type is Permanent and the end date/time is not required



The screenshot shows a web form for creating a ticket. It includes the following fields and controls:

- Ticket Type:** A dropdown menu currently set to "Temporary".
- Est. Start Date:** Two input fields for month/day and year.
- Est. End Date:** Two input fields for month/day and year, with a label "(MM/DD/YYYY)" below them.
- GO Comments:** A large text area for entering comments, with a label "GO Comments:" to its left.
- Buttons:** Four buttons at the bottom: "Submit Form", "Help", "Refresh", and "Main Menu".

- Files can be added to a ticket once it has been submitted
  - Select the Files button

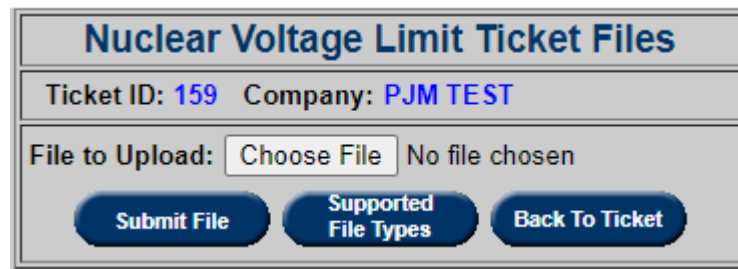


Est. Start Date: 01/05/2021 00:00 GO Comments: Sample ticket submission PJM Comments:

Est. End Date: 01/06/2021 23:59  
(MM/DD/YYYY) (HH24:MI)

Submit Form Help Refresh History Log Files(0) Main Menu

- Choose the file to upload
- Select Submit File



**Nuclear Voltage Limit Ticket Files**

Ticket ID: 159 Company: PJM TEST

File to Upload: Choose File No file chosen

Submit File Supported File Types Back To Ticket

The Review Tickets screen allows the users to search for historical, current, and future Nuclear Voltage Limit tickets. The available filter choices allow the user to be specific if desired, or complete a broad search by not selecting any additional information.

Nuclear Voltage Limit Ticket Review							
Company		Unit			Permanent/Temporary		Include Historical
PJM TEST ▾		NUCLEAR TEST ▾			<input type="radio"/> Perm. <input type="radio"/> Temp. <input checked="" type="radio"/> Both		<input type="checkbox"/>
Ticket ID	Status	Late Tickets	Upcoming Tickets	Recent Tickets	Occured During		
	Approved Completed Implemented PJM Admin Closure Received	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	From: <input type="text"/>	To: <input type="text"/>	
					(MM/DD/YYYY)	(MM/DD/YYYY)	

Apply Filter
Refresh
Main Menu

- Submitted – new ticket status when submitted to PJM.
- Received – initial review of ticket by PJM completed.
- Denied – voltage limit change reviewed and not approved by PJM.
- Approved – voltage limit change reviewed and approved by PJM.
- Cancelled by Company – NGO cancelled the tickets.
- PJM Admin Closure – PJM cancelled the ticket.
- Revised – Received or Approved ticket has been changed by NGO.

- Implemented – PJM EMS updated with new limits from approved ticket.
- Implemented w/o Approval – PJM EMS updated with new limits from un-approved ticket.
- Completed – PJM EMS updated with new limits that no longer match implemented temporary ticket or new permanent ticket created

The Late Tickets reports shows tickets that either:

- Are past their Start date but have not been Implemented or Cancelled.
- Are past their End Date but have not been Completed or Cancelled.

Nuclear Voltage Limit Late Ticket Report						
<input type="text"/>	<input type="text" value="3"/>	<input type="text"/>	<input type="text"/>	<input type="text" value="1"/>	<input type="text" value="2"/>	<input type="text"/>
Ticket ID	Unit	GO Name	Perm/Temp	Start Date	End Date	Status
<a href="#">94</a>	NUCLEAR TEST	PJM TEST	Temporary	11/17/2020 00:00	11/18/2020 00:00	Received
<a href="#">129</a>	NUCLEAR TEST	PJM TEST	Temporary	11/17/2020 17:41	11/18/2020 17:41	Implemented
<a href="#">100</a>	NUCLEAR TEST	PJM TEST	Temporary	11/20/2020 00:00	11/20/2020 23:59	Submitted
<a href="#">96</a>	NUCLEAR TEST	PJM TEST	Temporary	11/27/2020 11:11	11/28/2020 12:00	Submitted

Apply Filter
Help
Main Menu

The Implemented without Approval screen shows tickets which are created when the currently active limits in eDART does not match the limits monitored by PJM.

Nuclear Voltage Limit Implemented w/o Approval Ticket Report						
<input type="text"/>	<input type="text" value="3"/>	<input type="text"/>	<input type="text"/>	<input type="text" value="1"/>	<input type="text" value="2"/>	<input type="text"/>
Ticket ID	Unit	GO Name	Perm/Temp	Start Date	End Date	Status
<a href="#">139</a>			Temporary	12/11/2020 12:18	12/12/2020 12:18	Implemented w/o Approval
<a href="#">137</a>			Temporary	12/11/2020 12:18	12/12/2020 12:18	Implemented w/o Approval

Apply Filter
Help
Main Menu



The Upcoming Tickets report will show all tickets scheduled to start in the next 7 days.

Nuclear Voltage Limit Upcoming Ticket Report						
<input type="text"/>	<input type="text" value="3"/>	<input type="text"/>	<input type="text"/>	<input type="text" value="1"/>	<input type="text" value="2"/>	<input type="text"/>
Ticket ID	Unit	GO Name	Perm/Temp	Start Date	End Date	Status
<a href="#">98</a>	Palisades Nuclear Unit 2	Palisades Nuclear Co., LLC	Temporary	12/14/2020 11:00	12/15/2020 11:00	Submitted

The Recently Completed report will show all tickets completed in the last 7 days.

Nuclear Voltage Limit Recently Completed Ticket Report						
<input type="text"/>	<input type="text" value="3"/>	<input type="text"/>	<input type="text"/>	<input type="text" value="1"/>	<input type="text" value="2"/>	<input type="text"/>
Ticket ID	Unit	GO Name	Perm/Temp	Start Date	End Date	Status
<a href="#">119</a>			Temporary	11/17/2020 17:41	12/07/2020 15:17	Completed
<a href="#">121</a>			Temporary	11/17/2020 17:41	12/07/2020 15:17	Completed
<a href="#">123</a>			Temporary	11/17/2020 17:41	12/11/2020 12:18	Completed
<a href="#">131</a>			Temporary	12/07/2020 14:27	12/11/2020 12:18	Completed

Apply Filter
Help
Main Menu