Generation Initial Training Program

Outage Types & Entering Tickets

PJM State & Member Training Dept.

Objectives

Students will be able to:

- Describe the outage reporting process and requirements
- Identify the tools used to participate in the various PJM markets
- Describe how to create an outage ticket utilizing the eDART application

Business Rules

- PJM Members can request outages via the Gen. Ticket eDART tool
  - All outage requests are analyzed together, and PJM only rejects outage requests when they affect the reliability of the PJM RTO
  - It is the responsibility of each PJM Member to determine its own best outage schedule
  - Outage requests are honored by PJM on a first-come first-serve basis

Business Rules

- Where a user is required to give PJM verbal notification, the following PJM personnel should be contacted:
  - Master Coordinator
    - All Outages
    - Clearing of Outage Tickets
  - Generation Dispatcher
    - Outages of units on-line or scheduled to come on-line
- Generation Outages fall into the following categories:
  - Forecasted Planned/ Planned
  - Maintenance
  - Unplanned

Forecasted Planned/ Planned Outage

- The initial Planned outage request has to be submitted to PJM no later than 30 days prior to the Operating Day
- Every evening the eDART system will automatically change the status of all “Forecasted Planned” outages due to start in less than 31 days to “Planned” outages
- Once the ticket is changed to “Planned,” and has a status of approved, a reduction revision can be submitted, but only to decrease the amount of reduction
- The Start date of a Planned ticket can only be increased (and no more than 30 days into the future)
- The End date can also be changed

Forecasted Planned/ Planned Outage

- An approved Planned outage may be rescheduled within the 30 day timeframe of approval only if it is approved by PJM, but once an approved Planned outage is moved, it becomes “Unplanned” and cannot be extended past the original timeframe
- Other than cancellation, no other changes can be made
- The approval process involves checking for conditions such as violation of Black Start power failure solution and Reliability scenarios, availability of adequate reserves and whether the outage is scheduled during the Peak Period Maintenance season, which occurs from the 24th Wednesday of the calendar year through the 36th Wednesday of the same year

Forecasted Planned/ Planned Outage

- A Planned outage is in Black Start Scenario violation if a station already has an outage for a critical Black Start unit during the same period
  - However a Generation Owner may substitute another black start unit (currently not designated as critical) at a plant (on the same voltage level) for a black start unit that is on a planned outage to allow a concurrent planned outage of another critical black start unit at a plant to begin
  - This substituted unit must have a valid black start test within the last 13 months to be considered as an eligible substitution
- If the request is denied, members re-evaluate their Planned outage schedule and submit a new outage request
  - This process is repeated until the request submitted is acceptable
- PJM may withdraw its approval for a Planned outage by notifying members at least 24 hours in advance in order to ensure the adequacy of reserves or the reliability of the PJM RTO

Forecasted Planned/ Planned Outage

- A Planned Outage Extension is the extension beyond the originally estimated completion date which can only be used in instances when the original scope of work requires more time to complete than originally scheduled, and not when unexpected problems or delays are encountered
  - The request for a Planned Outage Extension must be submitted via eDART at least 48 hours before the end date of the outage

Maintenance Outages

- Maintenance outages may occur throughout the year, have flexible start dates, are much shorter than Planned outages, and have a predetermined duration established at the start of the outage
  - A Maintenance outage is an outage that may be deferred beyond the next weekend
  - The duration of a Maintenance outage is generally unlimited except during the PJM Peak Period Maintenance *(PPM) Season, during which approved Maintenance outages will be limited to a maximum duration of 9 consecutive days, 5 weekdays plus the included weekends
    - The Weekend Period is defined from Friday at 2200 hrs. to Monday at 0800 hrs.

* Peak Period Maintenance (PPM) shall be defined as those weeks containing the 24th through the 36th Wednesdays of a calendar year. Each such week shall begin on a Monday and end on the following Sunday, except for the week containing the 36th Wednesday, which shall end on the following Friday

Maintenance Outages

- A Maintenance outage Extension is an extension beyond the originally estimated completion date which can only be used in instances when the original scope of work requires more time to complete than originally scheduled
  - Not when unexpected problems or delays are encountered
  - The request for a Maintenance outage Extension must be submitted before the original end date
- Maintenance outages submitted inside of 3 days from start will be placed in “Pending Evaluation” status
  - “Pending Evaluation” does not mean outage is denied – it means outage is under evaluation, in order to confirm reserve maintenance margins, and evaluate local reliability issues
- If a Maintenance outage is extended beyond 9 days in PPM season, it becomes an “Unplanned” outage

Unplanned Outages

- In case of an Unplanned Outage, members are expected to do the following:
  - Advise PJM of the Unplanned Outage suffered or anticipated as promptly as possible, provide a verbal notification to the PJM Generation Dispatcher
  - Provide PJM with the expected date and time that the resource will be made available
  - Make and submit to PJM a record of the events and circumstances giving rise to the Unplanned outage using eDART
  - Cannot be submitted longer then 72 hours in advance
- An unplanned outage will also affect the EFORd

EFORD Calculation

Forced Outage Rate Calculation

The Equivalent Demand Forced Outage Rate ("EFORD") shall be calculated as follows:

$$EFORD\ (\%) = \{(ff * FOH + fp * EFPOH) / (SH + ff * FOH)\} * 100$$

Where

ff = full outage factor

fp = partial outage factor

FOH = full forced outage hours

EFPOH = equivalent forced partial outage hours

SH = service hours

Unavailability due to Transmission Outage

- If all or a portion of a generation resource is made unavailable due to a transmission facility outage
  - the Generation Owner shall submit an outage request corresponding to the timeframe that the generation resource will be made unavailable due to the transmission facility outage
  - this requires a high level of coordination between the GO/MOC, TO, and PJM in order to fully be able to study the impact this can have on the reliability of the system

Value of Generation Resource

Calculated Based on Unforced Capacity (UCAP)

Unforced Capacity Value of Unit X = **SUMMER** Installed Capacity (ICAP) Rating * **(1 – EFORd*)**

For Example:

96 MW = 100 MW * **(1 – .04)**

Unforced Capacity Value For Unit X = 96 MW

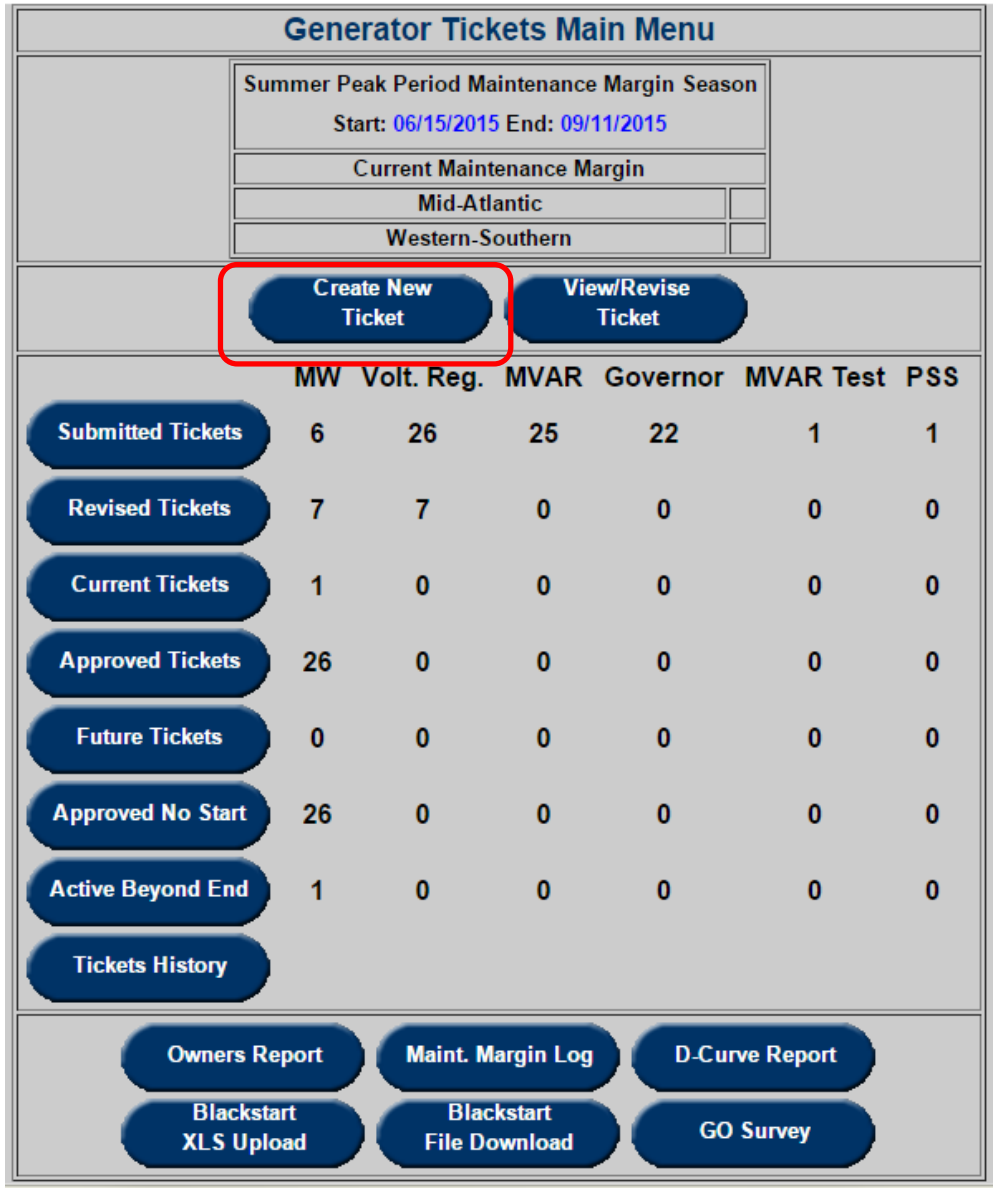
**EFORd = Equivalent Forced Outage Rate*

Creating a Generation Ticket

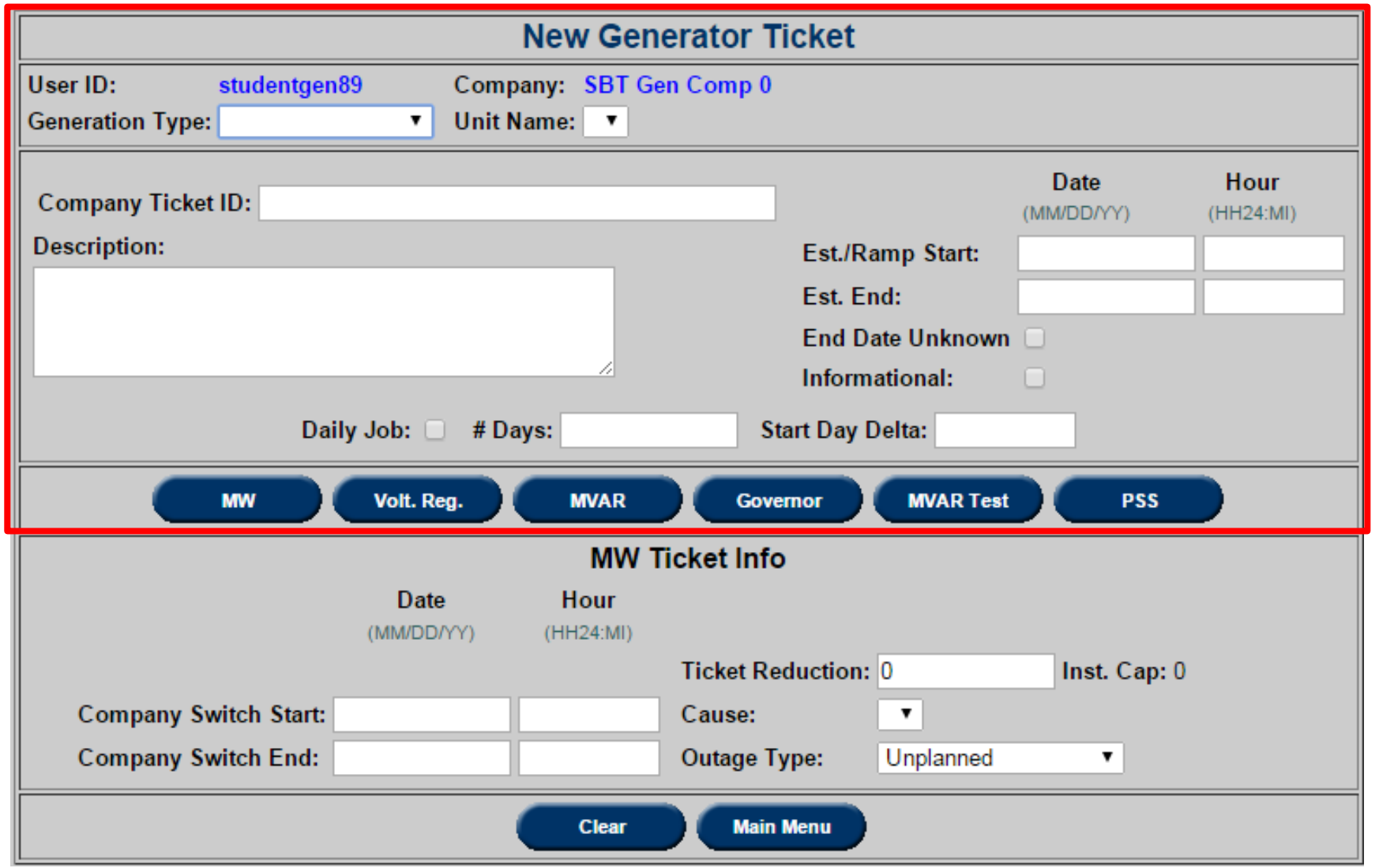
- PJM Members can request outages via the Gen. Ticket eDART tool
  - All outage requests are analyzed together, and PJM only rejects outage requests when they affect the reliability of the PJM RTO
  - It is the responsibility of each PJM Member to determine its own best outage schedule
  - Outage requests are honored by PJM on a first-come first-serve basis

Creating a Generation Ticket

- Tickets can be created for six types of Generator outages:
  - Generator Megawatt (MW) Outages
  - Voltage Regulator Outages
  - MVAR Capability Changes
  - Governor Outages
  - MVAR Test
  - Power System Stabilizer (PSS) Outages



Creating a Generation Ticket



Ticket Fields

- **The User and Company Fields** are system generated tags identifying the ticket's submitter and which company the user represents

- **Generation Type:** The generation type includes the options Combined Cycle, Diesel/CT, Diesel/CT (small unit), Geothermal, Hydro, Hydro – pumped storage, Nuclear, Nug, Solar, Fossil/Steam and Wind and refers to the method of generation the unit uses

Ticket Fields

- **Unit Name:** Select unit from the drop-down menu based on the type already selected
- **Company Ticket ID:** Optional field for the company's internal application ticket number, the ticket's submitter should review their own company policy to see if they should utilize this field
- **Description:** Brief work description. In Unplanned outages and Emergency cases, this field should always provide information on the circumstance resulting in the outage

Ticket Fields

- **Est. /Ramp Start**: Proposed ticket start date and time. All times should be entered in MM/DD/YY and HH24:MI (or 24 hour “military” style time). Ramp Start times are designed mainly for larger units, which could take hours to come off line

- **Est. End**: Proposed ticket end date and time. Mandatory for “Forecasted Planned” and “Maintenance” outages

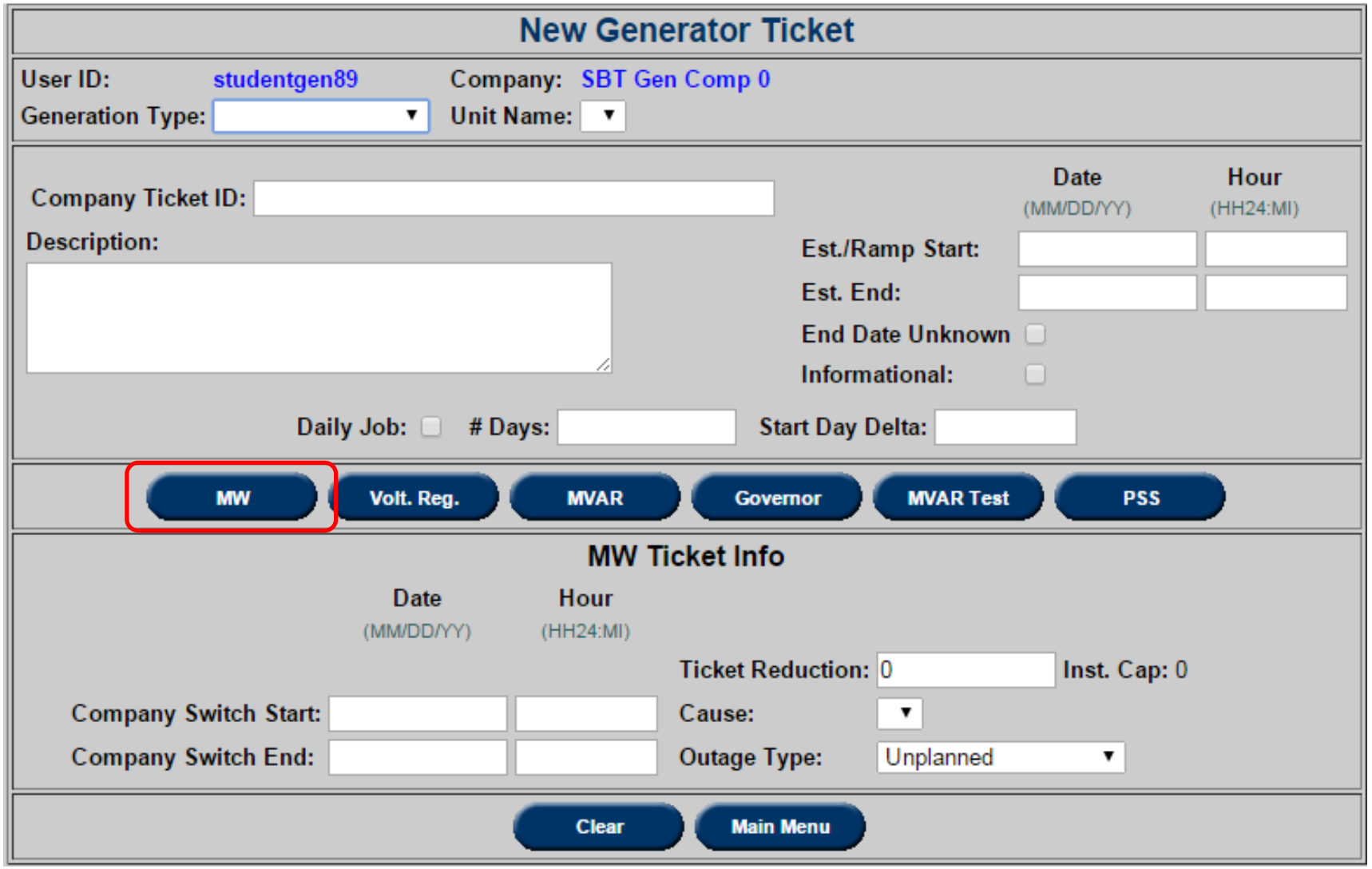
- **End Date Unknown**: Can only be selected for “Unplanned” MW outages, or for MVAR “New Default” tickets

Ticket Fields

- **Informational:** Indicates that outage is “Info-only” (MW Reduction = 0)
  - Only valid for Maintenance outages
- **Daily Job**: Check this box to designate whether a ticket will be a multiple day, multiple ticket outage
- **# Days**: Enter the total number of days of labor require for the job
- **Start Day Delta**: Enter the number of days separating each day of labor. If the job will occur on consecutive days, enter “1”

Outage Ticket Types

Creating a MW (Real Power) Ticket



MW Ticket Fields

- **Company Switch Start Date and Hour:** Actual outage start date and time. Cannot be before the Est./Ramp Start time or 2 hours later than the Est./Ramp Start time
- **Company Switch End Date and Hour:** Actual outage End date and time. Must be entered no later than 2 hours after the Est. End time
- **Ticket Reduction:** MW Reduction value. Cannot be zero for non-Informational tickets. Can be negative only if the “Cause” is Ambient Air and the “Outage Type” is Maintenance
- **Inst. Cap.:** Installed capacity for the unit selected on the ticket
- **Cause:** Reason for outage. Cannot be “Not Applicable.” If cause is “Other,” it is necessary to provide more information in the Description
- **Outage Type:** Unplanned, Maintenance or Forecasted Planned

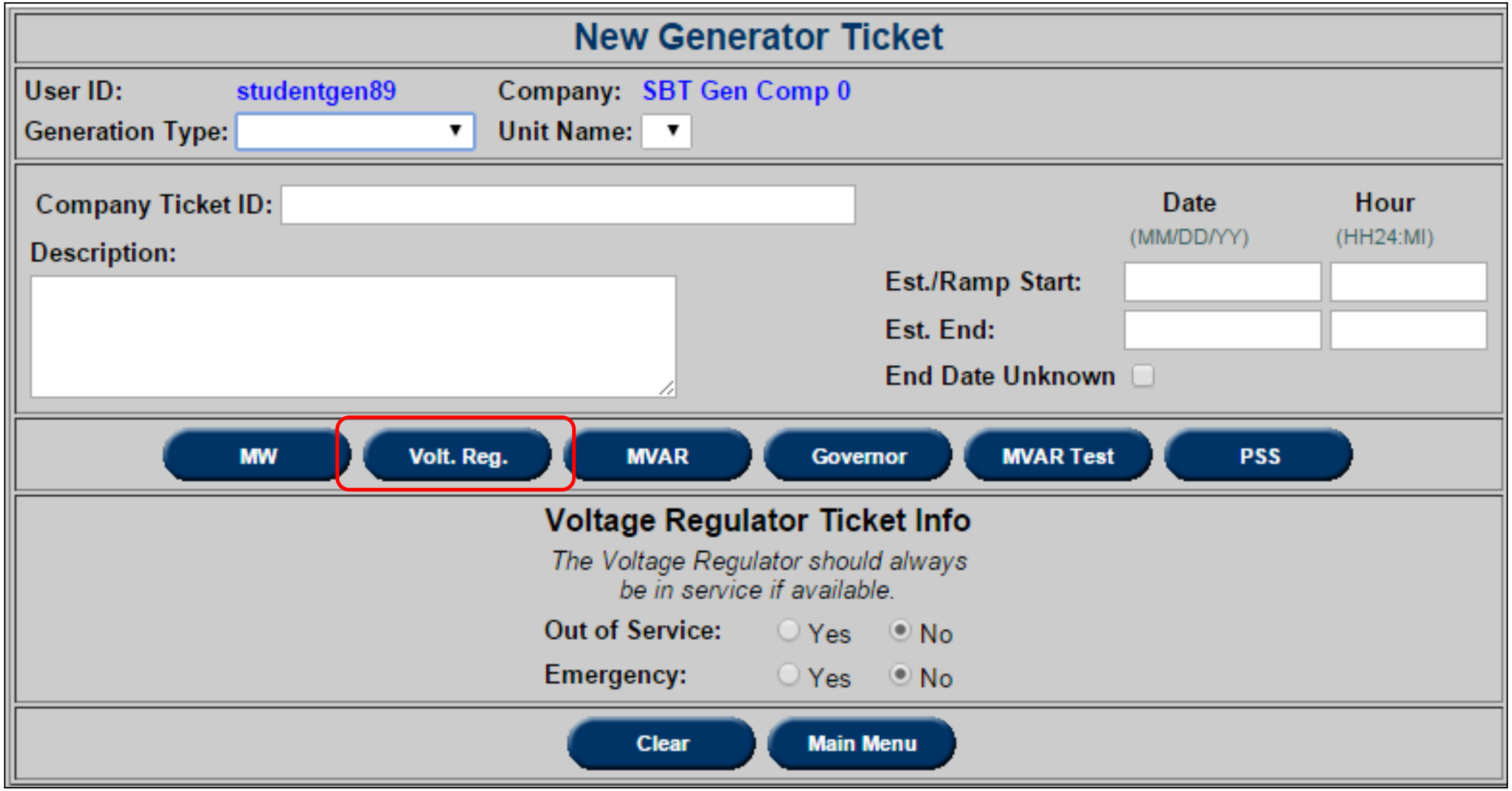
Cause Types

The following cause types are available for Generator MW tickets:

- Voltage Regulator, MVAR, Governor, MVAR Test, and PSS tickets do not have a corresponding cause type

Cause ID Description		
-1 N/A	21 Fuel Problem	44 Transmission Line
1 Air Heater	22 Fuel System	45 Transmission Problem
2 Annual Inspections	23 General Maintenance	46 Tube Leak
3 Annual Inspections/Refuel	24 Ground Problem	47 Turbine Repair
4 Boiler Feed Pumps	25 Inspections	48 Turning Gear
5 Boiler Work	26 Mill Problem	49 Unit Trip
6 Breaker Problems	27 Mill Work	50 Unknown
7 Breaker Work (Maintenance)	28 No Fuel	51 Vibrations
8 Chemistry Problem	29 Opacity	52 Water Chemistry
9 Clean Intakes	30 Other	53 Wicket Gate
10 Coal Feeder	31 Precipitator	54 Ambient Air (Ambient Conditions)
11 Condenser System	32 Pump Work/Problem	55 Brush Inspection
12 Diver Safety	33 Rampdown	56 Deslag
13 Electrical	34 Rod Pattern Adjustments	60 Ambient Conditions (Auto App.)
14 Emissions	35 Rod Swap	61 Turbine Deposits
15 Engine Repair	36 SCRAM Test	62 Intake Screens
16 Engine Work	37 Start Failure	63 High Pressure Heaters
17 Environmental	38 Substation/Yard	64 Valve Test/Work
18 Fan Problem	39 Testing	65 Cranking Diesel
19 Fan Work	41 Transformer Problems	66 Black Start Auxiliary Equipment
20 Feed Pump	42 Transformer Work	67 Cold Weather Preparation Exercise

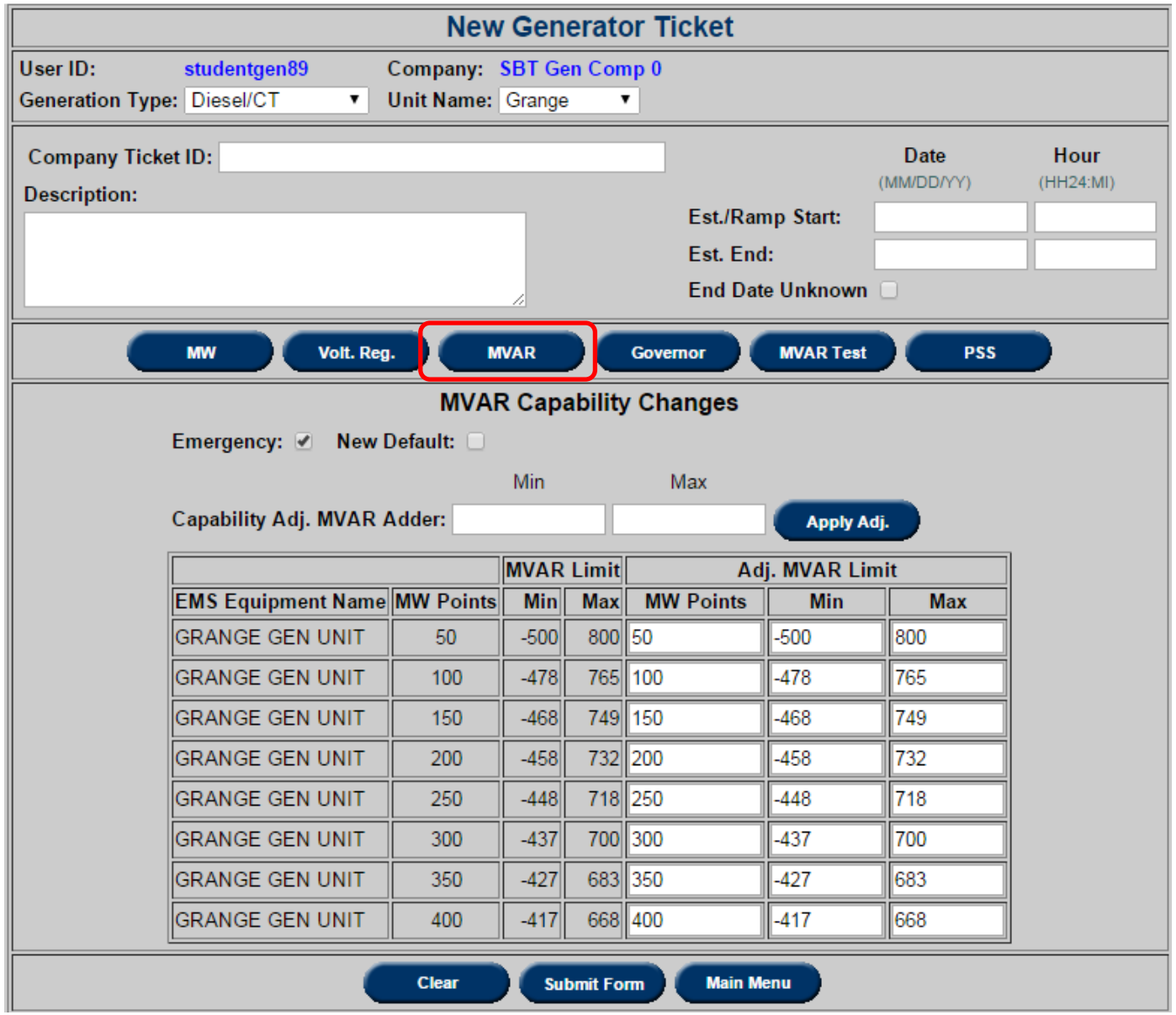
Creating a Voltage Regulator Ticket



Voltage Regulator Ticket Fields

- **Out of Service:** Indicates if the Voltage Regulator is Out of Service
- **Emergency:** Indicates if it is an Emergency outage

Creating a MVAR (Reactive Power) Ticket



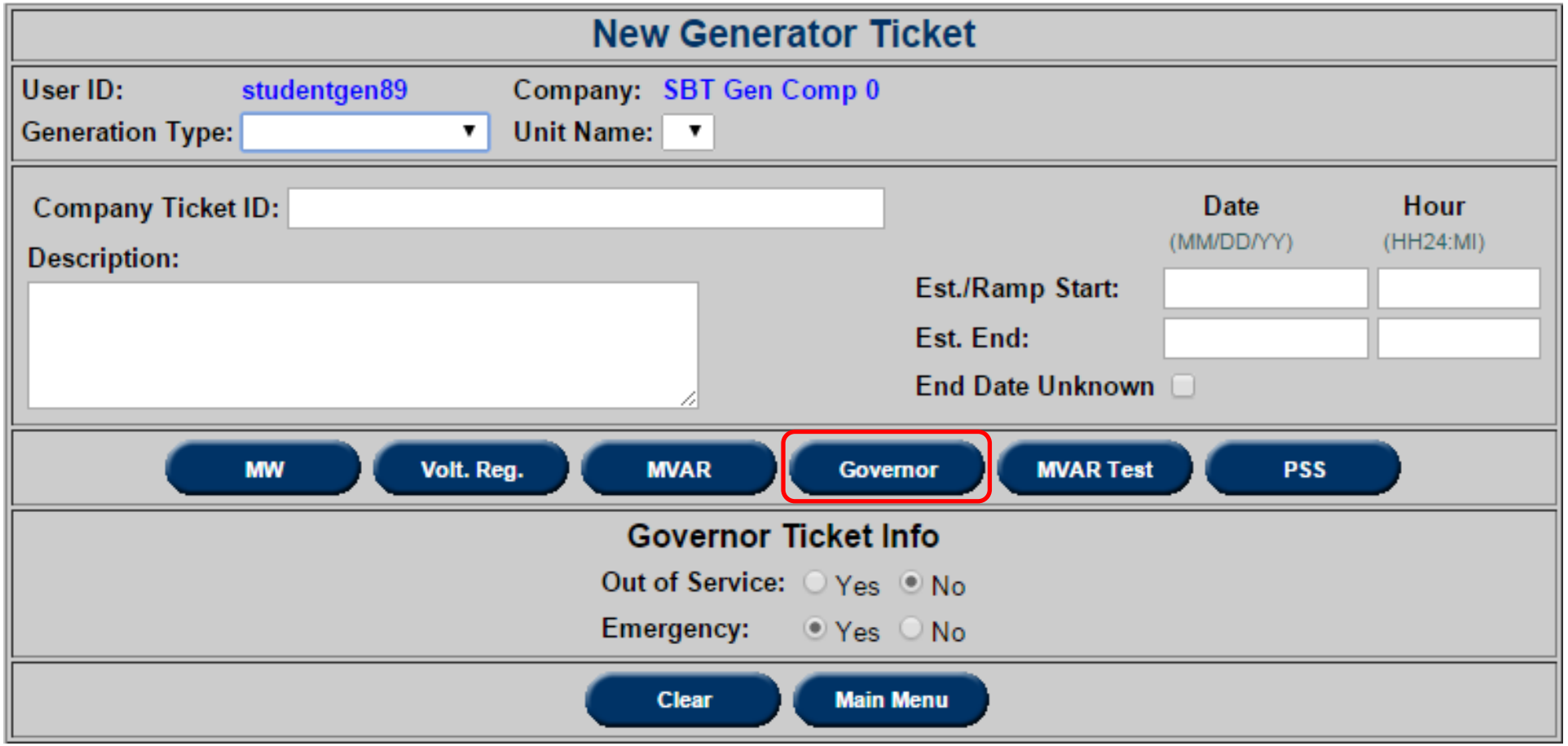
MVAR Ticket Fields

- **Emergency:** Indicates if it is an Emergency outage. Only applies if the change was unplanned
- **New Default:** Indicates that the change to the D-curve is permanent and will be used as the default going forward
- **Capability Adj. MVAR Adder:** Add or subtract a value from all entries at once rather than changing values individually to shift the entire D-curve
- **Max:** MVAR Max values should decrease or stay constant as MW Point value increases
- **Min:** MVAR Min values should increase or stay constant as MW Point value increases

MVAR Ticket Fields

- **Apply Adj.:** Apply adder value to MVAR values
- **MVAR Limit:** The Min and Max columns under MVAR Limit display the existing minimum and maximum values respectively
- **Adjusted MVAR Limit:** The MW points and the Min and Max columns under the Adjusted MVAR Limit field display the new values after the adder is applied

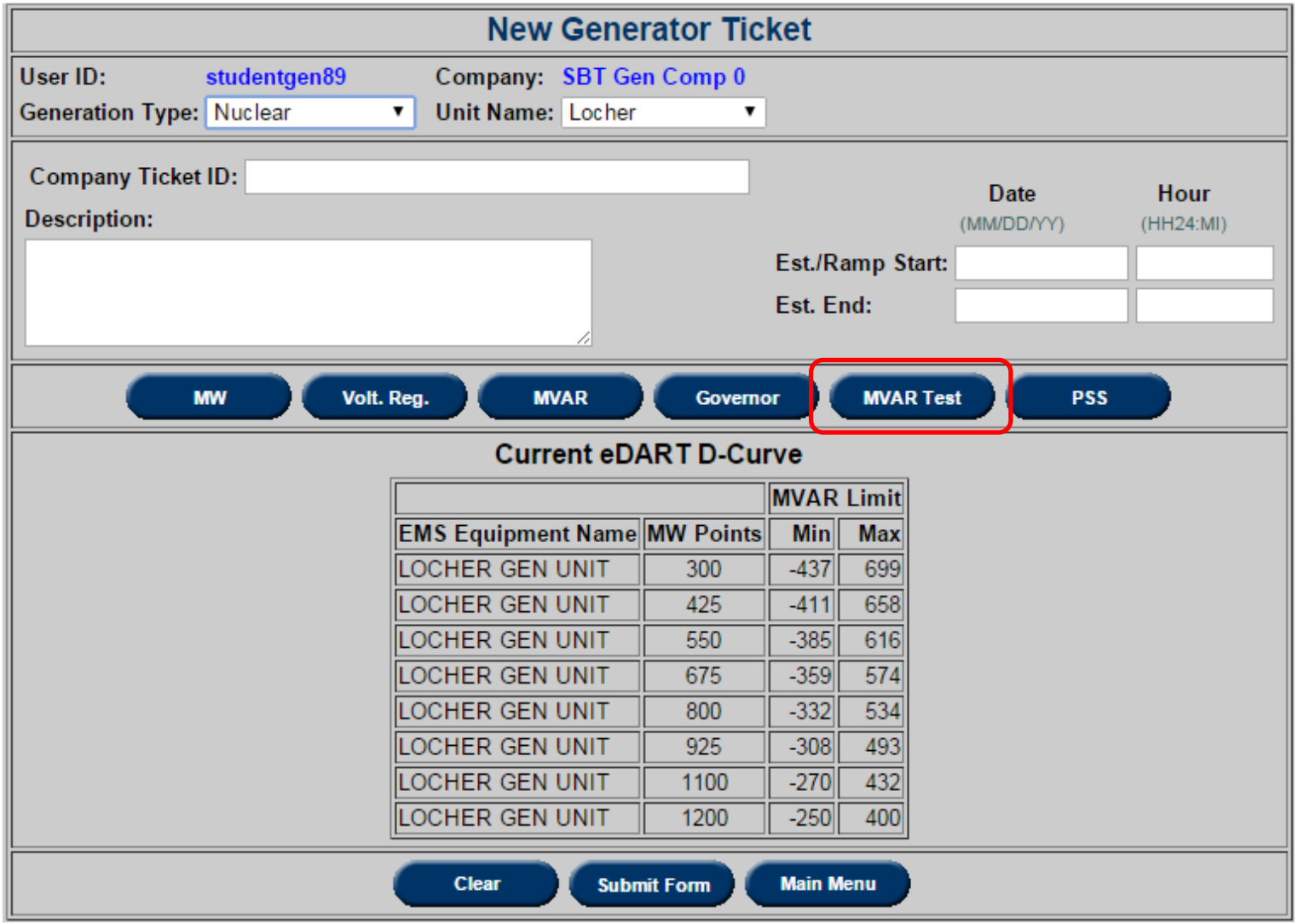
Creating a Governor Ticket



Governor Ticket Fields

- **Out of Service:** Use this field to indicate if the governor is Out of Service
- **Emergency:** Use this field to indicate if it is an Emergency outage

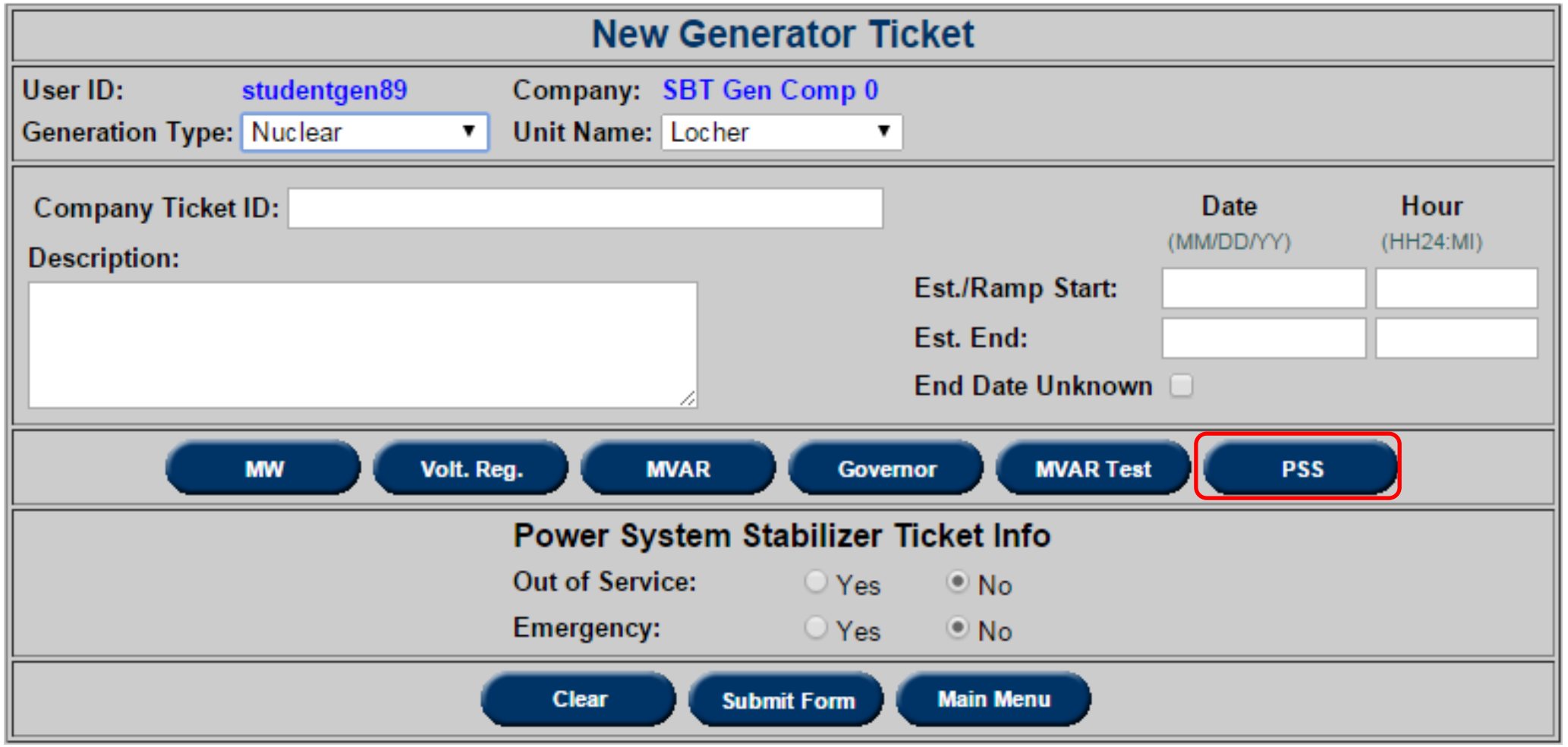
Creating a MVAR Test (Reactive Power Test) Ticket



MVAR Test Ticket Fields

- **Current eDART D-curve:** This table displays the current D-Curve data for reference

Creating a Power System Stabilizer (PSS) Ticket

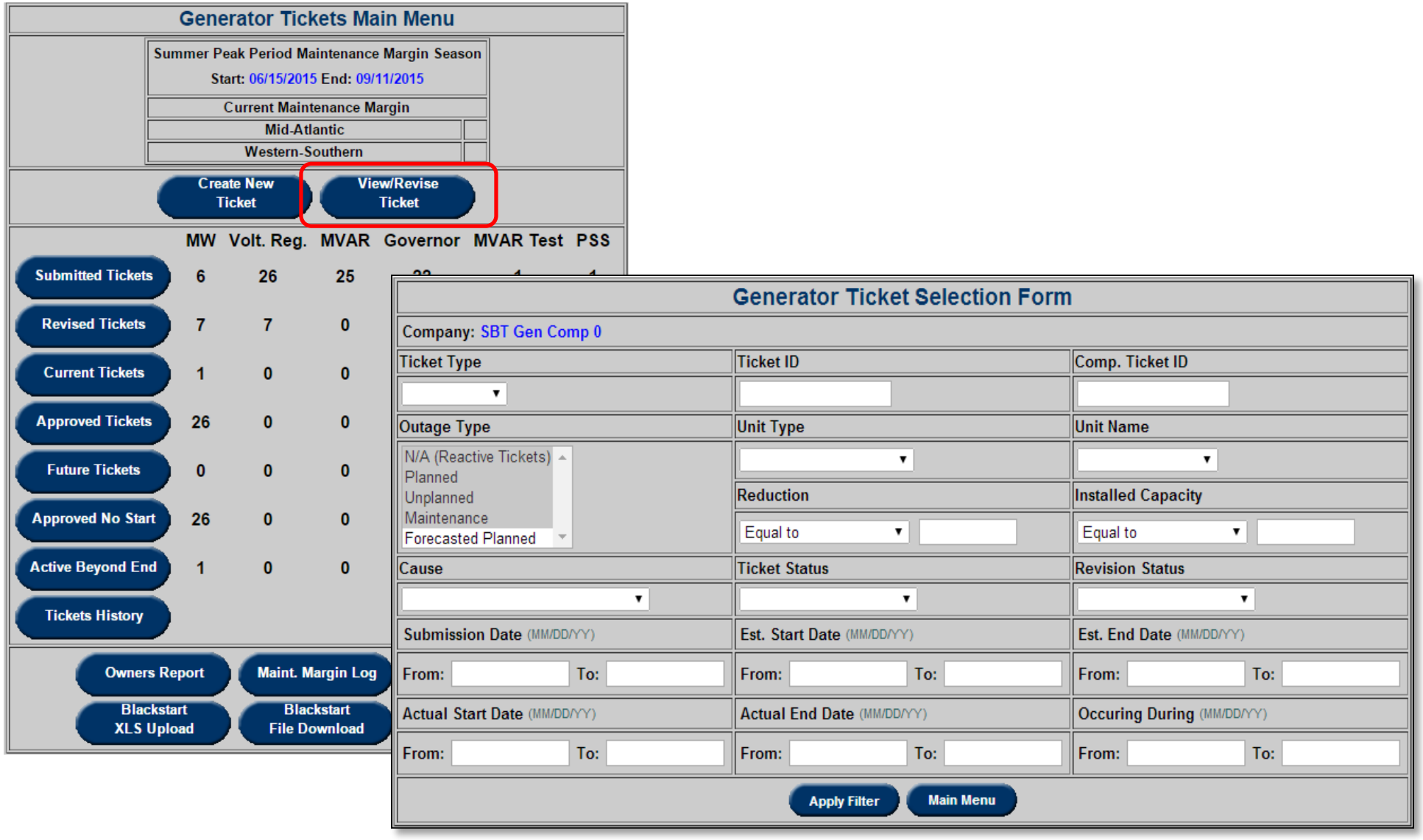


PSS Ticket Fields

- **Out of Service:** Use this field to indicate if the PSS is Out of Service
- **Emergency:** Use this field to indicate if it is an Emergency outage

Revising Tickets and Ticket Status

View/Revise a Generation Ticket



View/Revise a Generation Ticket

Generator Tickets

Apply Sorting | Go to Filter

Ticket ID	Comp.Ticket ID	Ticket Type	Outage Type	Submittal Date	Unit Name	MW Reduction	Status
1							
973174		MW	Unplanned	02/12/2014	External 2	24	Approved
975820		Governor	N/A	08/01/2014	External 3		Submitted
975821		MVAR	N/A	08/01/2014	External 4		Submitted
975822		MVAR Test	N/A	08/01/2014	External 1		Submitted
975823		PSS	N/A	08/01/2014	Amus		Submitted
975824		Volt. Reg.	N/A	08/01/2014	Locher		Submitted

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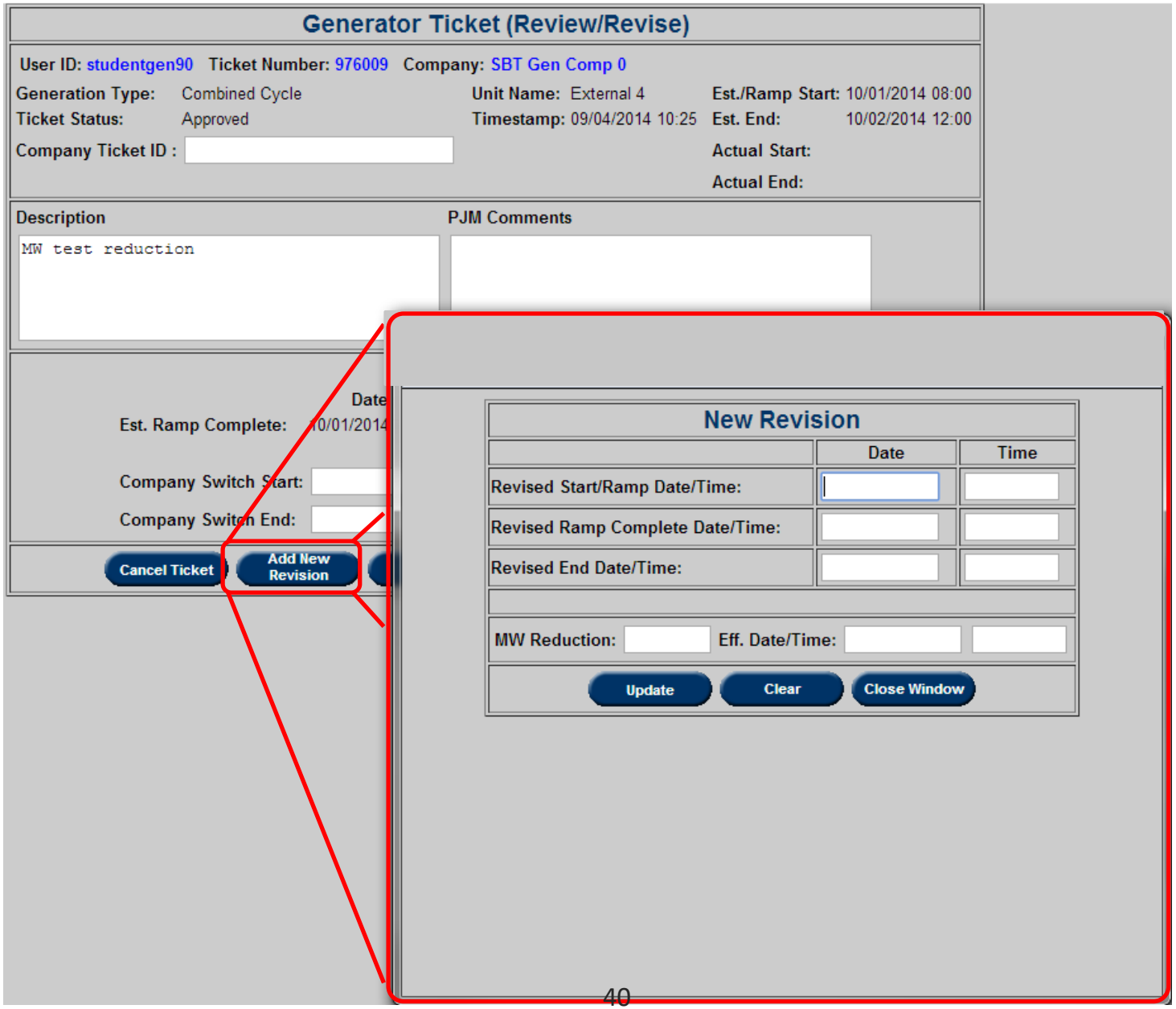
View/Revising a MW (Real Power) Ticket



View/Revising a MW (Real Power) Ticket

Generator Ticket (Review/Revise)

User ID: studentgen90 Ticket Number: 976009 Company: SBT Gen Comp 0

Generation Type: Combined Cycle
Unit Name: External 4
Est./Ramp Start: 10/01/2014 08:00
Ticket Status: Approved
Timestamp: 09/04/2014 10:25
Est. End: 10/02/2014 12:00
Company Ticket ID :
Actual Start:
Actual End:

Description: MW test reduction

PJM Comments:

MW Ticket Info

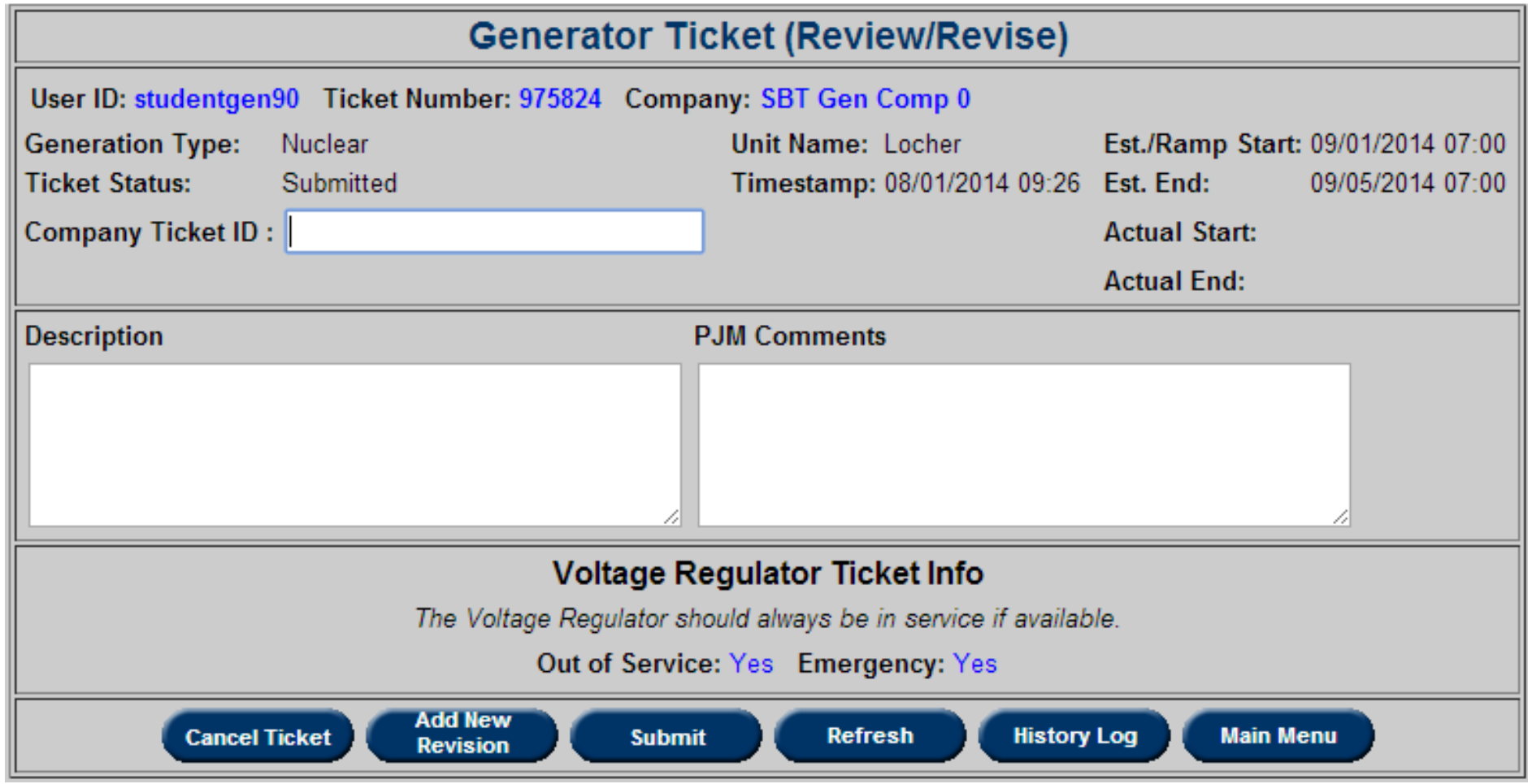
	Date	Time		
Est. Ramp Complete:	10/01/2014	13:00	Ticket Reduction: 100 Installed Cap: 500	
			Informational:	No
Company Switch Start:			Cause:	Boiler Feed Pumps
Company Switch End:			Outage Type:	Unplanned

Cancel Ticket | Add New Revision | Submit | Refresh | History Log | Main Menu

Revisions

Rev. ID	User ID	Rev. Start Date Time	Rev. Ramp Complete Date Time	Rev. End Date Time	MW Reduction	Eff. Date Time	Rev. Status	Timestamp
1260883	studentgen90				80	09/04/2014 13:54	Approved	09/04/2014 10:33
1260882	studentgen90				120	09/04/2014 13:35	Submitted	09/04/2014 10:32

View/Revising a Voltage Regulator Ticket



eDART Ticket Status

- **Submitted:** This is the original status of the ticket upon submittal
- **Approved:**
  - **MW Ticket** – The ticket status is changed to Approved by PJM upon review and approval
  - **Reactive Ticket** – The ticket status is changed to Received by PJM upon receipt of this type of ticket by PJM PD. The status is displayed as Approved on the menu
- **Active:** The ticket status is changed to Active upon input of an actual outage "start" date by PJM
- **Complete:** The ticket status is changed to Complete upon input of an actual outage "end" date by PJM
- **Pending Evaluation:** Maintenance Outages submitted with less than three days notice will get this status, in order for PJM to confirm reserve maintenance margins, and evaluate local reliability issues

eDART Ticket Status

- **Denied:**
  - **MW Ticket** – The ticket status is changed to Denied by PJM upon review and denial
  - **Reactive Ticket** – The ticket status cannot be changed to Denied
- **Cancelled by Company:** The ticket status is changed to Cancelled by Company if the company initiates cancellation of the ticket.
  Note: A verbal notification to PJM is required if the change affects current or the next operating day
- **Cancelled by PJM:** The ticket status is changed to Cancelled by PJM if PJM initiates cancellation of the ticket. A verbal notification is given to the company

Questions?

PJM Client Management & Services

Telephone: (610) 666-8980

Toll Free Telephone: (866) 400-8980

Website: 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