

# NERC

NORTH AMERICAN ELECTRIC  
RELIABILITY CORPORATION

# Inverter Group Performance

GADS Solar Training - Module 7

May 2024

**RELIABILITY | RESILIENCE | SECURITY**

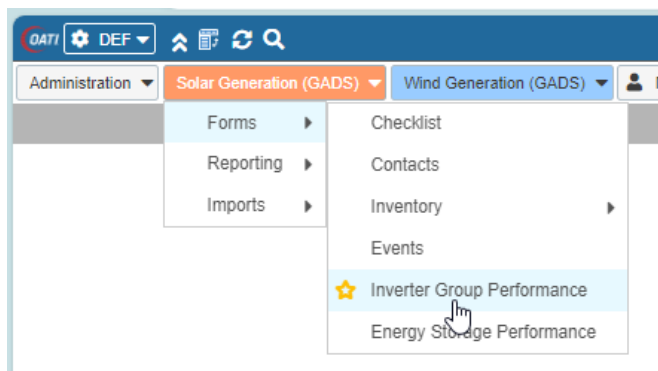


- Concepts
- Add Inverter Group Performance
- Performance Update
- Validations Concepts
- Export, correct, and reimport
- Inverter Group Performance Import (Excel)
  - Append, Update, Full Replace

- All graphics (screen shots) in this presentation are courtesy of Open Access Technology International (OATI), Inc.

## Inverter Group Performance – User Interface

- Login to the NERC GADS OATI Wind and Solar Portal
- Click on Solar Generation (GADS)
- Hover over Forms and then click Inverter Group Performance

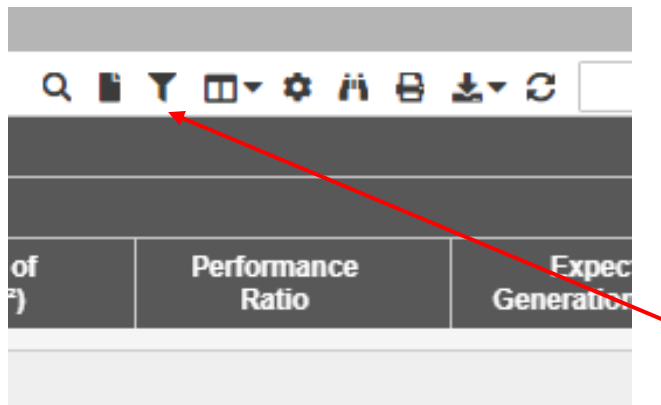


- A list of Inverter Group performance records (if any) will appear

The screenshot shows the 'Inverter Group Performance' page in the NERC GADS OATI interface. The page title is 'Inverter Group Performance'. Below the title is a table with the following structure:

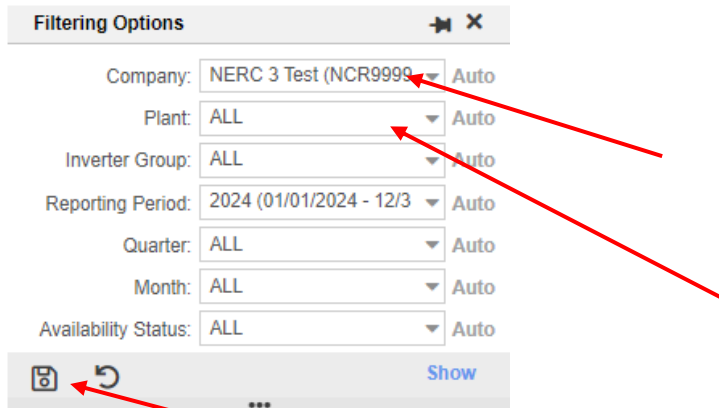
Company			Plant	
Company Name	NERC ID	Region	Plant ID	Plant Name

- You can edit the existing inverter group performance information by clicking on an inverter group performance record or you can create a new record
- You may need to filter (top right of screen) for a certain company and plant before adding a new event

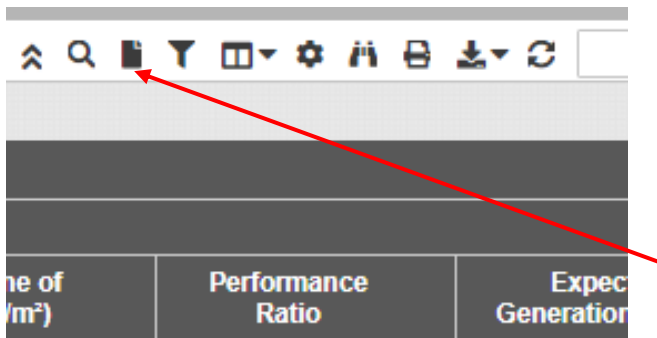


- Click the filter icon to select a company and plant

- Select a company from the filter and click the floppy disc icon to filter



- Select the new icon to create a new plant



- The following screen will appear
- Let's look closer at each section

**Inverter Group Performance**

**General Information**

**Entity**  
 NERC ID: NCR99997  
 Company: NERC 3 Test  
 Region: Non North America

**Service Date**  
 Reporting Year: 2024  
 Reporting Month:

**Plant Info**  
 Plant ID:   
 Plant Name:

**Inverter Group Info**  
 Inverter Group ID:   
 Inverter Group Name:   
 Inverter Availability Status:

**Performance Details**

Expected Generation (EG):  MWh      Net Maximum Capacity (MMC):  MW      Monthly Plane of Array (MPOA):  kWh/m<sup>2</sup>  
 Gross Actual Generation (GAG):  MWh      Net Actual Generation (NAG):  MWh      Performance Ratio:

**Performance Hours**

**Active Inverter Hours**

Total Active Inverter Hours (AIH):  hrs

	Available Inverter Hours	Unavailable Inverter Hours
<b>Daytime Inverter Hours</b>	Active Solar Inverter Hours (ASIH): <input type="text"/> hrs Service Inverter Hours (SIHD): <input type="text"/> hrs	Forced Outage (FOIHD): <input type="text"/> hrs Maintenance (MIHD): <input type="text"/> hrs Planned (PIHD): <input type="text"/> hrs Resource Unavailable (RUIHD): <input type="text"/> hrs Reserve Shutdown (RSIH): <input type="text"/> hrs
<b>Nighttime Inverter Hours</b>	Service Inverter Hours (SIHN): <input type="text"/> hrs	Forced Outage (FOIHN): <input type="text"/> hrs Maintenance (MIHN): <input type="text"/> hrs Planned (PIHN): <input type="text"/> hrs Resource Unavailable (RUIHN): <input type="text"/> hrs

**Inactive Inverter Hours**

Inactive Reserve (RIH):  hrs      Mottoballed (MBIH):  hrs      Retired (RIH):  hrs



- The NERC ID, company, and region are populated because this company was chosen in the filter

— General Information —

<b>Entity</b> NERC ID: NCR99997 Company: NERC 3 Test Region: Non North America	<b>Service Date</b> Reporting Year: 2024 Reporting Month: * Please select one... <b>1</b>
<b>Plant Info</b> Plant ID: * Please select one... <b>2</b> Plant Name: * Please select one...	<b>Inverter Group Info</b> Inverter Group ID: * Please select one... <b>3</b> Inverter Group Name: * Please select one...
Inverter Availability Status: * Please select one... <b>4</b>	

1. Select the reporting month from the picklist
2. Select the plant ID from the picklist or select the plant name from the picklist
3. Select the inverter group ID from the picklist or select the inverter group name from the picklist
4. Select the inverter group status from the picklist

- This part of the screen is for performance details entry

**Performance Details**

Expected Generation (EG):  MWh

Gross Actual Generation (GAG):  MWh

Net Maximum Capacity (NMC):  MW

Net Actual Generation (NAG):  MWh

Monthly Plane of Array (MPOA):  kWh/m<sup>2</sup>

Performance Ratio: \*

1. Enter the expected generation (MWh) expected at the data point level and rolled up to the inverter group
2. Enter the gross actual generation (MWh) for the inverter group. This is the sum of the AC inverter outputs for the group. Gross generation can be zero (0) but cannot be negative.
3. Enter the net maximum AC generating capacity (MW) at the inverter group boundary.
4. Enter the net actual generation (MWh) recorded at the inverter group boundary (usually the revenue meter). Net generation can be negative.
5. Enter the monthly plane of array value of solar radiation (MWh/square meter)
6. Enter the performance ratio for the month. See the Solar GADS Data Reporting Instructions Table 4.2.

- This part of the screen is for active performance hours entry

**Performance Hours**

**Active Inverter Hours**

Total Active Inverter Hours (AIH):  hrs

Available Inverter Hours	
Daytime Inverter Hours	Active Solar Inverter Hours (ASIH): <input type="text" value="2"/> hrs Service Inverter Hours (SIHD): <input type="text" value="3"/> hrs
Nighttime Inverter Hours	Service Inverter Hours (SIHN): <input type="text" value="4"/> hrs

1. Enter the total active solar inverter hours
2. Enter the active solar inverter hours daytime
3. Enter service inverter hours daytime
4. Enter the service inverter hours nighttime

- This part of the screen is for active performance hours entry

Unavailable Inverter Hours	
Daytime Inverter Hours	Forced Outage (FOIHD): <input type="text"/> hrs <b>1</b>
	Maintenance (MIHD): <input type="text"/> hrs <b>2</b>
	Planned (PIHD): <input type="text"/> hrs <b>3</b>
	Resource Unavailable (RUIHD): <input type="text"/> hrs <b>4</b>
	Reserve Shutdown (RSIH): <input type="text"/> hrs <b>5</b>
Nighttime Inverter Hours	Forced Outage (FOIHN): <input type="text"/> hrs <b>6</b>
	Maintenance (MIHN): <input type="text"/> hrs <b>7</b>
	Planned (PIHN): <input type="text"/> hrs <b>8</b>
	Resource Unavailable (RUIHN): <input type="text"/> hrs <b>9</b>

- Enter the forced outage inverter hours daylight
- Enter the maintenance outage inverter hours daylight
- Enter the planned outage inverter hours daylight
- Enter the resource unavailable inverter hours daylight
- Enter the reserve shutdown inverter hours
- Enter the forced outage inverter hours nighttime
- Enter the maintenance outage inverter hours nighttime
- Enter the planned outage inverter hours nighttime
- Enter the resource unavailable inverter hours nighttime

- This part of the screen is for inactive performance hours entry

The screenshot shows a form titled "Inactive Inverter Hours" with three input fields. The first field is labeled "Inactive Reserve (IRIH):" and contains the number "1". The second field is labeled "Mothballed (MBIH):" and contains the number "2". The third field is labeled "Retired (RIH):" and contains the number "3". Each field is followed by the unit "hrs".

1. Enter the inactive reserve inverter hours
2. Enter the mothballed inverter hours
3. Enter the retired inverter hours
4. Press the save button (floppy disk icon) on the bottom left of screen when all information has been entered

## Inverter Group Performance – Excel Template

## Inverter Group Performance

Inverter Plant ID	Inverter Group ID	Reporting Period (Month)	Reporting Year	Inverter Group Availability Status	Gross Actual Generation (GAG)	Net Actual Generation (NAG)	Net Maximum Capacity (NMC)
1	2	3	4	5	6	7	8

- Remember the pop-up windows provide helpful information

1. Enter your assigned plant ID
2. Enter your assigned inverter group ID
3. Enter the number of the month
4. Enter the reporting year
5. Select the inverter group availability status from the picklist
6. Enter the gross generation for the inverter group. This is the sum of the AC inverter outputs for the group. Gross generation can be zero (0) but cannot be negative.
7. Enter the net generation recorded at the inverter group boundary (usually the revenue meter). Net generation can be negative.
8. Enter the maximum AC generating capacity at the inverter group boundary.

Monthly Plane of Array	Performance Ratio	Expected Generation	Active Solar Inverter Hours	Active Inverter Hours	Inactive Reserve Inverter Hours	Mothballed Inverter Hours	Retired Unit Inverter Hours
1	2	3	4	5	6	7	8

- Remember the pop-up windows provide helpful information
1. Enter the monthly plane of array value of solar radiation (MWh/square meter)
  2. Enter the performance ratio for the month. See the Solar GADS DRI Table 4.2.
  3. Enter the expected generation (MWh) expected at the data point level and rolled up to the inverter group
  4. Enter the number of inverter-hours from sunrise to sunset for the month
  5. Enter the number of inverter-hours that the inverter group was in an active state for the month
  6. Enter the number of inverter-hours that the inverter group was in an inactive reserve state for the month being reported
  7. Enter the number of inverter-hours that the inverter group was in a mothballed state for the month being reported
  8. Enter the number of inverter-hours that the inverter group was in a retired state for the month being reported



Service Inverter Hours Day	Reserve Shutdown Inverter Hours	Forced Outage Inverter Hours Day	Maintenance Inverter Hours Day	Planned Inverter Hours Day	Resource Unavailable Inverter Hours Day
1	2	3	4	5	6

- Remember the pop-up windows provide helpful information
1. Enter the number of inverter-hours that the inverter group is synchronized to the grid during daylight hours for the month being reported
  2. Enter the number of inverter-hours that the inverter group is off-line for economic reasons but available for service during daylight hours for the month being reported
  3. Enter the number of inverter-hours that the inverter group is off-line for forced events during daylight hours for the month being reported
  4. Enter the number of inverter-hours that the inverter group is off-line for maintenance events during daylight hours for the month being reported
  5. Enter the number of inverter-hours that the inverter group is off-line for planned events during daylight hours for the month being reported
  6. Enter the number of inverter-hours that the inverters are available but not producing electricity for environmental conditions outside the operating specification of the solar inverter during daylight hours.

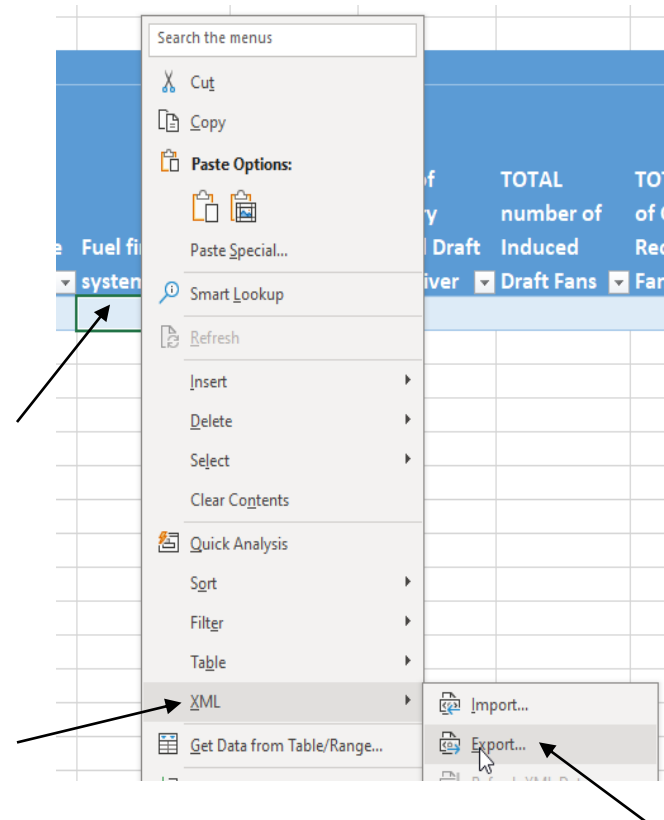
Service Inverter Hours Day	Reserve Inverter Hours	Shutdown Inverter Hours	Forced Outage Inverter Hours Day	Maintenance Inverter Hours Day	Planned Inverter Hours Day	Resource Unavailable Inverter Hours Day
1	2	3	4	5	6	

- Remember the pop-up windows provide helpful information
1. Enter the number of inverter-hours that the inverter group is synchronized to the grid during daylight hours for the month being reported
  2. Enter the number of inverter-hours that the inverter group is off-line for economic reasons but available for service during daylight hours for the month being reported
  3. Enter the number of inverter-hours that the inverter group is off-line for forced events during daylight hours for the month being reported
  4. Enter the number of inverter-hours that the inverter group is off-line for maintenance events during daylight hours for the month being reported
  5. Enter the number of inverter-hours that the inverter group is off-line for planned events during daylight hours for the month being reported
  6. Enter the number of inverter-hours that the inverters are available but not producing electricity for environmental conditions outside the operating specification of the solar inverter during daylight hours.

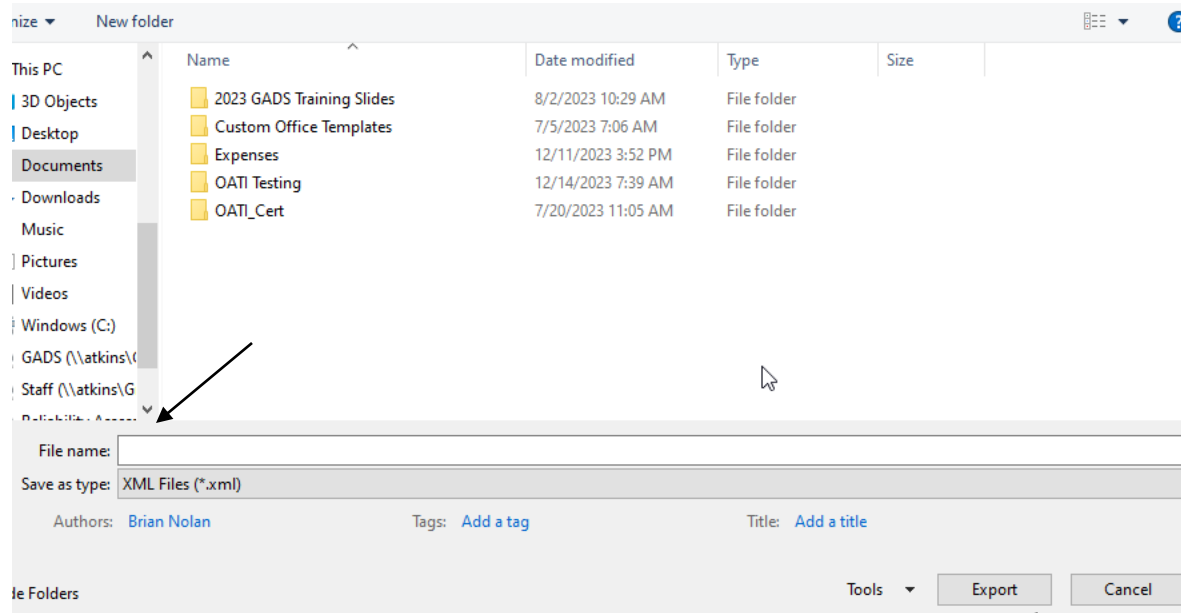
Service Inverter Hours Night	Forced Outage Inverter Hours Night	Maintenance Inverter Hours Night	Planned Inverter Hours Night	Resource Unavailable Inverter Hours Night
1	2	3	4	5

- Remember the pop-up windows provide helpful information
1. Enter the number of inverter hours that the inverter group is synchronized to the grid between sunset of the current day and sunrise of the next day for the month
  2. Enter the number of inverter hours that the inverter group is off-line for forced events between sunset of the current day and sunrise of the next day for the month
  3. Enter the number of inverter hours that the inverter group is off-line for maintenance events between sunset of the current day and sunrise of the next day for the month being reported
  4. Enter the number of inverter hours that the inverter group is off-line for planned events between sunset of the current day and sunrise of the next day for the month
  5. Resource Unavailable Inverter Hours Night are like Resource Unavailable Inverter hours Day except that it uses hours from sunset on the current day until sunrise on the next day as the period to find resource unavailable hours. See Table 4.2 in the GADS Solar Data Reporting Instructions.

- You are now ready to export your Inverter Group performance data file to OATI
- Save your Excel template to a place of your choosing
- Next create the XML file for an Inverter Group Performance Record
  - Make sure that you are on the “Group Performance” worksheet tab
  - Right click a cell somewhere on a row of data on the “Group Performance” worksheet
  - Select XML from the popup menu
  - Select export from the popup menu

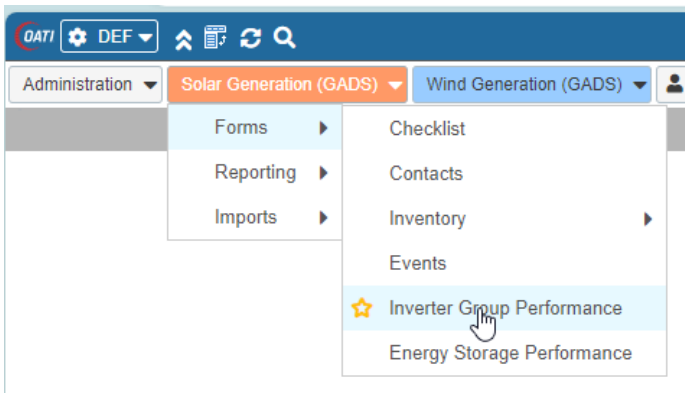


- Name the file, select where you want the file saved, and press the export button



- Make note of your file name and where you saved it

- Next import the XML file into the OATI system
  - Log into the OATI Solar GADS system
  - Navigate to the appropriate menu item on the Solar interface
    - Click on SOLAR Generation (GADS) on the top menu ribbon
    - Click Forms and then Inverter Group Performance in the dropdown menu



Administration | Solar Generation (GADS) | Wind Generation (GADS) | My Settings

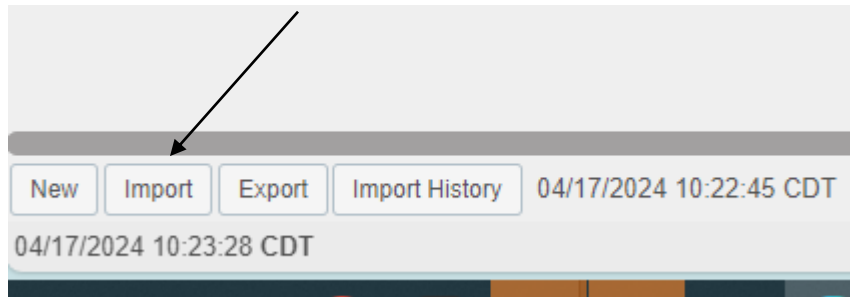
Inverter Group Performance

Filtered By: Company: NERC 3 Test (NCR99997 | NERC 3 Test) Reporting Period: 2024 (01/01/2024 - 12/31/2024)

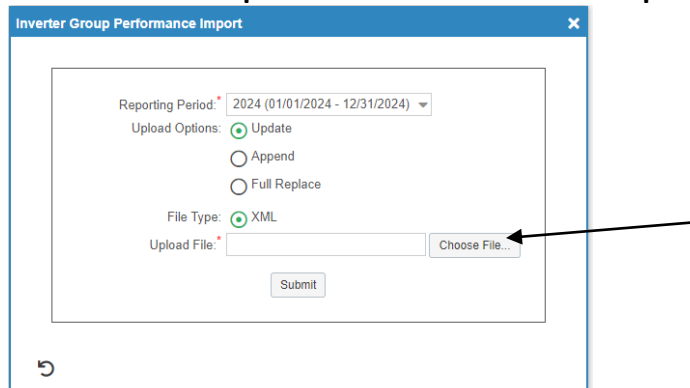
Company			Plant		Inv
Company Name	NERC ID	Region	Plant ID	Plant Name	Inverter Group ID
NERC 3 Test	NCR99997	Other	1000001	test2Plant	2000002

- A list of previously created Inverter Group Performance Records (if any) will appear

- An Import button will appear on the bottom left of the screen

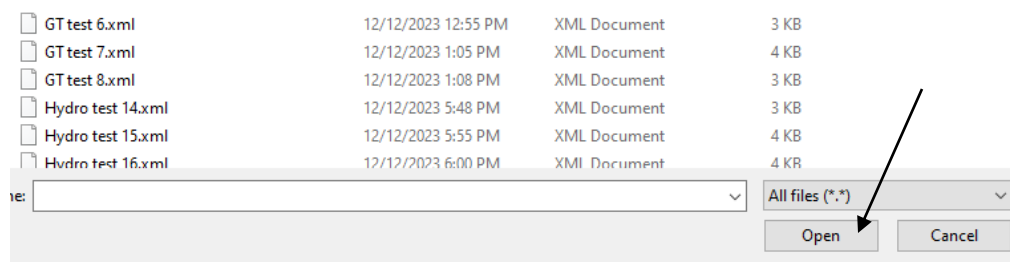


- Press the import button and the popup below will appear

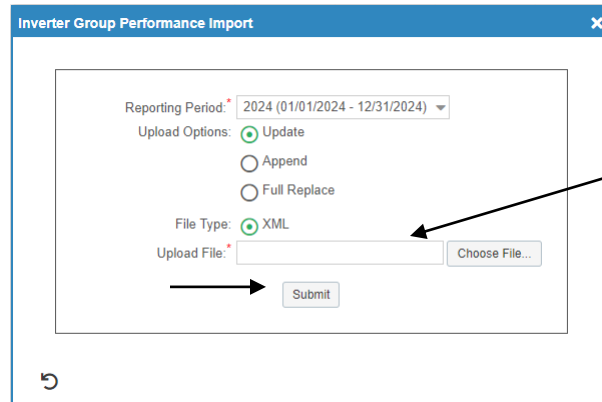


- Click the “Choose File” button on the Inverter Group Performance Import popup and navigate to where you saved your XML file

- Select the file you just created and press the “Open” button



- Click the submit button on the Inverter Group Performance Import popup shown below



File chosen in previous step will appear here

- If you correctly entered the data in your spreadsheet, your Inverter Group performance record should load without issue and is complete.



A stylized map of North America is centered on the page. The map is divided into three horizontal sections by a prominent blue band. The top section, covering Canada, is a light purple color. The middle section, covering the United States, is a dark blue color. The bottom section, covering Mexico, is a light grey color. The blue band across the center contains the title text.

# Questions and Answers