

NERC

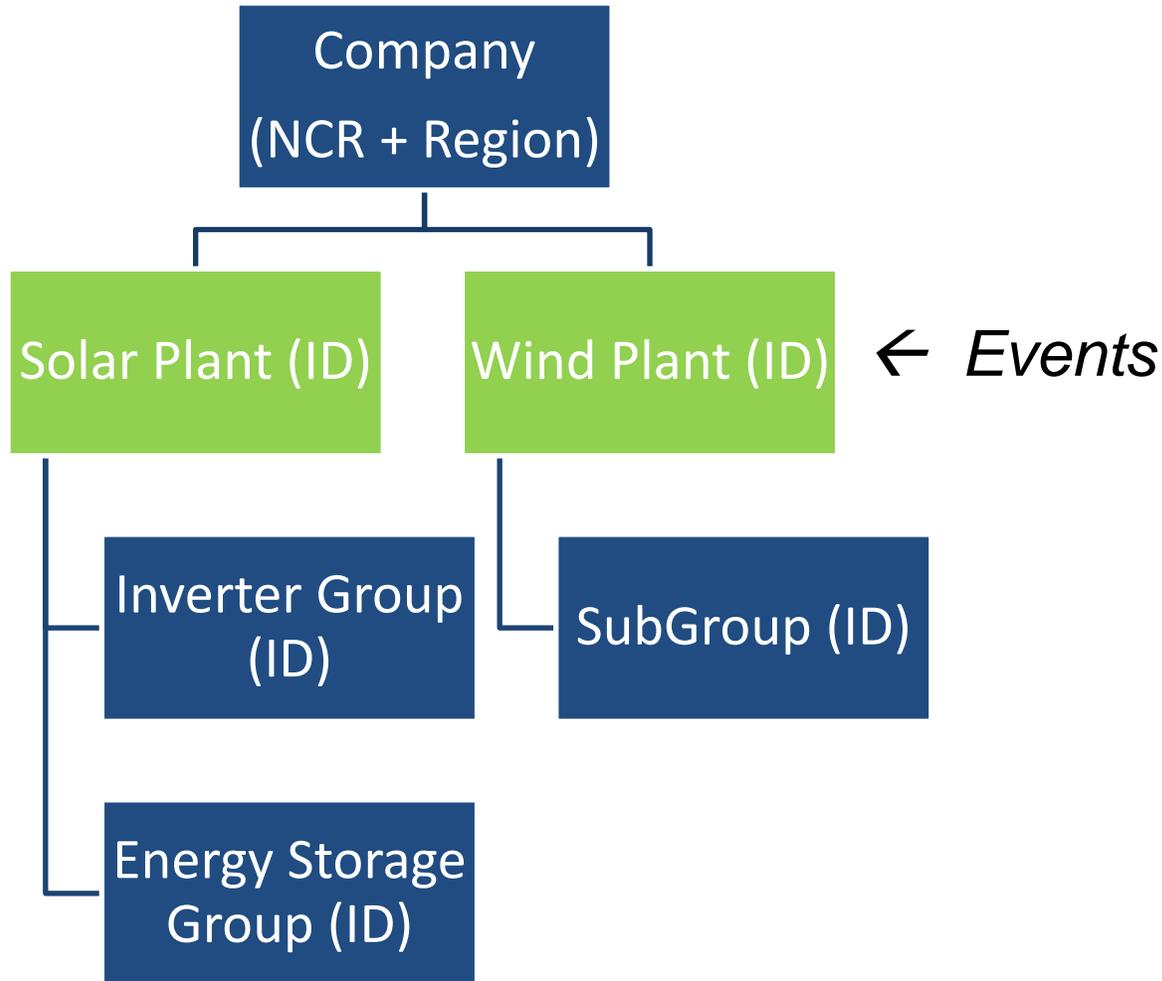
NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

Event Reporting - Plant Level

GADS Wind and Solar Training

NERC GADS Wind and Solar Team
Training for Solar PV and Wind Plants
April 29 – May 1, 2025

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



- Events are reported at the Plant level
- Reported quarterly within 45 days after the end of each quarter

- What is an Event?

Event Criteria

Event Start:

An event starts when there is a loss of at least 20 MW of Plant Total Installed Capacity due to a forced outage. ^(7,8)

Event End:

95% of the Plant Total Installed Capacity that was unavailable due to the forced outage event has been returned to service.

AND

Less than 20 MW of Plant Total Installed Capacity is unavailable due to a forced outage.

- Only Forced Outage Events are Mandatory to report. Planned Outage Events and Maintenance Outage Events are Voluntary.

- Cause codes indicate the equipment that has caused the outage. This could be equipment related, or personnel related.
- For events with multiple causes the most impactful code should be identified as the primary cause, with any other causes reported as additional causes.
- Cause Codes are listed in each Workbook, as well as the Data Reporting Instructions.

| | | | | | | |
|-------|-------------------|---------|-------------------|-------------------|---------------------|--|
| | | | | | | 29090 Physical Security Incident |
| | | | | | | 29091 Physical Security Incident (OMC) |
| | | | | | | 29092 Cyber Security Incident |
| | | | | | | 29093 Cyber Security Incident (OMC) |
| | | | | | | 29100 External Labor Strikes (OMC) |
| | | | | | | 29110 Regulatory-Environmental |
| | Transmission | | Transmission | | | 29300 Transmission (Gen Tie) |
| | Human Performance | | Human Performance | | | 29900 Operator Error |
| | | | | | | 29910 Maintenance Error |
| | | | | | | 29920 Contractor Error |
| | | | | | | 29940 Procedure Error |
| Plant | Group | Storage | Event | Group Performance | Storage Performance | <u>Cause Codes</u> + |

- The Contributing Operating Condition provides context for the conditions which led to the event or outage
- Most of the time, the selection will be “0 – No Contributing Condition”
- If reporting multiple cause codes in the Workbook, the same Contributing Operating Condition should be used for all causes.

- Example: If a plant has a call to stop generating due to extreme weather, such as a Hurricane, then the Hurricane Cause Code can be used since no equipment was directly the cause of the outage. If equipment goes out during a Hurricane, report the Cause Code as the equipment that is out and report the Hurricane as the Contributing Operating Condition.

- For each Inverter or Turbine out of service, multiply the Installed Capacity by the duration of all intervals of it being out of service. Add up the total for all Inverters or Turbines to obtain the total **Potential MWh Production Loss**.
- The duration of the interval used to calculate **Potential MWh Production Loss** should be at the finest granularity available, the maximum observation interval should not exceed 10 minutes.
- Equipment out of service may have different durations due to being out of service or returned to service at different times.

| FE Forms Checklist for 2025 | | | | | |
|-----------------------------|--|------|---------------------|--------|-----------|
| Completed | Name | Form | Status | Reason | Completed |
| | Contacts | | Reviewed | | Yes |
| | Plants | | Reviewed | | Yes |
| | Inverter Groups | | Reviewed | | Yes |
| | Energy Storage | | Needs Review | | No |
| | Events | 1.0 | Awaiting Completion | | No |
| | Quarter 1 | | Awaiting Data | | No |
| | Quarter 2 | | Awaiting Data | | No |
| | Quarter 3 | | Future | | No |
| | Quarter 4 | | Future | | No |
| | Performance - Inverter Group | 2.0 | Awaiting Completion | | No |
| | Quarter 1 | | Awaiting Data | | No |
| | Quarter 2 | | Awaiting Data | | No |
| | Quarter 3 | | Future | | No |
| | Quarter 4 | | Future | | No |
| | Performance - Energy Storage | 3.0 | Awaiting Completion | | No |
| | Quarter 1 | | Awaiting Data | | No |
| | Quarter 2 | | Awaiting Data | | No |
| | Quarter 3 | | Future | | No |

Update Checklist or Completion Status

- Two ways:
 - Fill in workbook tab, or
 - Enter through user interface
- Workbook method
 - Enter data on the event tab and save a copy of the workbook
 - This will make it easier to address errors that need to be corrected
 - **Export** the event data to XML (do not save the workbook as XML)
 - Use the import interface (next slide)
- Interface entry method (see subsequent slides)
- Data will be validated upon import or when attempting to save
- Error messages will be provided, based on the method of data entry

- When entering Multiple Cause Codes for a single event in the **Workbook**, put the *Primary Cause Code* in one row, and any *Additional Cause Codes* in additional rows below the primary row.
- **All other fields remain the same!**
- **This only applies if you are using the templates to create the XML import files.**

| Plant Event | | | | | | | | | | | |
|-------------|----------|------|------------------|------------------|-------|---------------|------|------------------|------------------------|--|----------|
| | | Time | | | Event | Primary Cause | | Additional Cause | Contributing Operating | | |
| Plant ID | Event ID | Zone | Start Date/Time | End Date/Time | Type | Code | Code | Code | Condition | Description | MWH Loss |
| 2111 | | PPT | 01/10/2024 13:05 | 01/20/2024 23:45 | FO | 25310 | | | 4 | Lost communication during strong weather; likely lost plant generation | 100 |
| | | | | | | | | | | external harmonics tripped protection system taking part of the plant down, during outage transmission company reduced MW line due to congestion; when trying to investigate, personnel caused more inverters to trip from service | |
| 2222 | | PPT | 02/28/2024 00:00 | 03/06/2024 01:00 | FO | 23612 | | | 0 | | 3666 |
| | | | | | | | | | | external harmonics tripped protection system taking part of the plant down, during outage transmission company reduced MW line due to congestion; when trying to investigate, personnel caused more inverters to trip from service | |
| 2222 | | PPT | 02/28/2024 00:00 | 03/06/2024 01:00 | FO | | | 29050 | 0 | | 3666 |
| | | | | | | | | | | external harmonics tripped protection system taking part of the plant down, during outage transmission company reduced MW line due to congestion; when trying to investigate, personnel caused more inverters to trip from service | |
| 2222 | | PPT | 02/28/2024 00:00 | 03/06/2024 01:00 | FO | | | 29900 | 0 | | 3666 |
| | | | | | | | | | | external harmonics tripped protection system taking part of the plant down, during outage transmission company reduced MW line due to congestion; when trying to investigate, personnel caused more inverters to trip from service | |

Use Import interface to directly import from XML file

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

Solar Import

Forms

Reporting

Imports

Import

Import History

Reporting Period: * 2025 (01/01/2025 - 12/31/2025)

Upload Options: Update Append Full Replace

File Type: XML

Object Type: * Please select one..

Upload File: * Choose File...

Submit

- Upload Options:
 - Update: use to correct existing records
 - Append: use to import new data
 - Full Replace: USE WITH CAUTION - use to wipe out all data in the system from existing reporting period (current year) and replace with new data

- Clicking the “New” button in the *Events Summary* interface will bring you to the *Events Entry* screen.

The screenshot displays the 'Solar Events Entry' form. At the top, there is a navigation bar with 'Administration', 'Solar Generation (GADS)', 'Wind Generation (GADS)', and 'My Settings'. Below this, the 'Solar Events Entry' tab is active. The form is divided into two main sections: 'General Information' and 'Event Details'. In the 'General Information' section, there are fields for 'NERC ID: NCR99997', 'Company: NERC 3 Test', 'Region: Other', 'Plant ID: Please select one..', and 'Plant Name: Please select one..'. A button labeled 'Adding a New Event' is positioned below these fields. The 'Event Details' section contains fields for 'Event ID', 'Event Type: Please select one..', 'Contributing Operating Condition: Please select one..', 'Primary Cause Code: Please select one...', 'Start Time: [calendar icon] 00:00', 'End Time: [calendar icon] 00:00', and 'Potential Production Loss (MWh)'. A large text area for 'Description (Optional)' is located at the bottom of the form.

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

OATI NERC

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

Solar Events Solar Events Entry

Solar Event Entry

General Information

NERC ID: NCR99997 Plant ID: Please select one..

Company: NERC 3 Test Plant Name: Please select one..

Region: Other

- Select a plant from the picklist or select the plant name from the picklist

- This part of the screen is for event details entry

Event Details

Event ID:

Event Type: 4

Contributing Operating Condition: 5

Primary Cause Code: 7 +

Description (Optional):

Start Time: 2

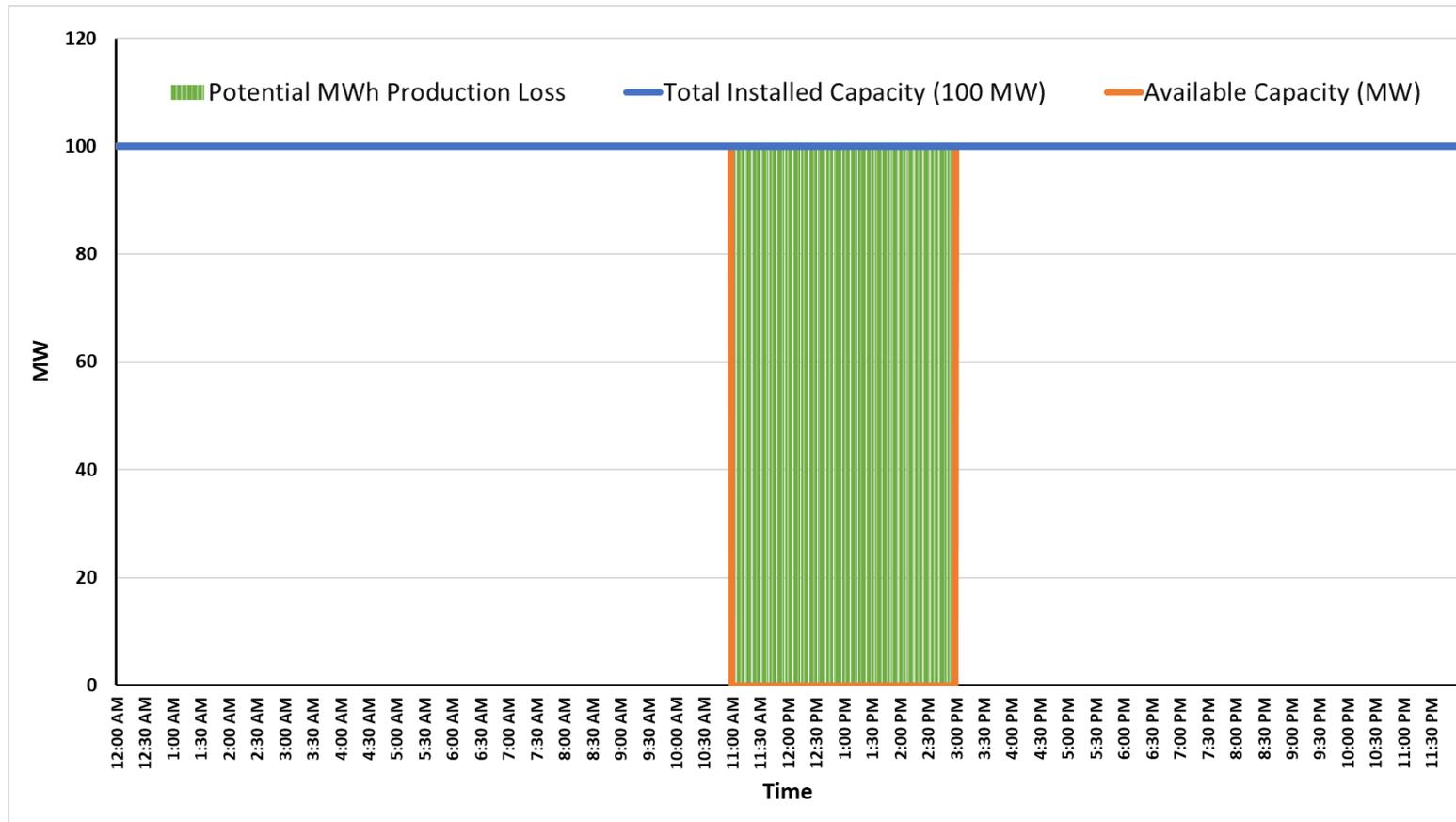
End Time: 3

Potential Production Loss (MWh): 6

- Enter a unique number to identify this event
- Enter the start date and time - mm/dd/yyyy hh:mm (24-hour clock)
- Enter the end date and time - mm/dd/yyyy hh:mm (24-hour clock)
- Select the outage event type from the picklist
- Select the Contributing Operating Condition from the picklist.
- Enter the estimated potential production loss in MWh.
- Select a primary cause code from the picklist. The complete list of codes and descriptions can be found in the GADS Solar Data Reporting Instructions Appendix K.
 - An additional cause code can be added by selecting the “+” sign next to the primary cause code selection
- Enter a good, detailed description. Although the description is optional, NERC cannot assess problems in the industry without this input.
 - Press the save button (floppy disk icon) on the bottom left of screen when all information has been entered

- How to find errors after import
- How to export error file or view list of errors
- How to resolve errors when entering data through the user interface

Transmission failure prevents plant from sending power to the grid. The failure is fixed after four hours.



| Plant ID | Event ID | Time Zone | Start Date/Time | End Date/Time | Event Type | Primary Cause Code | Additional Cause Code | Contributing Operating Condition | Description | MWH Loss |
|----------|----------|-----------|------------------|------------------|------------|--------------------|-----------------------|----------------------------------|--|----------|
| 1010999 | 1899 | CPT | 10/23/2024 11:00 | 10/23/2024 15:00 | FO | 19300 | | 0 | Remote transformer outage, caused plant to be removed from service | 400 |

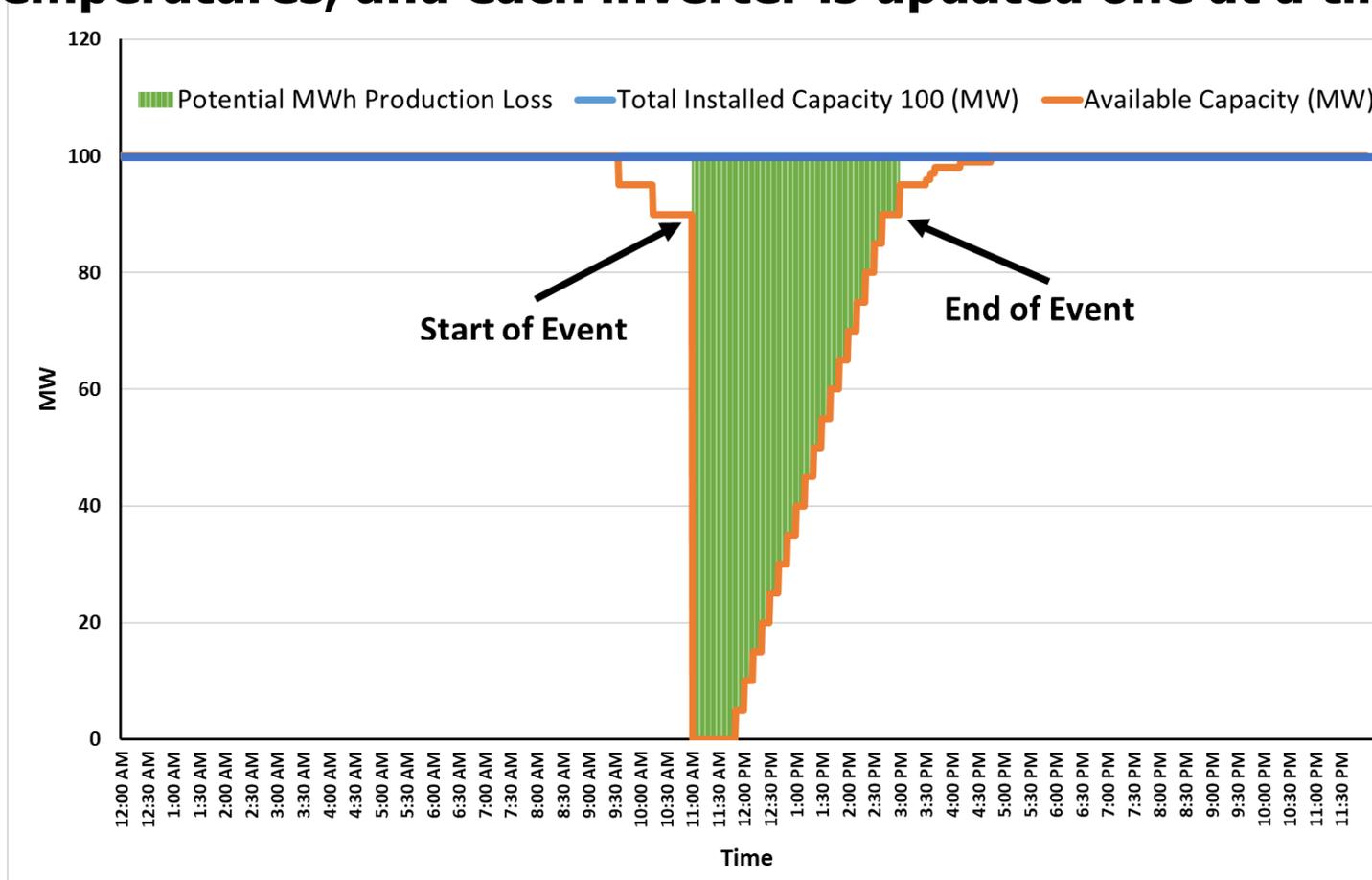
Potential MWh Production Loss Calculation

$$MWh\ Loss = Event\ MW\ Loss \times Event\ Duration$$

$$MWh\ Loss = 100\ MW \times 4\ hours$$

$$MWh\ Loss = \mathbf{400\ MWh\ Loss}$$

Sensors detect low temperatures and start shutting down inverters. At first a few, then the whole plant. A software upgrade allows inverters to work in the lower temperatures, and each inverter is updated one at a time.



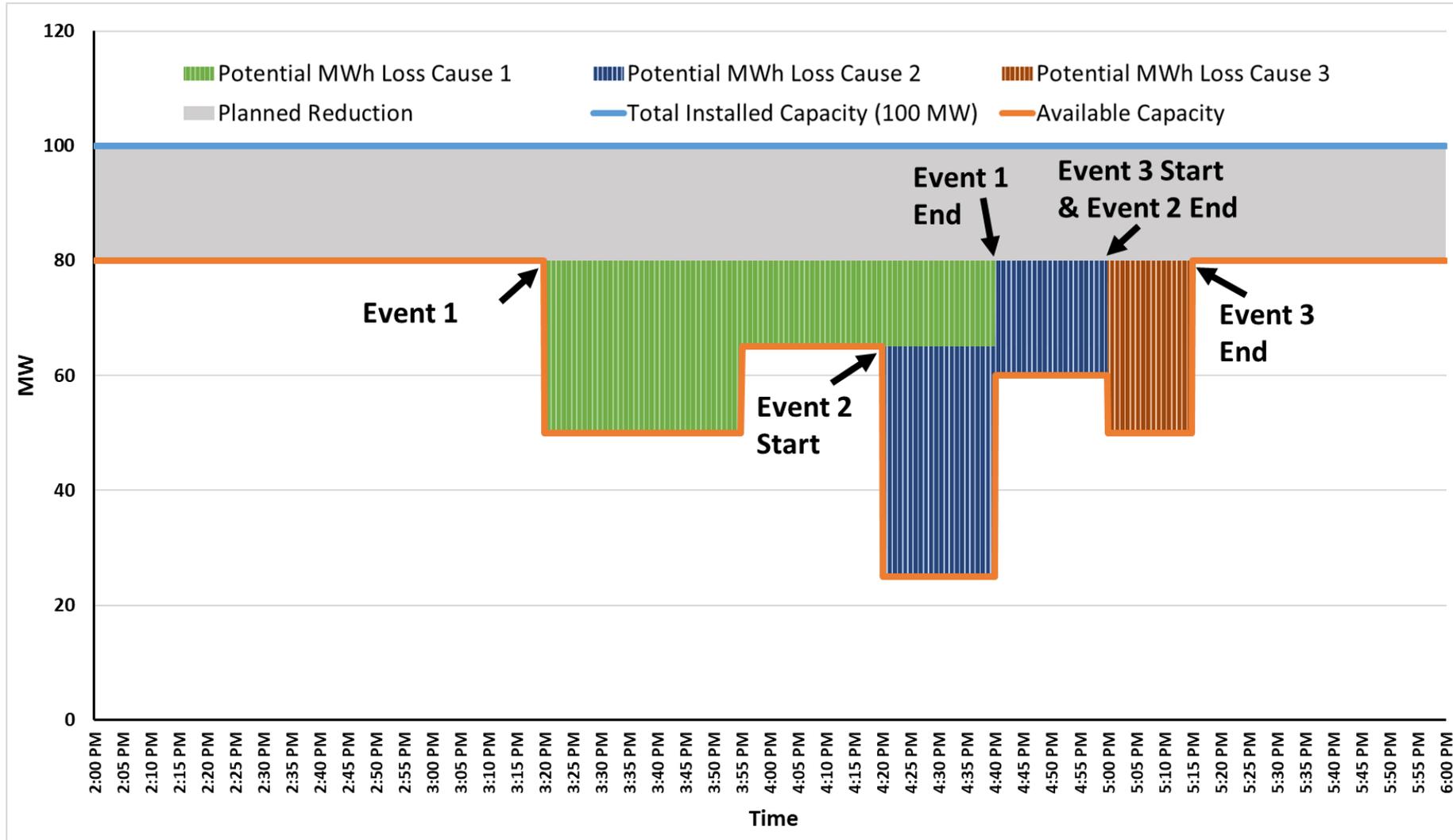
| Plant ID | Event ID | Time Zone | Start Date/Time | End Date/Time | Event Type | Primary Cause Code | Additional Cause Code | Contributing Operating Condition | Description | MWH Loss |
|----------|----------|-----------|------------------|------------------|------------|--------------------|-----------------------|----------------------------------|---|----------|
| 1010999 | 1411 | CPT | 10/23/2024 11:00 | 10/23/2024 15:00 | FO | 15050 | | 9 | Cold weather shut down inverters. However, inverter settings were out of date. Updates allow inverters to run in colder weather. Installed updated settings on each inverter one at a time. | 242 |

* Potential MWh Production Loss calculation is summed for all intervals between the Event Start Date/Time and Event End Date/Time.

- During a summer heat wave, some turbines shut off for protection. At 08:15, the accumulated shutoffs cause a loss of 20 MW of Plant Total Installed Capacity. As the day goes on the number of shutoffs vary, however at 09:40, the Plant Available Installed Capacity reaches its minimum for the event at a loss of 60 MW. At 12:15, 95% of the Plant Total Installed Capacity that was unavailable due to the forced outage, has been returned to service, at which point the event ends.
- Event start: Plant Total Installed Capacity (300 MW) – Start Plant Available Installed Capacity (280 MW) = 20 MW
- Event Nadir: Minimum value for Plant Available Installed Capacity for event = 60 MW
- Event End: End Plant Total Installed Capacity = Plant Total Installed Capacity (300 MW) – (Minimum Plant Available Installed Capacity (60 MW * (1 – 0.095))) = 297 MW
- End Plant Available Installed Capacity = 300 – (60 * 0.05) = 297 MW

- An underground feeder overheats and fails.
- 25 1.5MW turbines are on the failed circuit for a total of 37.5MW.
- At the time of the overheat, 12 additional turbines were down for a maintenance outage
- Event start: 37.5 MW event begins as soon as the overheat is detected.
- Event End: When $37.5 * 0.95 = 24$ turbines that were part of the outage are restored.
- Note the 12 turbines that were on MO are not part of the outage.

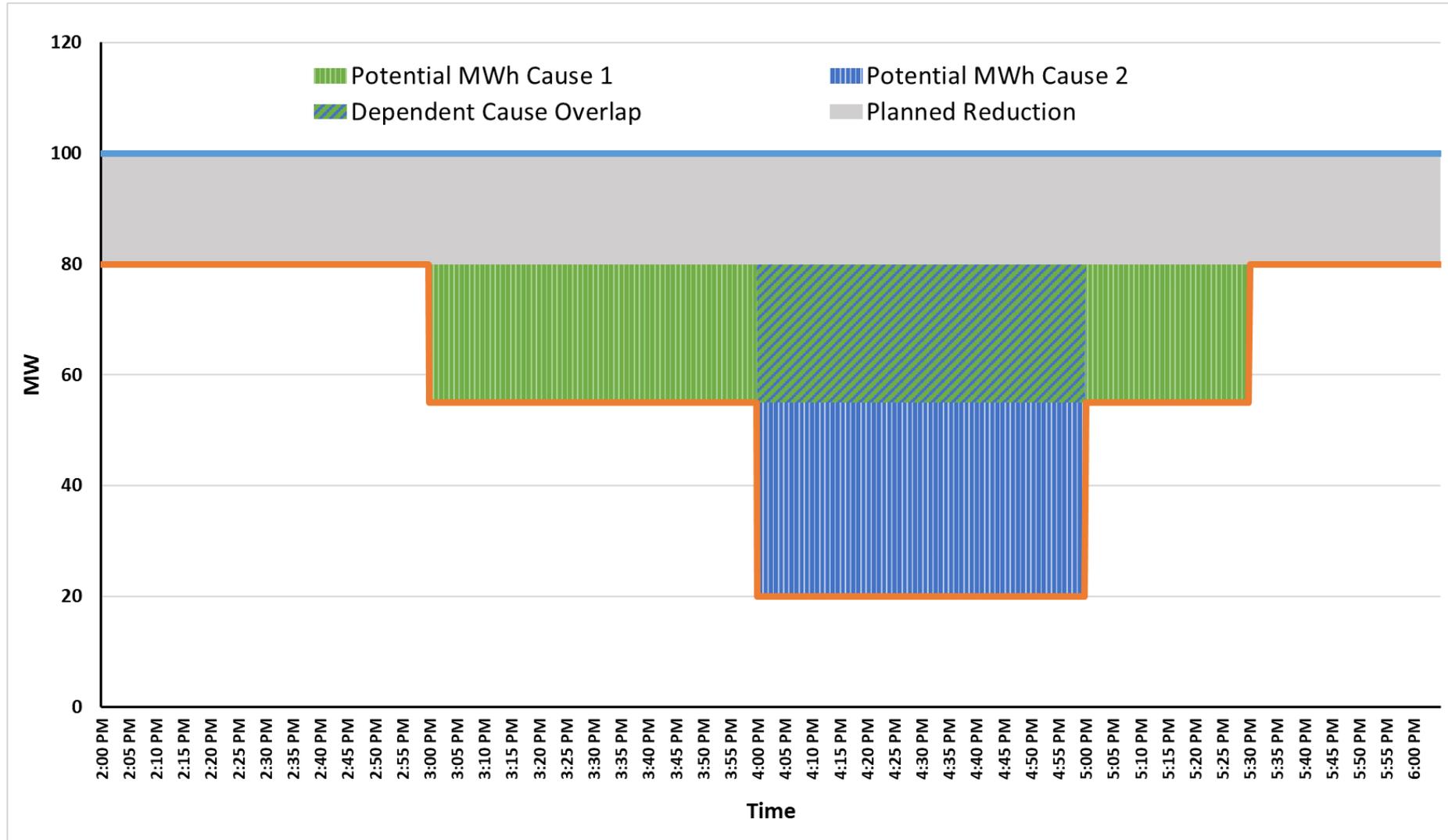
Example 3 Multiple Inverter Outages during Planned Outage



Report format still under development

| Entity ID | Plant ID | Event ID | Time Zone | Event Start Date / Time | Event End Date / Time | Event Type | Cause Code | Contributing Operating Condition | Description | Potential MWh Production Loss* |
|-----------|----------|----------|-----------|-------------------------|-----------------------|------------|------------|----------------------------------|---|--------------------------------|
| 1234 | 5678 | 45 | CPT | 10/23/2023 15:20 | 10/23/2023 16:40 | FO | 24050 | 0 | Section 1 had several inverter rows overheat. | 28.75 |
| 1234 | 5678 | 46 | CPT | 10/23/2023 16:20 | 10/23/2023 17:00 | FO | 25080 | 0 | Section 2 had Cooling failure. | 15.0 |
| 1234 | 568 | 47 | CPT | 10/23/2023 17:00 | 10/23/2023 17:15 | FO | 25110 | 0 | Section 3 had a short circuit in a cabinet which resolved itself quickly. | 7.5 |

* Potential MWh Production Loss calculation is summed for all intervals between *each* Event Start Date/Time and Event End Date/Time



Report format still under development

| Entity ID | Plant ID | Event ID | Time Zone | Event Start Date / Time | Event End Date / Time | Event Type | Cause Code | Contributing Operating Condition | Description | Potential MWh Production Loss* |
|-----------|----------|----------|-----------|-------------------------|-----------------------|------------|------------|----------------------------------|--|--------------------------------|
| 1234 | 5678 | 45 | CPT | 10/23/2023 15:00 | 10/23/2023 17:30 | FO | 24050 | 0 | Section 1 had several inverter rows overheat. | 62.5 |
| 1234 | 5678 | 46 | CPT | 10/23/2023 16:00 | 10/23/2023 17:00 | FO | 23600 | 0 | Transformer 2 failed, causing outage over large part of plant, overlapping some inverters already out due to event 45. | 35.0 |

* Potential MWh Production Loss calculation is summed for all intervals between *each* Event Start Date/Time and Event End Date/Time

- For Events crossing the quarter, it is okay to leave the Event end date/time blank.
- For Events crossing the end of the year, end the event on 1/1 at 00:00 and start a new equivalent event in the new year at 1/1 at 00:00.
- The Potential Production MW loss is calculated separately each year.

- What if part of the plant is already in another outage State?
- How Not to Report
 - Exceeding Plant capacity ratings with MW loss calculation
 - Unhelpful descriptions
- Examples of reporting difficulties? / advanced topics?

- Event begins at 1 PM on 1/15/2025 – Your entire plant goes offline
- At 2 PM on 1/15/2025 – Half the plant comes back
- At 3 PM on 1/15/2025 – The remaining half comes back
- Use any cause codes
- Calculate your Potential MWh losses

- Event begins at 1 PM on 2/15/2025 – Your entire plant goes offline
- At 2 PM on 2/15/2025 – Half the plant comes back
- At 4 PM on 2/15/2025 – The remaining half comes back
- Use any cause codes
- Calculate your MWh losses
- Same event occurs on 2/19/2025 and 3/2/2025

Update Checklist or Completion Status

| | | | | | |
|-----|------------------------------|---|----------------------|-------------------------------------|---|
| 1.0 | Events | | | <input type="checkbox"/> | |
| | Quarter 1 | <input checked="" type="radio"/> No | <input type="text"/> | <input checked="" type="checkbox"/> | |
| | Quarter 2 | <input checked="" type="radio"/> No | <input type="text"/> | <input type="checkbox"/> | |
| | Quarter 3 | <input checked="" type="radio"/> No | <input type="text"/> | <input type="checkbox"/> | |
| | Quarter 4 | <input checked="" type="radio"/> No | <input type="text"/> | <input type="checkbox"/> | |
| 2.0 | Performance - Inverter Group | | | <input type="checkbox"/> | |
| | Quarter 1 | <input type="radio"/> Yes <input checked="" type="radio"/> No | <input type="text"/> | <input type="checkbox"/> | <input type="button" value="Validate"/> |
| | Quarter 2 | <input checked="" type="radio"/> No | <input type="text"/> | <input type="checkbox"/> | <input type="button" value="Validate"/> |
| | Quarter 3 | <input checked="" type="radio"/> No | <input type="text"/> | <input type="checkbox"/> | <input type="button" value="Validate"/> |
| | Quarter 4 | <input checked="" type="radio"/> No | <input type="text"/> | <input type="checkbox"/> | <input type="button" value="Validate"/> |
| 3.0 | Performance - Energy Storage | | | <input type="checkbox"/> | |
| | Quarter 1 | <input type="radio"/> Yes <input checked="" type="radio"/> No | <input type="text"/> | <input type="checkbox"/> | <input type="button" value="Validate"/> |
| | Quarter 2 | <input checked="" type="radio"/> No | <input type="text"/> | <input type="checkbox"/> | <input type="button" value="Validate"/> |
| | Quarter 3 | <input checked="" type="radio"/> No | <input type="text"/> | <input type="checkbox"/> | <input type="button" value="Validate"/> |
| | Quarter 4 | <input checked="" type="radio"/> No | <input type="text"/> | <input type="checkbox"/> | <input type="button" value="Validate"/> |



For Quarters with No Plant Events, Mark "Exempt"

An answer of "Yes" requires a reason explaining why is exempt.

| ID | Form | Exempt | Reason | Completed | Validate |
|-----|------------------------------|---|---|-------------------------------------|---|
| | Contacts | | Needs Review | <input type="checkbox"/> | |
| | Plants | | Needs Review | <input type="checkbox"/> | |
| | Inverter Groups | | Needs Review | <input type="checkbox"/> | |
| | Energy Storage | | Needs Review | <input type="checkbox"/> | |
| 1.0 | Events | | | <input type="checkbox"/> | |
| | Quarter 1 | <input checked="" type="radio"/> Yes <input type="radio"/> No | <input type="text" value="No Events Recorded"/> | <input checked="" type="checkbox"/> | |
| | Quarter 2 | <input type="radio"/> Yes <input checked="" type="radio"/> No | <input type="text"/> | <input checked="" type="checkbox"/> | |
| | Quarter 3 | <input type="radio"/> Yes <input checked="" type="radio"/> No | <input type="text"/> | <input checked="" type="checkbox"/> | |
| | Quarter 4 | <input type="radio"/> Yes <input checked="" type="radio"/> No | <input type="text"/> | <input type="checkbox"/> | |
| 2.0 | Performance - Inverter Group | | | <input type="checkbox"/> | |
| | Quarter 1 | <input type="radio"/> Yes <input checked="" type="radio"/> No | <input type="text"/> | <input checked="" type="checkbox"/> | <input type="button" value="Validate"/> |
| | Quarter 2 | <input type="radio"/> Yes <input checked="" type="radio"/> No | <input type="text"/> | <input checked="" type="checkbox"/> | <input type="button" value="Validate"/> |
| | Quarter 3 | <input type="radio"/> Yes <input checked="" type="radio"/> No | <input type="text"/> | <input checked="" type="checkbox"/> | <input type="button" value="Validate"/> |
| | Quarter 4 | <input type="radio"/> Yes <input checked="" type="radio"/> No | <input type="text"/> | <input type="checkbox"/> | <input type="button" value="Validate"/> |
| 3.0 | Performance - Energy Storage | | | <input type="checkbox"/> | |
| | Quarter 1 | <input checked="" type="radio"/> Yes <input type="radio"/> No | <input type="text" value="Not Applicable"/> | <input checked="" type="checkbox"/> | <input type="button" value="Validate"/> |
| | Quarter 2 | <input checked="" type="radio"/> Yes <input type="radio"/> No | <input type="text" value="Not Applicable"/> | <input checked="" type="checkbox"/> | <input type="button" value="Validate"/> |
| | Quarter 3 | <input checked="" type="radio"/> Yes <input type="radio"/> No | <input type="text" value="Not Applicable"/> | <input checked="" type="checkbox"/> | <input type="button" value="Validate"/> |
| | Quarter 4 | <input type="radio"/> Yes <input checked="" type="radio"/> No | <input type="text"/> | <input type="checkbox"/> | <input type="button" value="Validate"/> |

FE Forms Checklist for 2025

| Completed | Name | Form | Status | Reason | Completed |
|--|------|------|---------------------|--------|-----------|
| Contacts | | | Reviewed | | Yes |
| Plants | | | Reviewed | | Yes |
| Inverter Groups | | | Reviewed | | Yes |
| Energy Storage | | | Needs Review | | No |
| Events | 1.0 | | Awaiting Completion | | No |
| Quarter 1 | | | Data Entered | | Yes |
| Quarter 2 | | | Awaiting Data | | No |
| Quarter 3 | | | Future | | No |
| Quarter 4 | | | Future | | No |
| Performance - Inverter Group | 2.0 | | Awaiting Completion | | No |
| Quarter 1 | | | Awaiting Data | | No |
| Quarter 2 | | | Awaiting Data | | No |
| Quarter 3 | | | Future | | No |
| Quarter 4 | | | Future | | No |
| Performance - Energy Storage | 3.0 | | Awaiting Completion | | No |
| Quarter 1 | | | Awaiting Data | | No |
| Quarter 2 | | | Awaiting Data | | No |
| Quarter 3 | | | Future | | No |

Update Checklist or Completion Status



Questions and Answers