NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

GADS Wind 2024 Concepts

For GADS Wind Reporting Starting 2024

NERC Wind Team
Q4, 2023

RELIABILITY | RESILIENCE | SECURITY




Training Agenda

- Resources
- Overview - Changes from 2023 Reporting
- Migration of Existing Data
- New Concepts and Tools
  - Energy Storage
  - Event Reporting
    - Examples
  - New User Interface at Open Access Technologies Inc. (OATI)
- Timeline and Deadlines

Reporting Concepts - General

- Configuration data - **plant** and group levels
  - Establishes inventory in the system
  - Required before monthly performance or event reporting can occur
  - May be updated as configuration changes
  - Types:
    - Plant – design and other characteristics about the overall plant
    - Group (Subgroup, Energy Storage) – design and other characteristics about the equipment groups with the same manufacturer, model, capacity, etc.
- Performance data – group level
  - Monthly data reported on a quarterly basis
  - Primarily hours-based values, some capacity (MW) and generation (MWh) values
  - Hours = month hours * number of turbines or energy storage devices in the group
- Event data – **plant level**
  - Reported quarterly for events that meet specific criteria
  - At least one cause code required, multiple cause codes permitted
  - Contributing Operating Condition

Changes to Wind Reporting
Effective January 1, 2024

- No change to reporting threshold
  - Wind plants with a total installed capacity of 75MW or greater with a commissioning date of January 1, 2005, or later, for any portion of the plant
- The GADS Section 1600 data request modifies GADS reporting for wind plants:
  - Now applies to Generator Owners – formerly Generator Operators
  - Changes to Inventory/configuration
    - Plant level information
    - Connected energy storage
    - Added Plant U.S. Energy Information Administration (EIA) code
  - New: event reporting
    - Contributing operating condition
  - Changes to performance data
    - Eliminated voluntary component outage data and other voluntary derate and delay fields
  - New Platform - OATI

2024 GADS Wind Data Reporting Instructions

Data Comparison and Migration

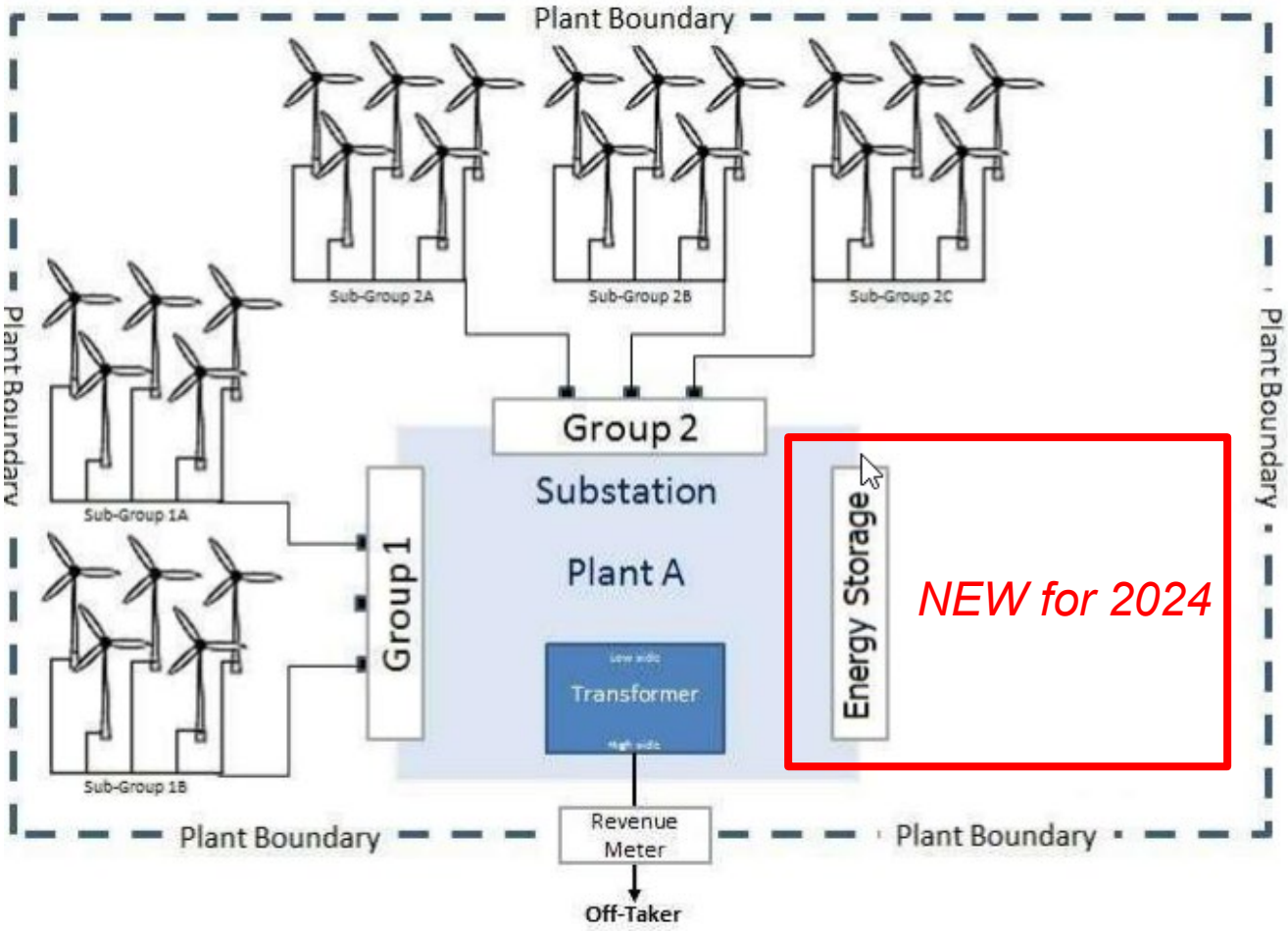
GADS Wind Data	2023	2024
Plant	Loosely identified via Subgroup configuration with alpha numeric codes	Migrated to separate, unique set of data specific to plant – Unique, numeric ID
Subgroup	Identified via unique numeric codes	Identified via *NEW* numeric codes
Subgroup Performance	Identified via unique combination of Subgroup ID and reporting period (month).	Same conceptually, except for new Subgroup IDs.
Storage Configuration	Not collected	If storage is attached to an existing plant, use new Plant ID as part of identification

Data Comparison and Migration - cont

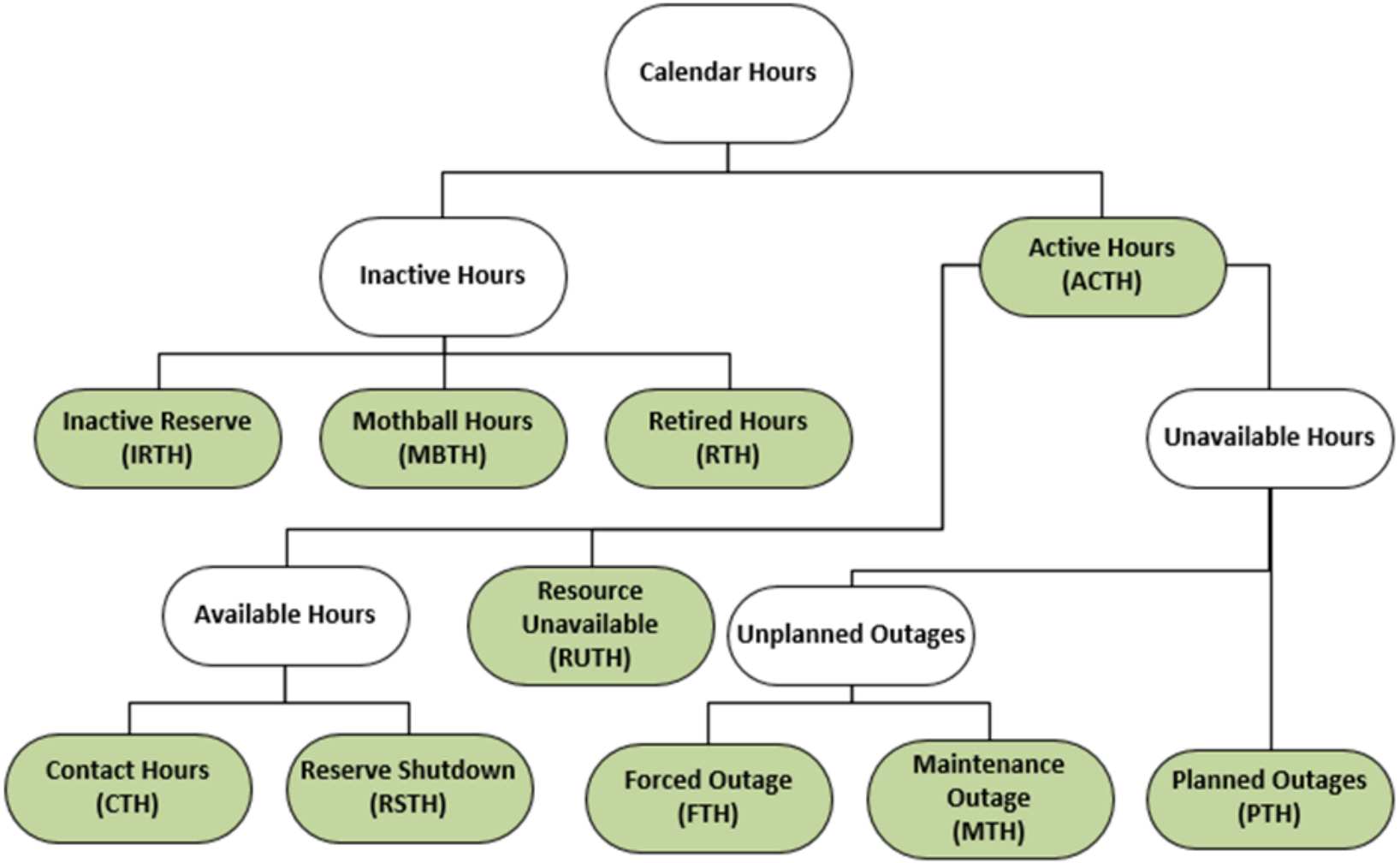
GADS Wind Data	2023	2024
Storage Performance	Not collected	**New** – refer to Data Reporting Instructions (DRI)
Event	Voluntarily submission via component outage data	**Required – at Plant Level**. See DRI and info in this training for details
Transfers	Transfers done at subgroup level	May be done at Plant or subgroup level and even from one NCR to another in the same plant
Outside Management Control, Component Outage, Other Voluntary Data	Voluntary Data	Removed – will not be migrated

Wind Plant Terminology in NERC Reporting

- Sub-group: a group of turbines with the same manufacturer, design, model number, and phase of construction
- Group – one or more sub-groups, typically differentiated by the phase or year they were commissioned
- Turbine Hours – the number of turbines in a subgroup multiplied by the number of hours in a calendar month
  - E.g., 10 turbines * 720 hours in April = 7,200 turbine hours



Monthly Performance Hours: Wind



Energy Storage Group Configuration

Identifiers

Attributes

Tracking

Field Name
Entity ID
Plant ID
Energy Storage Group ID
Energy Storage Group Name
Energy Storage Group EIA Code
Energy Storage Group ISO ID
Energy Storage Type
Energy Storage Capacity (MW) (Nameplate Capacity)
Energy Storage (MWh) (Nameplate Energy Capacity)
Energy Storage Connection (AC or DC)
Energy Storage Chargeable from Grid (Yes/No)
Energy Storage Manufacturer
Energy Storage Model
Storage Group Commissioning Date
Energy Storage Inverter Manufacturer
Energy Storage Inverter Model
Storage Group Ownership Status
Storage Group Effective Date
Storage Group Transfer to Entity ID

Energy storage performance

Energy Storage

NEW for 2024

Energy Storage Group Identifiers

Generation Measures

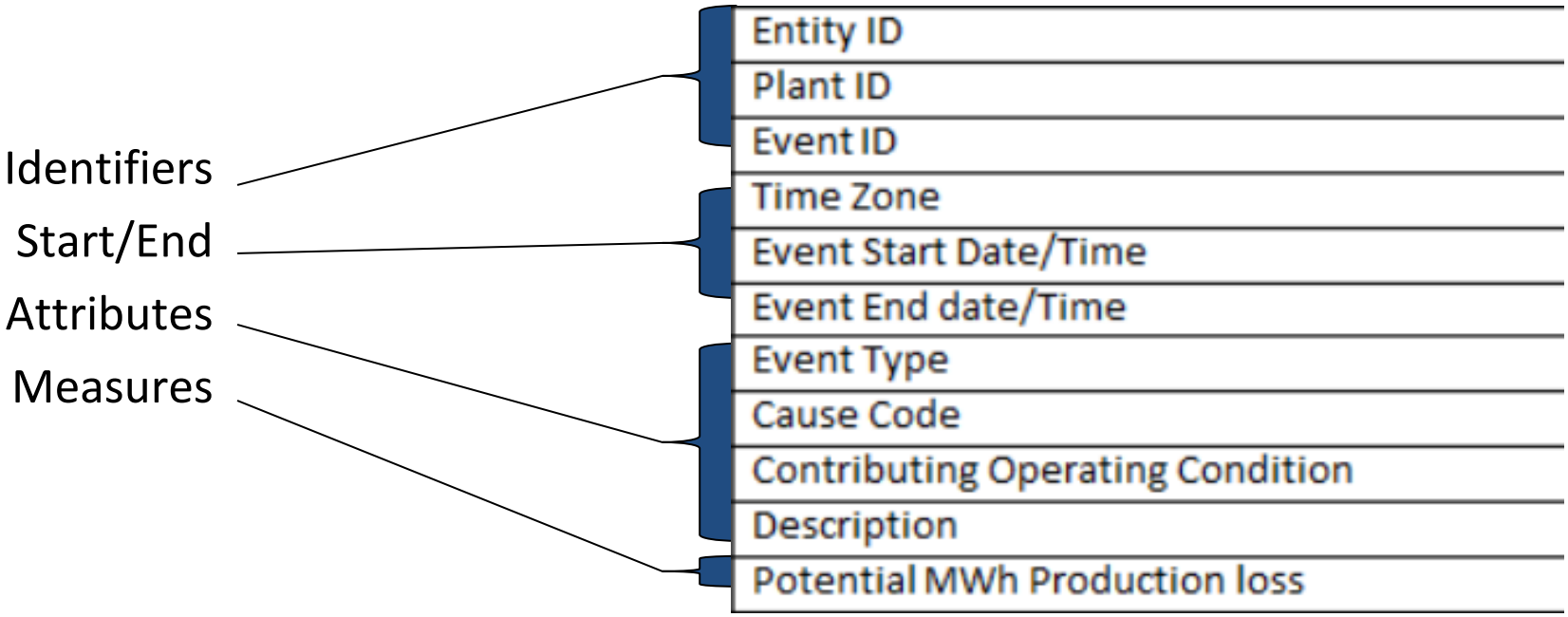
Hours

Field Name
Entity ID
Plant ID
Energy Storage Group ID
Report Month (month)
Report Year
Storage Availability Status
Charge Generation (MWh)
Discharge Generation (MWh)
Charging Hours
Discharging Hours
Forced Outage Hours
Maintenance Outage Hours
Planned Outage Hours

Event Reporting Criteria

- Significant difference from conventional generating unit event reporting in recognition of the variability of the resource
  - Objective is to identify outages that are impactful to the grid
- 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
- 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
- One primary cause code required, multiple cause codes may be assigned
- One Contributing Operating Condition per event

Events – Plant Level

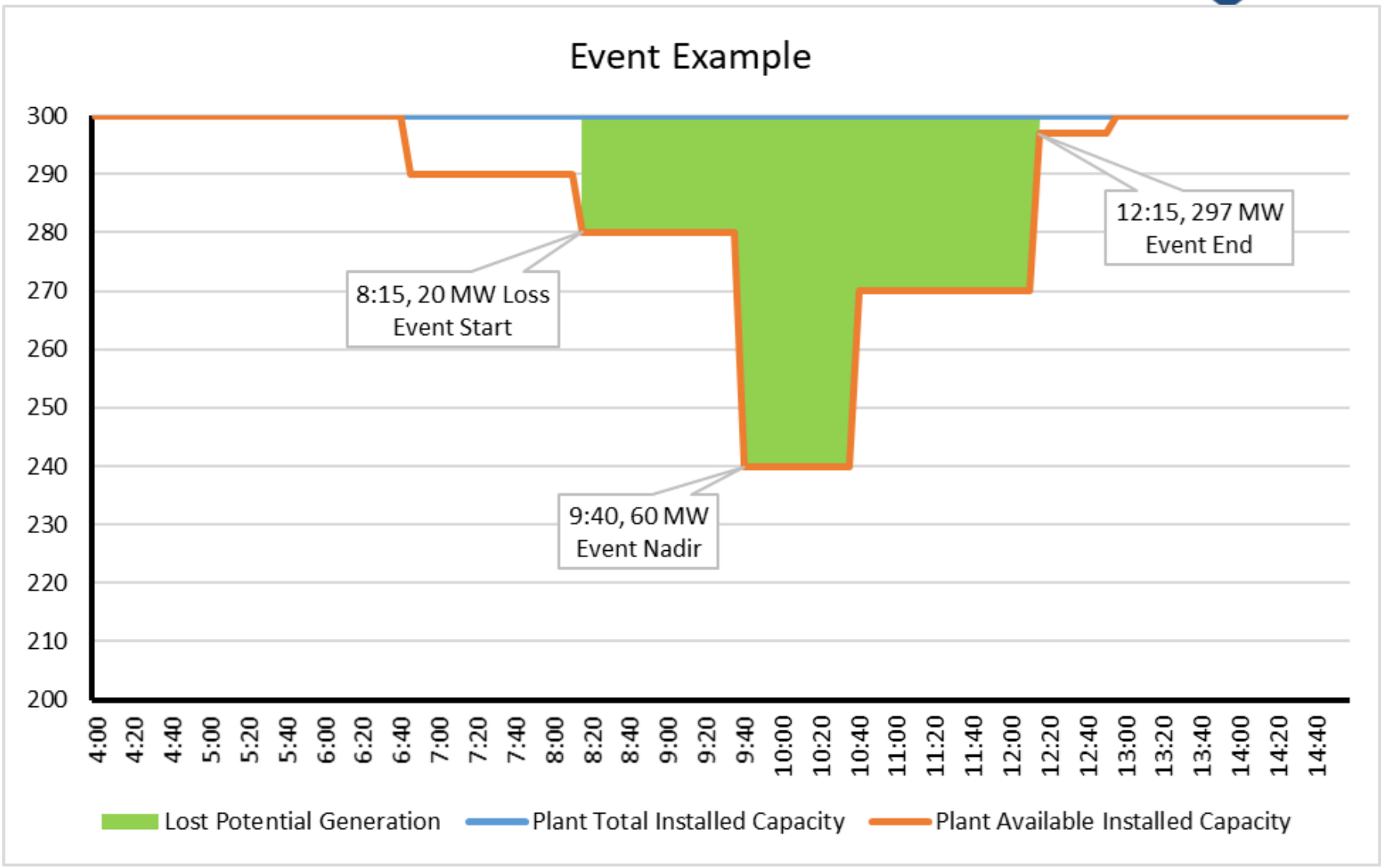


Potential MWh Generation Loss

Potential Production MWH Loss

The sum of the capacity lost due to forced outage(s) in all intervals during the event period - the MW loss during an interval multiplied by the duration of an interval, shown as the green-shaded area in the next slide. The duration of the interval used to calculate Potential Production MWH Loss should be at the finest granularity available, the maximum observation interval should not exceed 5 minutes.

Event Graph


Event Example
300
290
280
270
260
250
240
230
220
210
200
4:00
4:20
4:40
5:00
5:20
5:40
6:00
6:20
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7:00
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12:20
12:40
13:00
13:20
13:40
14:00
14:20
14:40
8:15, 20 MW Loss
Event Start
9:40, 60 MW
Event Nadir
12:15, 297 MW
Event End
Lost Potential Generation
Plant Total Installed Capacity
Plant Available Installed Capacity

Event Example - #1

- 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

Events – Key Concepts

Equipment unavailability contributes to an event when it prevents injection of power to the BPS. The most common reasons are:

- Damage to individual turbines, completely removing them from service
- Damage within the plant preventing turbines from injecting electricity to the BPS
- Transmission outages preventing the entire plant from injecting electricity to the BPS

A turbine is not considered part of an event if it is capable of providing power to the BPS, even if that capability is reduced. Examples of these nonqualifying conditions would be:

- Lack of resource
- Individual turbine efficiency reductions

Guidelines for Determining Event Start and End Times

Events start when they are known to start and end when they are known to end. For example, if equipment shows a fault time when the equipment went out, then that is when the event is known to start. Similarly, if equipment is fixed during a period of no resource, then the event ends at the time the equipment is fixed.

Event Example - #2

- 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.

Event Example - #3

- An ice storm causes ice to accumulate on turbine blades at a 100 MW plant.
- The ice accumulates evenly across the plant and reduces all turbines' efficiency by half for 2 hours. No turbines were shut down completely.

- This is NOT an event. The ice did not cause any part of the plant to shut down completely. Event reporting relates to equipment unavailability, not when the equipment is producing at a reduced capacity, due to lack of resource or efficiency losses.

Event Example - #4

- Freezing fog causes ice to accumulate on turbine blades at a 100 MW plant, with 50 2 MW turbines.
- The ice accumulates on turbines across the plant. Over several hours, turbine icing causes a reduction in efficiency, but all equipment continues to run.
- After a few hours, 10 turbines shut down due to blade imbalance.
- After another hour, another 10 turbines shut down for the same reason.

- This IS an event. Even though the ice simply 'derated' the turbines initially, as soon as >= 20 MW of total installed capacity is prevented from injecting, the event begins.
- The event will end when 20 MW X .095 = 19 MW is restored. In this case, that would equate to 19 of the 20 turbines.

Event Example - #5

- Based on ambient conditions and historical data, the plant manager expects that his plant should be producing 75 MW at his 100 MW plant.
- The SCADA systems indicate that the plant is only producing 55 MW, but all turbines are producing

- This is NOT an event. Even though the plant is producing 20 MWs less than the plant manager expected, no part of the plant is damaged or prevented from injecting to the BPS. The gap between expectation and actual production plays no part in defining an event.

Event Example - #6

- Based on conditions and historical data, the plant manager expects that her plant should be producing 75 MW at her 100 MW plant.
- The SCADA systems indicate that the plant is only producing 55 MW. It is determined that 20 MW of installed capacity (turbines) are shut down due to temperature limits.

- This IS an event. 20 MW of installed capacity is completely shut down due to an equipment limitation.

Event Example - #7

- At a 300MW plant, with 200 1.5MW turbines, a transformer fails knocking out an entire 20 turbine circuit
- At the same time, there are 3 units down for generator replacement, one down for blade replacement and 3 down for main bearing replacement. In addition, a mild lightning storm results in 5 units needing IGBT replacements

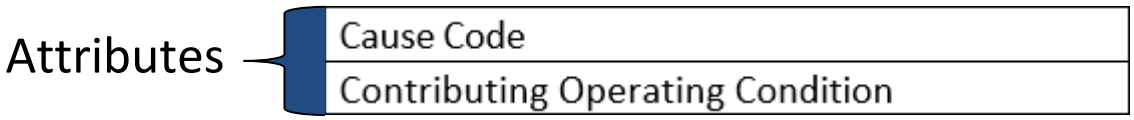
- This IS an event because the plant lost 30MW due to the transformer outage. The event begins as soon as the transformer fault is detected.
- The other coincidental events need not be reported as part of the event unless they were a direct result of the transformer outage.

When To Report New Plant Events

Plants:

- Review/Input configuration data first!
- Events that occur on or after 1/1/2024 should be reported by the end of the relevant reporting period
- Follow reporting period calendar for reporting to NERC

Cause Code vs Contributing Operating Condition



Event Cause Codes

Cause codes indicate the equipment that has caused the outage. This could be equipment related or personnel related.

"What went out?"

Contributing Operating Condition

- A required field for event reporting. It provides context for the conditions that led to the event or outage.
- Will be used in analysis of events to distinguish the failure mode ("what failed") from the failure mechanism ("conditions under which it failed").
- Does not take the place of the Cause Code but complements the overall detail and cause of the event.

"Was there any special circumstance that spurred the event?"

List of Contributing Operating Conditions

15 Contributing Operating Conditions	
0 No contributing condition	1 Flood or high water
2 Drought or low water	3 Fire including wildfire
4 Lightning	5 Geomagnetic disturbance
6 Earthquake	7 Tornado
8 Hurricane	9 Cold weather
A Hot weather	B Ice/Hail/Snow
C Turbulent wind	D Avalanche/landslide
E State of emergency/other external disturbance	

Note: Hot and cold weather are relative to your location. Hot and cold in Minnesota are not necessarily the same temperatures as in Florida

Initial Reporting Deadlines

- **Configuration Files:**
  - August 15, 2024: Configuration review and initial configuration files for storage due
  - Configuration data **MUST** be reviewed before Event or Performance data imports
- **Performance Files**
  - August 15, 2024: Q1 and Q2 data due
- **Event Files**
  - August 15, 2024: Q1 and Q2 data due

Questions and Answers

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