

NERC

NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

Outage Event Reporting

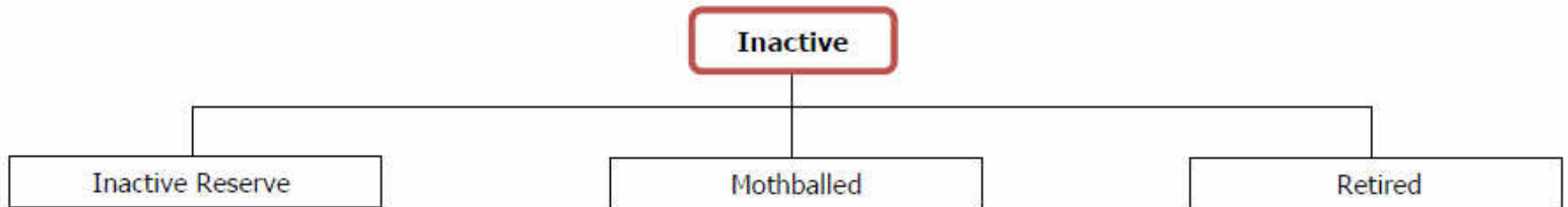
Data Reporting Instructions – Section III

Module 05 - GADS Data Reporting Workshops

RELIABILITY | ACCOUNTABILITY



- Proof of unit outages for interested parties
 - Independent System Operators (ISO)
 - Public Utility Commissions (PUC)
 - Watchdog consumer groups
- Calculate unit performance
 - Reliability – measure of how long a unit can operate normally (MTBF)
 - Availability – percentage of time that a unit is in an operable state (EAF)
 - Maintainability – probability that a unit can be restored to an operable state (MTTR)
- Analyze unit history
 - Feedback for “lessons learned”
 - Planning to determine the length and scope of future outages



- Inactive

- From IEEE 762, <http://www.ieee.org> (membership or subscription required):
 - Deactivated shutdown is “. . . the State in which a unit is unavailable for service for an extended period of time for reasons not related to the equipment.”
- IEEE and GADS interpret this as three events types:
 - Inactive Reserve
 - Mothballed
 - Retired

- Inactive Reserve (IR)
 - A unit is unavailable for service but can be brought back into service after some repairs in a relatively short duration of time
 - Typically measured in days
 - Units on inactive reserve are not counted in GADS statistical data
 - Excludes idle units due to a failure and dispatch did not call for operation
 - Unit must be on Reserve Shutdown (RS) a minimum of 60 days before moving to IR status
 - The 60 day rule was implemented to prevent generators from improperly moving units to IR status to improve GADS statistics
 - Use cause code “0002” for these events

- Problem: Your company has some units it is considering placing in the Inactive Reserve (IR) state
- Question: How many days must a unit be on Reserve Shutdown before it can be placed in the IR state?
 - A. None – it can go straight into the IR state
 - B. 10 days
 - C. 45 days
 - D. 60 days
 - E. 90 days
- Answer: D. 60 days
- Explanation: The 60 day Reserve Shutdown requirement is a built in waiting period to avoid abusing the IR state

- **Mothballed (MB)**

- A unit is unavailable for service but can be brought back into service after some repairs with appropriate amount of notification
 - Typically measured in weeks or months
- Not operable or is not capable of operation at a moments notice and it must be on a forced, maintenance or planned outage, and remain on that outage for at least 60 days before it is moved to the MB state
- Units in mothball status do not count in GADS statistics
- The 60 day rule was implemented to prevent generators from improperly moving units to MB status to improve GADS statistics
- Use Cause Code “9991” for these events

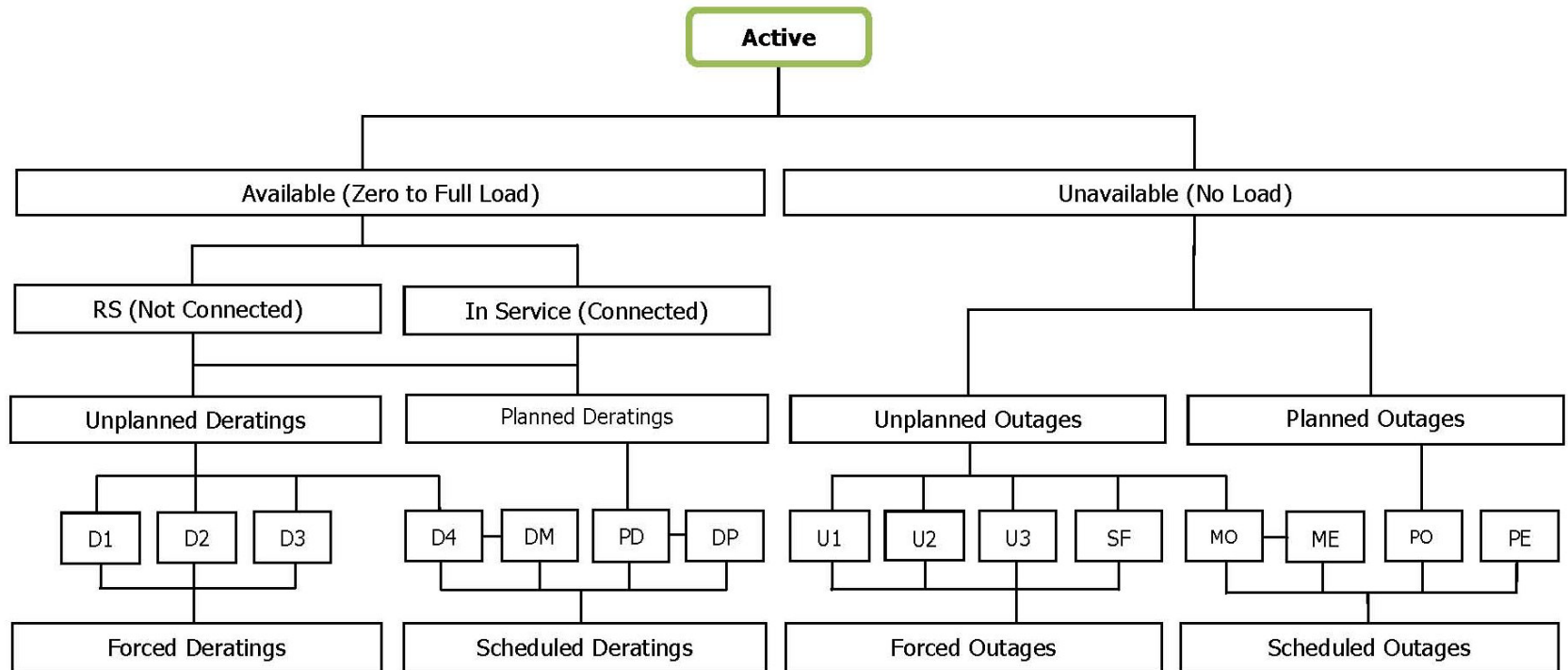
- Problem: Your company has some units it is considering placing in the Mothballed (MB) state
- Question: How many days must a unit be on maintenance, forced, or planned outage before it can be placed in the MB state?
 - A. None – it can go straight into the MB state
 - B. It can't – you have to finish the outage first
 - C. 60 days
 - D. 45 days
 - E. 90 days
- Answer: C. 60 days
- Explanation: The 60 day outage requirement is a built in waiting period to avoid abusing the MB state

- Problem: Your company has a unit that has been mothballed for over a year. Another unit loses its generator, a long lead item for which they have no spare, so your company decides to bring the mothballed unit back.
- Question: What do they have to do to bring it back?
 - A. Restore the unit while mothballed then put it back online
 - B. Just end the mothballed state and start it up
 - C. Change the mothballed state back to the original outage it was in before being mothballed and fix the problem it was mothballed for
- Answer: C. Change the mothballed state back to . . .
- Explanation: When an MB event ends the unit has to go back on the original outage it was in before being mothballed

- Retired (RU)
 - A unit is unavailable for service and is not expected to return to service in the future
 - RU should be the last event for the remainder of the year
 - Up through December 31 at 2400
 - The unit must not be reported to GADS in future submittals
 - Use cause code “9990” for these events

- Problem: Your company is considering retiring some units and asks you to explain the GADS process for doing so which involves adding an RU event to the unit
- Question: Which cause code must you use with an RU event?
 - A. 0000
 - B. 0002
 - C. 9991
 - D. 9990
 - E. 1000
- Answer: D. 9990
- Explanation: A Retired Unit (RU) event is one of several event types that have a specific cause code assigned to them

- Units in IR or MB will not be included in fleet unit reporting statistics because no period hours are being reported on them
- However, unit-level compliance may still be required for NERC auditing under the NERC Reliability Standards
 - Examples include Critical Infrastructure Protection (CIP), Emergency Preparedness and Operations (EOP), and Protection and Control (PRC)
- WECC requires compliance with their standards
 - Check with your Region for rules
- In general as long as you maintain permit(s) of any kind on an inactive unit you will have to do reporting to the agencies overseeing the permit(s)
- Other agencies (EIA, EPA, et cetera) often cross check your data submission with NERC so be consistent to avoid errors



- Active

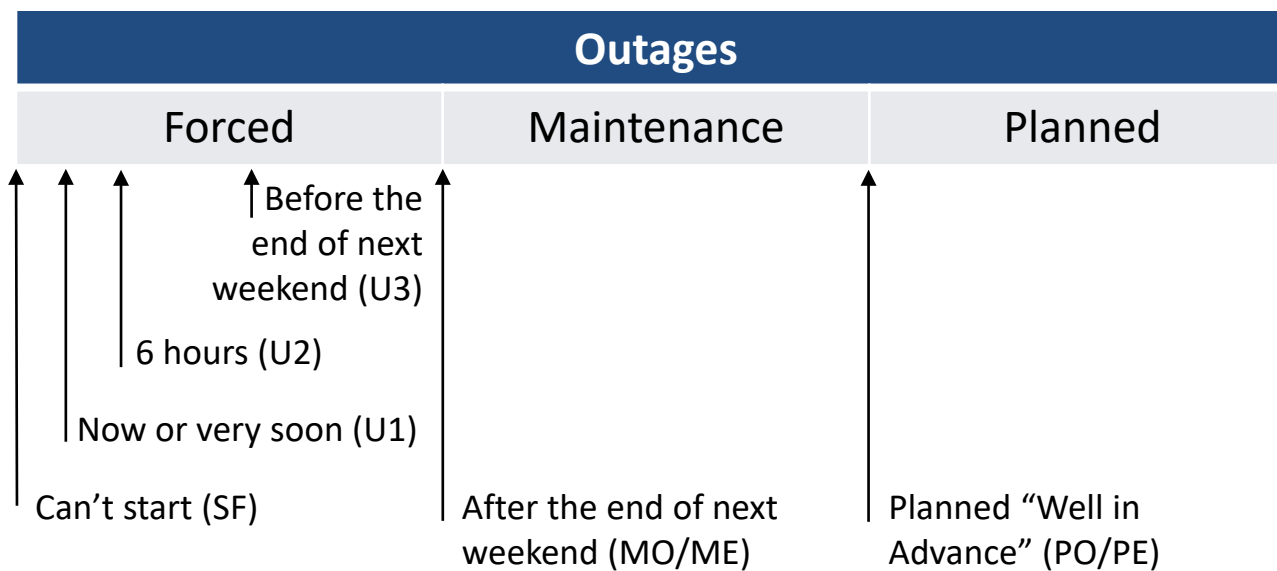
- From IEEE 762, <http://www.ieee.org> (membership or subscription required):
- A unit is in the active state while you collect and report data on it to NERC
- A unit enters the active state on its service date and leaves the active state on an inactive date (whenever it goes inactive because of an MB, IR, or RU event)

- Event Type Code (required)
 - A two-character code that describes the event type
 - 17 Types: Outages (8), Derates (7) , and Other (2)

| Event Types | | |
|-----------------------------------|-----------------------------------|------------------------------|
| Outages | Derates | Other |
| PO – Planned | PD – Planned | RS – Reserve Shutdown |
| PE – Planned Extension | DP – Planned Extension | NC – Non-curtailing |
| MO – Maintenance | D4 – Maintenance | |
| ME – Maintenance Extension | DM – Maintenance Extension | |
| SF – Startup Failure | D1 – Forced - Immediate | |
| U1 – Forced - Immediate | D2 – Forced - Delayed | |
| U2 – Forced - Delayed | D3 – Forced - Postponed | |
| U3 – Forced - Postponed | | |

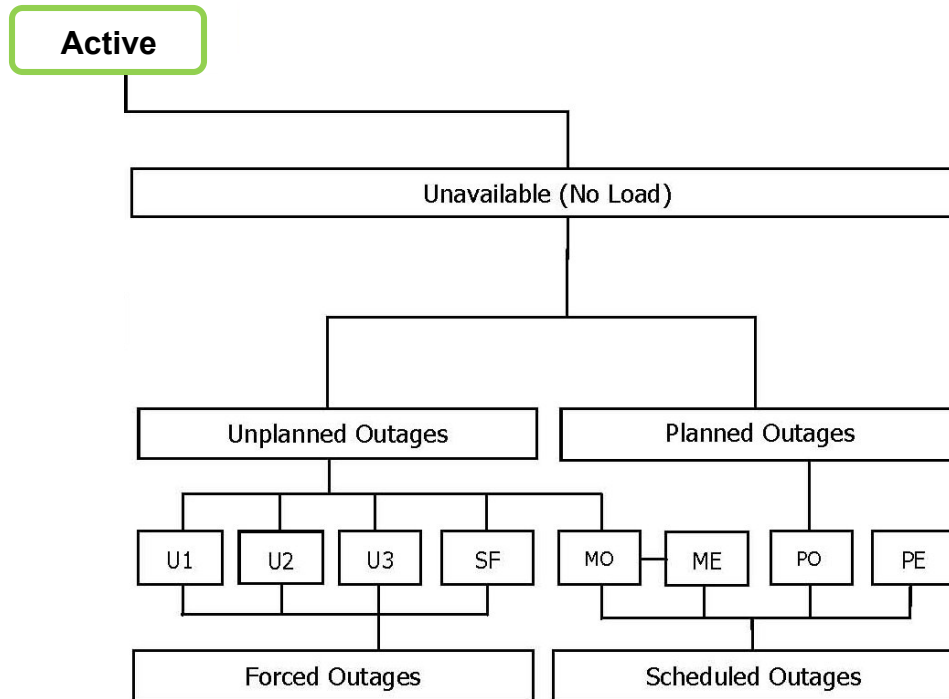
- What is an outage?
 - An outage
 - Is a state the unit enters when it is no longer capable of delivering power to the grid
 - During an outage Net Available Capacity = 0
 - Starts when the unit is either desynchronized (breakers open) from the grid or when it moves from one unit state to another
 - Ends when the unit is synchronized (breakers are closed) to the grid or moves to another unit state
 - In moving from one outage to the next, the date/time must be exactly the same for the end of the previous outage and the start of the next

- Timing starts when the problem is detected
 - Forced Outages (four types)
 - Maintenance Outage (one type plus extension)
 - Planned outage (one type plus extension)



- Problem: At noon operations notices an increasing makeup water flow. During a walk down of the boiler a rumbling noise inside the casing is heard. An IR camera is used to survey the area and a large hot spot is detected. The makeup water flow rate steadily increases and the noise gets louder. Operations decides to bring the unit offline after the daily peak for repairs.
- Question: What type of outage is this?
 - A. U1
 - B. U2
 - C. U3
- Answer: U2, unplanned forced outage, delayed
- Explanation: The problem was severe enough that the unit had to come down within six hours to avoid further damage

Forced + **“Scheduled”** Maintenance + Planned



- Scheduled-type Outages

- Planned Outage (PO)

- Outage planned “well in advance”

- Typically an annual unit overhaul or nuclear refueling outage
- Typically budgeted with an outage identifier (OID) number
- Typically scheduled by an outage planning system to balance resources across outages

- Predetermined duration

- Can slide PO if approved by ISO, Power Pool or dispatch

- Maintenance (MO)

- Deferred beyond the end of the next weekend but before the next planned outage (Sunday 2400 hours)

- Definition applies if the outage occurs before Friday at 2400 hours
- If the outage occurs after Friday at 2400 hours and before Sunday at 2400 hours, MO will only apply if the outage can be delayed passed the next, not current, weekend
- If the outage can not be deferred, the outage is a forced event

- Problem: A cold front is expected to cool off the dispatch area for the next few days and the ISO wants to shut your unit down. The unit has a large backlog of open work orders so you request an outage instead.
- Question: What type of outage should you request?
 - A. U1
 - B. MO
 - C. U3
 - D. PO
- Answer: B. MO
- Explanation: The unit can operate but management decides to take advantage of an opportunity to make some repairs instead

- Scheduled-type Outages
 - Planned Extension (PE)
 - Continuation of a planned outage
 - Maintenance Extension (ME)
 - Continuation of a maintenance outage
 - IEEE 762 does not define ME events
 - Added by NERC because ME events must be approved and tracked

- Extensions are valid if:
 - They are requested to complete work started during PO and MO events that was determined in advance as part of the “original scope of work”
 - When unexpected problems or conditions are discovered during an outage that are not part of the original scope of work and the result is a longer outage time
 - Do not use PE or ME
 - Use another outage instead
 - PE or ME starts at the same date/time that the PO or MO ended

- The webE-GADS edit program checks to make sure that an outage extension (PE or ME) is preceded by a PO or MO event
 - If the original PO or MO event is not in the file you are submitting it won't pass the check
- You can avoid an error by:
 - Ending the outage one minute after midnight and a one minute portion of it will be automatically included in the 07 event file at the start of the next year
 - Start of one minute outage event portion: 01010000 (MMDDHHMM)
 - End of one minute outage event portion: 01010001
 - Start of outage extension: 01010001
 - No extra work is involved because the one minute outage event portion is added automatically by the 07 event file program when it creates the file
 - No outage count inaccuracies introduced

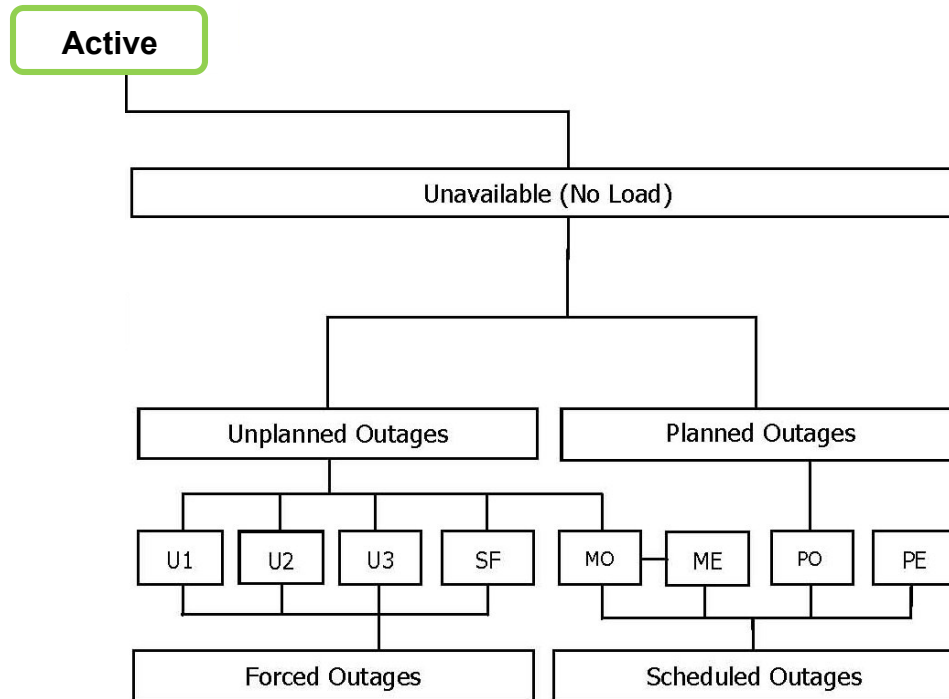
- Problem: During a planned outage an inspection finds a serious problem outside the scope of work. Repairs are begun but it soon becomes evident that they will need more time than remains in the planned outage to complete the work.
- Question: What should they do to get more time?
 - A. Request a Planned Extension (PE)
 - B. Change the end date of the Planned Outage (PO) to extend it
 - C. Request a Maintenance Outage (MO)
 - D. Finish the PO then go on a U1 forced outage
- Answer: D. Finish the PO then go on a U1 forced outage
- Explanation: A PE would be invalid because the work is out of scope and the unit will be forced out until repairs are completed

- Problem: A unit has just completed a major generator overhaul. At the end of the outage, operators attempt to put the unit on-line. The generator rotor vibration is so bad that the machine will not go thru critical speed. The plant decides to remove the rotor and send it to the shop for high speed balancing.
- Question: Is this a planned extension?
- Answer: No.
- Explanation: This is a forced outage as the plant did not have it in the work scope to shop balance the rotor after re-assembly. One would never have disassembly and reassembly at the end of an outage in the work scope.

- Problem: A plant is installing a new economizer in unit 1. Tube welding is taking longer than planned. The outage will now take 33 days instead of 30.
- Question: Is this a planned extension?
- Answer: Yes.
- Explanation: The plant is still working on the original work scope, and there have been no delays caused by unexpected discovery work.

“Unplanned”

Forced + Maintenance + Planned



- U1
 - An immediate unplanned forced outage
 - Requires
 - Removal of a unit from
 - Service
 - Another outage state
 - Reserve Shutdown state
 - An Amplification Code is required only if the U1 is preceded by the unit being in service (generating power)
 - T1: Tripped/shutdown grid separation, automatic
 - T2: Tripped/shutdown grid separation, manual
 - 84: Unknown – investigation underway
 - Warning: Amplification code 84 is ignored until the end of the year so don't forget to change it as soon as you know the correct code

- U1
 - An immediate unplanned forced outage
 - If U1 is not a trip but the result of a change of state
 - Example: from planned outage to U1
 - Then the amplification code can be any appropriate amplification code
 - Voluntary

In-service (generating power)

U1 Outage

Amp code required = T1 (automatic) or T2 (manual)

PO, MO, U1, RS, etc.

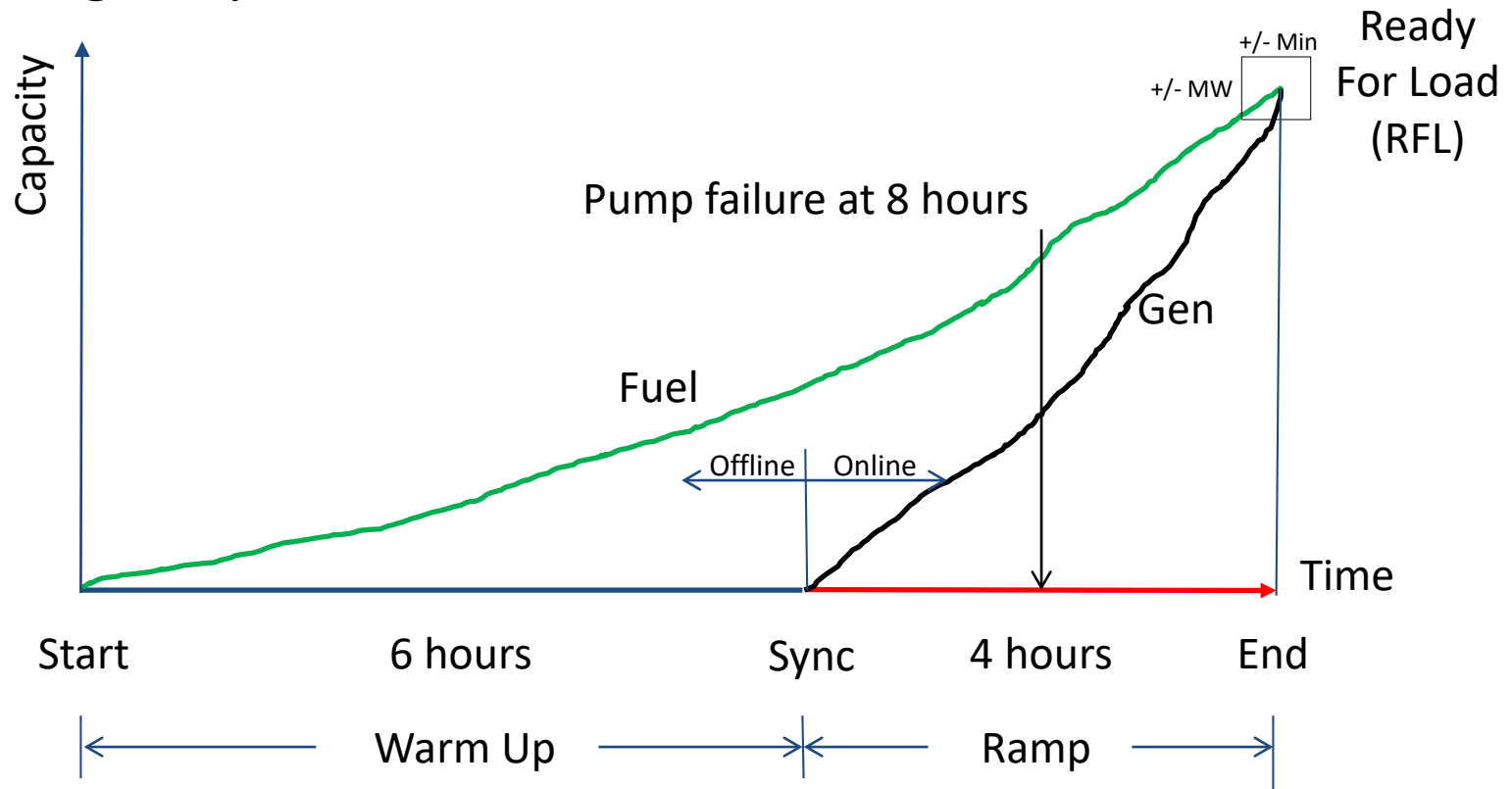
U1 Outage

No amp code required

- **Forced Outage Types**
 - **Delayed (U2)**
 - Requires removal within six (6) hours
 - Only occurs when unit is in service
 - **Postponed (U3)**
 - Outage is postponed beyond six (6) hours
 - Requires removal from service before the end of the next weekend
 - Only occurs if the unit is in service
 - **Startup Failure (SF)**
 - Unable to synchronize within a specified period of time or abort startup for repairs
 - Startup procedure ends when the breakers are closed

- Problem: Dispatch wants Unit 1 at 100 MW at 10AM tomorrow. It takes 10 hours to cold start the unit, six hours from first fire to synchronization, and another four hours to soak the turbine and ramp up the unit to 100 MW. The startup begins at midnight and goes well. At 8AM they lose a pump and shutdown.
- Question: What type of outage is this?
 - A. MO
 - B. SF
 - C. U1
 - D. U2
- Answer: U1, forced outage, immediate
- Explanation: The unit had synchronized and was online when the pump was lost so it is not an SF

- There is a difference between the GADS startup definition and an actual startup because the unit changes state at sync. SF events can only occur offline, but an actual startup can also fail during ramp while the unit is online, which is a U1.



- Problem: A gas turbine unit is scheduled for a three day planned boroscope inspection. The turbine vendor finds a cracked rotating compressor blade and declares the blade must be replaced. It takes two weeks to remove the rotor and replace the blade.
- Question: What type of outage is this?
 - A. PE
 - B. MO
 - C. U1
- Answer: U1, forced outage, immediate, no amp code
- Explanation: The repair is outside the outage scope of work and must be made immediately. The U1 outage starts at the end of the PO.

- Problem: A gas turbine unit is scheduled for a three day planned boroscope inspection. The turbine vendor finds an indication on a blade that can be blended now or the unit can be started ten times and then re-inspected. The unit is repaired now.
- Question: What type of outage is this?
 - A. PE
 - B. MO
 - C. U1
- Answer: MO
- Explanation: The repair could have waited past the weekend (i.e. 10 starts), but it is repaired now with vendor employees on-site.

- Problem: A combined cycle unit has a 3 week planned outage for balance of plant repairs. A boroscope inspection of the gas turbine during the outage reveals a cracked compressor blade. Immediate repairs are made that require 2 weeks to complete. The gas turbine work is completed before the original outage end date.
- Question: What should you report?
- Answer: Secondary cause under the PO event
- Explanation: The repair was completed during the PO window and did not delay the outage.

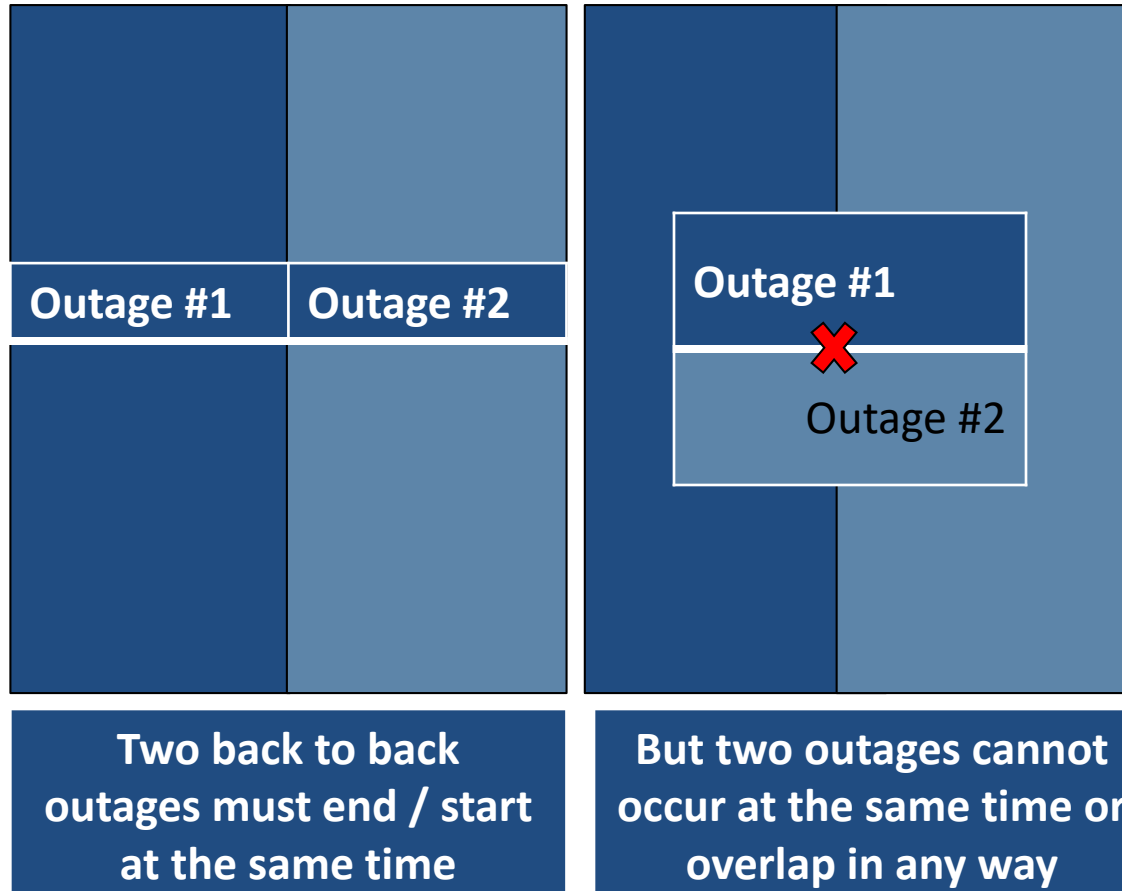
- Problem: A unit calls the commercial operations group and informs them that the forced outage event has ended. The commercial operations team acknowledges the outage has ended. The unit is not needed immediately, but will be needed at the end of the unit's normal startup time.
- Question: How should you report the startup time?
- Answer: Startup time is part of the forced outage.
- Explanation: The unit is wanted on-line after the outage, but takes some time to start.

- Problem: A unit calls the commercial operations group and informs them that the forced outage event has ended. The commercial operations team acknowledges the outage has ended and says the unit will not be needed for 48 hours. It takes 24 hours to start the unit.
- Question: What should you report? How should you report the startup time in a couple of days?
- Answer: The unit would transition to RS.
- Explanation: The unit is not wanted on-line after the outage. The start-up time will be part of the RS.

- On-line testing (synchronized)
 - Testing at a reduced load following an outage event
 - Report the test as a PD, D4, or D1 derate
 - Report all generation
- Off-line testing (not synchronized)
 - Testing at a reduced load during an outage event
 - Report the test during the outage under Section D “Additional work during event”
 - Can also report as a separate outage event of the same type
 - Example: add a new PO at the end of the original PO for a turbine balance shot

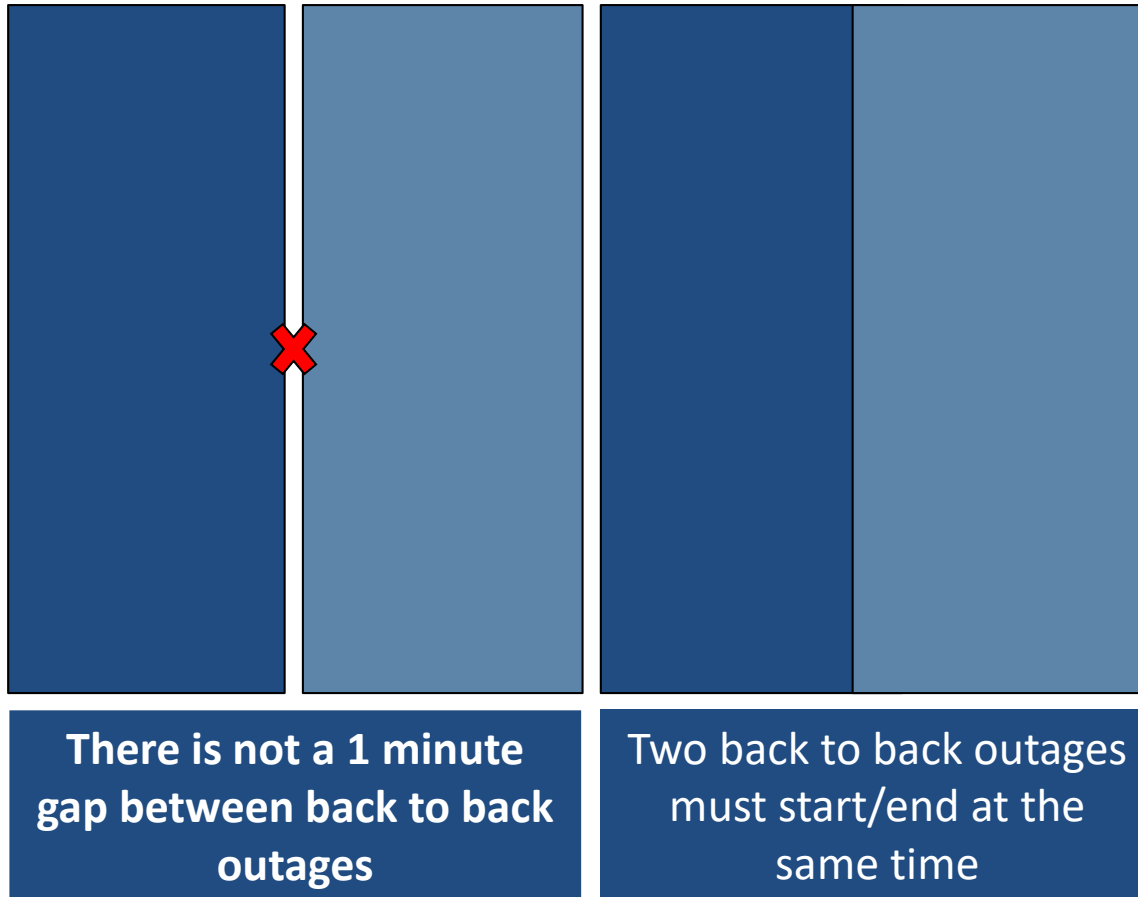
- Black start test
 - A verification that a CT unit can start without any auxiliary power from the grid and can close the generator breaker onto a dead line or grid
- To set up the test
 - Isolate the station from the grid, de-energize a line, and then give the command for the CT to start
 - With a successful start, close the breaker onto the dead line
 - Once complete, take the unit off, and re-establish the line and auxiliary power to the station
- Coordinate this test with the transmission line operator
- Not an outside management control event
- Can be a forced, maintenance or planned event
- Use cause code “9998” for these events

- **Problem:** Your company converts a small peaking gas turbine to a black start unit by adding some additional controls and a small diesel generator to provide power to start it up during black outs. The plant engineers perform an initial black start test in coordination with operations and the ISO. All goes well and your company signs a black start contract with the ISO to generate additional revenue.
- **Question:** What type of event do you use to report a black start test to GADS?
 - A. FO
 - B. MO
 - C. PO
 - D. Any of the above
- **Answer:** D. Any of the above
- **Explanation:** A black start test can be reported in multiple ways, including a forced, maintenance, or planned outage



- For additional outage examples see Appendix G

No gap between back to back outages



- A unit is on reserved shutdown (RS) prior to being on forced outage (U1) for tornado damage to the switchyard.
- The GADS reporter enters the RS end time as 10:00 and the U1 start time as 10:01. There is no amp coded entered for the U1.
- The data is uploaded to the OATI portal, and the reporter receives an error message that a T1 or T2 amp code is required. The reporter knows that no amp code is needed as the unit was not on-line at the time of the tornado.
- What is the problem?
- There is one minute between outages which the GADS program interprets as on-line requiring an amp code of T1 or T2.
- Correct the outages to have the same start/end time to resolve the issue.
- One minute between events is a fairly common error.

- While coal and lignite units have fuel stored on site in case of fuel supply disruptions, natural gas fired units do not have fuel storage on site and require just in time fuel delivery via pipelines.
- Natural gas disruptions can cause full or partial outages (derates).
- GADS provides 2 codes for reporting natural gas disruptions:
 - 9130 - Lack of fuel due to problems in the pipeline system which is outside management control (OMC)
 - 9131 - Lack of fuel because the plant owner/operator chose to purchase interruptible fuel (not OMC)
- It is important to choose the correct code so that the industry will know the correct cause of plants not having natural gas for generation.

Problem 1

- The gas pipeline contacts the plant to inform them they will be “pigging” the pipeline next week, and natural gas will not be available for 24 hours starting on Wednesday at 9 AM.
- What type of outage should be reported? What is the correct cause code?

Answer

- This would be a maintenance outage as it is can be deferred past the upcoming weekend. It probably could be deferred for several weeks. The correct cause code is 9130 because the outage is caused by the pipeline operator.

Problem 2

- A combined cycle unit with a firm gas transportation contract is operating at full load when the pipeline operator experiences problems at a compressor station. Gas supply to the unit is immediately curtailed.
- What type events should you report? What cause code should you use?

Answer

- The unit should report an immediate forced outage (U1).
- The correct cause code is 9130 because the outage is caused by the pipeline operator.

Problem 3

- A simple cycle gas turbine with an interruptible gas contract is operating at full load when the pipeline operator experiences problems at a compressor station. Gas supply to the unit is immediately curtailed.
- What events should you report? What cause code should you use?

Answer

- The unit should report an immediate forced outage (U1).
- The correct cause code is 9130 because the outage is caused by the pipeline operator.

Problem 4

- A simple cycle gas turbine (not dual fuel) has an interruptible gas contract. The system dispatcher wants this unit for load, but it is 15 degrees this morning and gas is not available to purchase for this unit.
- What events should you report? What cause code should you use?

Answer

- The unit should report an immediate forced outage (U1).
- The correct cause code is 9131 because the owner/operator chose to have an interruptible fuel contract.

Problem 5

- A simple cycle gas turbine (dual fuel) has an interruptible gas contract. The unit has 100k gallons of #2 oil on-site. The system dispatcher wants this unit for load, but it is 15 degrees this morning and gas is not available to purchase for this unit. The plant starts the unit on oil, but it trips in 5 min because the NOx injection water system is frozen.
- What events should you report? What cause code should you use?

Answer

- The unit should report an immediate forced outage (U1).
- The correct cause code is 5065 for NOx water injection system. The unit had an alternate fuel, but was not able to run. The outage end time is determined by the GADS outage rules.



Questions and Answers