The Hard Questions

GADS Wind Training Module 17

April 2019 – Final

RELIABILITY | ACCOUNTABILITY

- The following will be reviewed in this module:
  - Getting All the Facts
  - Have a Questioning Mind
  - Determine the Outage Type
  - Is it OMC?
  - What Components were Involved?
  - Putting it Together

The first step to properly code a new type of event is to get the facts straight:

1. Often the plant will supply minimal data that they think is needed to make a determination

2. Get all the facts first
   a. What happened – What broke or didn't work right
   b. Where did it happen
   c. When did it happen – Date and time
   d. Plant output at the time of the event
   e. Weather conditions at the time of the event
   f. Any lightning or abnormal weather in the area
   g. Was anyone at the site at the time
   h. Gather any appropriate equipment data

- Plant coding decisions tend to be biased toward the plant performance indicators. It is important to get all the facts in order to understand the timeline, people and equipment involved.
- Ask questions of those involved. Don't be afraid to call. Sometimes E-mail doesn't always work especially when parties are coming from different angles.
- Be a detective
- The list of examples is not exhaustive. Each situation will bring up different questions.

- Were any special agreements involved (Noise, environmental, land lease, PPA)
- What protections were designed into the failed equipment (heater)
- Were external contractors involved
- Did any of the employees notice any dimming of lights or flickering
- Has the equipment been recently worked on
- What is the maintenance history
- Could the plant have prevented the event with inspections or condition assessment
- Did the plant know about the problem
- Was their planning involved and how much
- Were other land easements involved
- Was it specifically in the budget

- Now that we have the facts on what happened, it is time to start asking questions about the processes, equipment, procedures, environment and practice.
- Inspections maybe needed at this point also.

- Did something break (FO)? This is a forced event even if the failure was anticipated. The equipment is no longer capable of performing its task. Weather events are always forced

- Could it run another week (MO) without causing additional damage
- Was there some planning involved
- Was there time to start preparations

- Was it specifically in the budget (PO)
- Was this planned long in advance with notification by an outside entity

- Now that we have the facts and answered a lot of questions, determine the type of outage (FO, MO, or PO)

- Next identify if it Outside Management Control
    - Did it occur within the plant boundaries
    - Was it caused by weather - Always OMC
    - Were any legal or regulatory issues involved

  Note: Physical outages caused by animals are not OMC. Examples:
    - Mouse causes phase to phase short in the turbine controller
    - Ringtail cat causes short in the substation bussing
    - Climbing snakes cause short in the substation bussing
    - Snake causes phase to phase short in substation bussing
    - Gophers eat SCADA system control wiring
    - Bird shorts out in overhead lines

- Is the event OMC? Did it occur outside the plant boundaries or was it caused by weather?
- Animal outages within the plant boundary are FO and not OMC. There are ways that management can mitigate these issues.
- Example: Turbine controller fires caused by mice walking across the breaker buss
- Facts – several turbine controllers caught on fire in a short interval. Mouse parts found on hot side of the main breaker buss. Flash and smoke moved upward from there.
- Questions – There were no turbine fires in the previous 15 years. Abnormal number of mice found in towers during the last several years. Budget cut-backs in recent years had limited weed control around the turbines.
- Finding – Mice do not like open gravel. When the grass was allowed to grow it provided hiding places for the mice as well as food.
- Animals also like warm places. It is important to seal equipment properly.

- Next identify was components were involved
  - Understanding the components and how they are integrated will help code the components
  - Separate the review into 3 sections:
    - Is it outside the plant boundary (External system)
    - Is it turbine equipment (Turbine systems)
    - If not turbine (Balance of Plant)
  - For turbine equipment, break it into systems first than individual components
  - There are not individual components for everything. Select the closest equivalent or use the general component code for the system

- There are 15 Systems defined in component reporting. It is important to understand the boundaries between systems.
- Understanding the boundaries will help determine if the outage is External (OMC), Turbine or Not Turbine (Balance of Plant)
- Each system contains components with their specific codes.

- Plant breaker was tripped by the off-taker. The plant would like to code as External > Off-Taker (OMC) | Forced. Is this correct?

  - Facts – Occurred Monday, June 10th at 13:35. Weather was clear and wind was 9m/s. The plant was at 80% production and the event involved all the wind turbines
  - Questions – There is an interconnect agreement that requires constant plant communications. Because of a failed substation air conditioner some of the communication equipment was not working right. The off-taker had warned that they would pull the plug if com was not addressed.
  - Type of Outage – Forced – Little warning
  - Is it OMC – No – This is plant equipment within the plant boundary
  - Equipment – Not turbine equipment therefore Balance of Plant - Communication
  - Code – Balance of Plant > Communication | Forced

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- It is important to understand agreements / contracts and their impact on the plant
- In this case an external entity tripped the plant off due to an internal balance of plant equipment failure

- The plant experiences an outage because a farmer is moving his house. How would you code the downtime?

    - Facts – Occurred Saturday, August 15th at 07:35. Weather was clear and wind was 9m/s. The plant was at 80% production and the event only involved feeder 5 (35 turbines)

    - Questions – The farmer is physically moving his house and due to low overhead lines feeder 5 was opened for safety. The farmers lease agreement pays for the relocation of his house

    - Type of Outage – Most likely a Maintenance Outage but could be planned if in the budget

    - Is it OMC – Yes – This a legal agreement that is tied to the land lease for the turbines

    - Equipment – Overhead lines

    - Code – External > Legal (OMC) | Maintenance

- There are all types of agreement that wind farms get involved in. Tiling is often part of land leases. This procedure helps drain water from fields, allowing earlier planting for the farmer and easier access for turbine maintenance

- The plant has had a lot of yaw trips and would like to code them to External > Turbulence (OMC) | Forced. Is this correct?

  - Facts – Occurred Thursday, June 10th between 21:33 and 23:40. There were no storms, the temperature 75F but the wind was from an abnormal direction at 13m/s. The plant was at 80% production
  - Questions – The faulted turbines were all yaw locked due to slew ring damage. The turbines that were not yaw locked did not fault
  - Type of Outage – Forced – No warning
  - Is it OMC – No – Yaw locking is not normal operations. When the wind blows from abnormal directions faults will occur. These faults are consequential to the locks
  - Equipment – Yaw - slew ring
  - Code – Yaw System > Slew Ring | Forced

- In this case, turbines were physically altered to keep them running but increase in yaw problems is a consequence
- Always be aware of consequences due to interim countermeasures

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