

Lesson Learned

Generating Unit Temperature Design Parameters and Extreme Winter Conditions

Primary Interest Groups

Generator Owners
Generator Operators
Balancing Authorities
Reliability Coordinators

Problem Statement

Extreme low winter temperatures forced a plant offline which had been providing over 1000 Mw. The plant was not designed to operate under such conditions. The Balancing Authority (BA) and Reliability Coordinator (RC) were not informed that the plant was not designed to operate during the low temperature conditions.

Details

During a period of extreme cold, a large power plant experienced temperatures below freezing for as much as 100 hours. Sustained winds of over 20 mph with gusts much higher created wind chills in the single digits. These weather conditions had been predicted a week earlier by weather services in long range forecasts. The plant had taken some precautions before the cold period to protect equipment. These precaution steps included applying covering at various places, using heating equipment and adding items such as checks of equipment for freezing to operator "rounds" checklists, etc. Yet, the plant was not design to handle these temperatures and had numerous freezing issues. Critical pieces of equipment froze. For example, the plant had instrumentation freeze on its Zero Liquid Discharge Facility (ZLDF) which stopped it from making demineralized water. Another example is a freezing regulator on one unit caused oil to leak out of the seal on the generator. Oil from the seal got on the field brushes which started arcing. Units, some of which had just started to come online, tripped offline. The plant implemented further freeze protection which included operating heaters for wind sensitive transmitters continuously to stop further freezing and adding more tarps as windbreaks for the ZLDF tower. The plant had to obtain demineralization trailers from various sources in other states and bought them in to replace their ZLDF.

The BA and RC did not know this plant had these low temperature design limitations and were counting on the plant for its generation to help meet the cold weather load peaks. As a result of the loss of this generation and other generation, the BA and RC were forced to implement rolling load sheds in order to reliability manage the load.

Corrective Actions

The Generator Operator (GO) evaluated its plant's design and determined its temperature limitations due to its design. Further work was done to improve the plant's ability to operate at low temperatures. Maintenance practices were changed to identify and fix any issues which changed the design temperature limitations. Processes were established with the BA and RC to inform them if that design temperature limitation changed.

Lesson Learned

Generator Owner/Operator should:

- Know the ambient temperature limitations of their plant and if they don't know, they should perform a detailed engineering design analysis of their plants to determine their ability to operate during extreme cold conditions. A low ambient temperature limit according to the design of the plant should be established.
- Fix issues which do not allow the plant to operate at extreme low ambient temperatures by identifying freezing places and ensuring insulation, heat tracing, lagging and wind breaks are sufficient to maintain water temperature at 40 degrees or above. This practice should also be performed to protect the plant if it is offline.
- Establish ongoing maintenance practices which stress identification of possible freeze areas after maintenance or design changes and ensure those areas can meet the requirements to continue to operate during low ambient temperature periods. If ambient air temperatures exist which could cause a unit to runback its output, these temperature limitations should be documented and procedures and training modified accordingly.
- Work with the BA and RC to establish communications practices by which the GO and GOP informs the BA and RC of the plant design low ambient temperature limitation and when the plant cannot meet the design specification. These communications should include informing the BA and RC if weather conditions dictate that the plant must be kept online to be able to operate the next day. Include such notification in winter operation drills which involve the plants and other entities.
- Document and institutionalize knowledge and experiences from previous severe winter weather events, and apply this learning to the winterization procedures of plant equipment.

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Source of Lesson Learned: Texas Reliability Entity

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