

Design and Testing of a System to Classify Faults for a Generation Shedding RAS

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Abstract

PacifiCorp's Jim Bridger generating facility has 2.2 GW of installed capacity and is connected to the main grid by three 345kV series compensated lines. These lines are, on average, over 200 miles long. In order to operate at full capacity and maintain stability during a system contingency, a generation shedding, remedial action scheme (RAS) is required. PacifiCorp is modernizing and upgrading this scheme. The design of the RAS requires inputs from the protection systems and a special RAS logic relay on critical lines near Jim Bridger that tell it the severity of the fault so that the proper amount of generation is shed to maintain stability without over shedding. The RAS logic relay must quickly and accurately classify the fault in one of three categories: three-phase, multi-phase, or single line to ground. It must also accurately classify the fault as severe or non-severe as determined by distance from the Jim Bridger bus. This paper discusses the design of the RAS system, the challenges faced in designing the RAS logic relay, the novel method that was developed for classifying the fault type, and the validation and optimization of the RAS logic relay using a real-time digital simulator.

Discussion Points

1. This RAS scheme is sophisticated in that it recognizes that the fault type and severity has a major affect on the stability of the power system.
2. The RAS logic relay had very strict performance requirements on speed and accuracy of its inputs to the RAS. Meeting those performance requirements was very challenging. The paper describes the novel method that was used to meet the performance requirements and the thorough testing method that was used to validate and optimize the RAS logic relay's algorithms.
3. This paper will give engineers an example of a successful project where we were able to think outside the box in solving a complex problem and then use modern testing tools to manage the risk associated with doing so.

Short Paragraph

PacifiCorp's Jim Bridger generating facility requires a generation shedding, remedial action scheme (RAS) to operate at full capacity and maintain stability during a system contingency. The design of the RAS requires inputs from the protection systems and a special RAS logic relay on critical lines near Jim Bridger that tell it the severity of the fault so that the proper amount of generation is shed to maintain stability without over shedding. This paper discusses the design of the RAS system, the challenges faced in designing the RAS logic relay, the novel method that was developed for classifying the fault type, and the validation and optimization of the RAS logic relay using a real-time digital simulator.