

AEP-Immediate Need Baseline Project

Introduction:

A circuit breaker at Tanners Creek 345kV substation in the transmission owner American Electric Power (AEP)'s footprint has been identified as overdutied in the 2020 Series RTEP short circuit 2022 Baseline analysis. A short circuit violation has occurred that needs a solution for the reliability of the power grid.

Details:

The specifics of the reliability violation driving the necessity for an immediate need project are shown in the screenshot below. The screenshot is from the 2020 Series RTEP 2022 year baseline analysis results.

BUS_NO	BUS	BREAKER	RATINGTYPE	DUTY_P	DUTY_A	BKR_CAPA	M_DUTY	M_DUTY_A	M_BKR_CAPA	MAX_SC_CASE	ISC	X/R	FLAG	FLAGM	3LG_AMP
243233	05TANNEFR1		S	104.2	52092.9	50000	60	78021.2	130000	Flt#4722 to Group2	48949.8	24.1	W1		49602.6

Fig.2022 Baseline results

As shown in the screenshot, breaker "R1" is rated at 50kA and the fault current is 52.0929kA which pushes the breaker to be overdutied by additional 4.2%. This results in a total duty percentage of 104.2%.

In the 2020 Series RTEP 2025 baseline analysis, this breaker's duty percentage increases slightly to 104.6%.

The violation was first identified during 2020 Series RTEP short circuit case build during the initial analysis process around March of 2020.

Upon further investigation, it was identified that breaker "R1" at Tanners creek had been modeled as a 63kA breaker in previous models, as provided by AEP. As a result, the overdutied conditions did not occur in the past case builds and analysis process.

This attributes the driver of the overdutied condition as 'modeling correction'.

AEP transmission owner confirmed that the actual rating of breaker "R1" is 50kA as it currently exists in the field. Since this overdutied breaker is identified in 2022 short circuit model, it is recommended to consider this case as an immediate need project.

The circuit breaker "R1" protects the tie lines to an external area, IPL (MISO) and internal area, OVEC (PJM), which could expose the rest of the power grid to fault conditions as a result of overdutied breaker.

The fault is located on the tie line from Tanners Creek 345kv to Hanna(IPL/MISO) between breaker "R1" and "R2 ". This fault condition will result in loss of the tie-line to IPL and the rest of the system.

If this breaker is not replaced with a higher capacity fault interrupting current, it could result in explosion of the SF6 gas circuit breaker (R1) due to high fault current which could pose safety concerns to the personnel on site.

Additionally this might also result in stuck breaker scenario which will undermine the overall protection system, harm personnel, cause damage to equipment and overall damage to the substation.

The Tanners Creek substation and breaker “R1” are owned by American Electric Power (AEP) Transmission Owner and they would be the responsible entity for the construction work required to mitigate this issue of overdutied breaker condition at the 345kV substation.

This short circuit driven baseline project is being proposed in order to increase the breaker capability of breaker “R1” at Tanners Creek from its current rating of 50kA.

The proposed solution by American Electric Power (AEP) is the addition of TRV capacitors to the breaker to increase the rating of breaker “R1” from 50kA to 63kA. The construction is due for completion by the end of this year, 12/31/2020.

The alternative solution considered by AEP was to replace the breaker with a higher capacity breaker. Due to the higher cost and additional labor involved in the process of a breaker replacement, AEP chose the solution of adding the TRV capacitors.

Please see below the specifications for the baseline proposal.

Problem statement	Circuit breaker “R1” is overdutied at Tanners Creek 345kV substation
Potential solution	Add TRV capacitor to circuit breaker “R1” at Tanners Creek 345kV to increase the rating to 63kA from 50kA
Estimated cost	\$0.05million
Required in service date	Immediate need
Projected in service date	End of year(12/31/2020)
Project status	Engineering
Driver	Modeling correction