

# The Light company

Houston Lighting & Power

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U. S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, DC 20555

South Texas Project Electric Generating Station  
Units 1 & 2  
Docket No.: STN 50-498;50-499  
Protective Settings of Molded Case Circuit Breakers

This letter responds to a request for information concerning the bases used at the South Texas Project for the protective trip setting of molded case circuit breakers.

During an inspection of the Generic Letter 89-10 Program for safety-related motor-operated valves at the South Texas Project performed by the Nuclear Regulatory Commission in December 1994, the inspector noted that South Texas Project uses a minimum criteria of 125% of peak motor inrush current or locked rotor current for setting the instantaneous trip on molded case circuit breakers. The Nuclear Regulatory Commission inspector noted that other utilities use 200% to 250% of locked rotor current for the protective trip setting. In addition, Nuclear Regulatory Commission Information Notice 92-51, Supplement 1 endorses the use of 200% of locked rotor current as the minimum recommended setting for molded case circuit breaker protective trips. The recommended setting is to prevent premature tripping of a molded case circuit breaker and rendering associated safety-related equipment inoperable.

The criteria for molded case circuit breaker protective settings used at the South Texas Project is based on the IEEE 242-1975 & 1986 Standards and normal industry practice at that time. Section 9.3.3 of the 1975 standard and section 9.3.3.5 of the 1986 standard were used for development of the criteria. The standards state that circuit breakers in motor branch circuits having instantaneous over-current relays or direct-acting trips should have their trip setting sufficiently high that they do not trip on current occurring (1) at initiation of the motor starting inrush, (2) when the motor contributes fault current to an external short-circuit condition, and (3) upon automatic transfer or fast re-closing. For many smaller squirrel-cage induction motors (that are installed on what may be considered a routine basis ) it is usual to set the instantaneous trip

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at 10 or 11 times the motor full-load current. Instantaneous settings are frequently determined by trial and error starting of the specific motor. This approach can result in unnecessary tripping at a later date if the maximum asymmetry possible never occurs during the trial and error starts. A minimum of three starts is recommended.

STP uses adjustable magnetic instantaneously only molded case circuit breakers as the primary breaker for motor loads on motor control centers. This type of molded case circuit breaker is specifically designed for motor protection and is recommended for that use in Nuclear Regulatory Commission Information Notice 92-51 by Westinghouse. These breakers are ITE EF breakers.

The protective trip setpoint methodology for molded case circuit breakers was established during unit startup. That methodology followed Note 1.1 of the Electrical Setpoint Index Section VII. The note states that the trip settings of magnetic units of the molded case circuit breakers should be set as low as possible in the range of 900 to 1400% of Full Load Current.

The trip setting of a circuit breaker magnetic unit was initially set at the lowest setting shown in the setpoint index for the particular breaker and load. If this setting allowed the motor to start, the breaker was left at the initial setting. If the circuit breaker tripped during motor starting, the breaker setting was increased to the next higher setting. This procedure was repeated as required until the highest setting was reached. The breaker setting was not adjusted to any setting mark above or below those shown without Design Engineering approval. By following this procedure, the settings for molded case circuit breakers during unit startup were incorporated into the Setpoint Index.

During the early testing of the Generic Letter 89-10 Program at the South Texas Project, random tripping was observed for a number of motor operated valves. Engineering review determined the breakers for these valves were sized too small for the frequent starts required by the test program. These breakers were replaced with larger breakers with the instantaneous setpoint adjusted to minimize random trips. After breaker replacement, the random tripping did not re-occur.

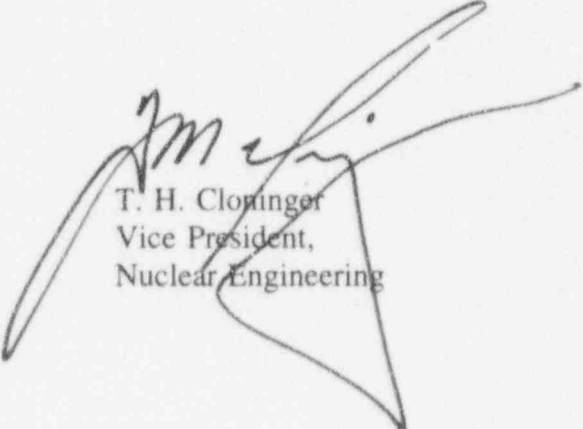
During the Generic Letter 89-10 testing program at the South Texas Project, each motor operated valve was started many times. During numerous tests, these starts were at elevated system voltages due to low loads on the electrical buses. During this testing, no concerns were addressed to Design Engineering about random breaker tripping.

The setpoints for the Class 1E motor operated valves were examined and determined to vary from 1.33 to 4.67 times locked rotor current. The South Texas Project concluded that the results of the Generic Letter 89-10 Program Testing for safety-related motor-operated valves demonstrated that the methodology used for setting breaker instantaneous trip settings provided adequate motor protection while allowing the equipment to perform its intended safety function without premature tripping.

Since the Nuclear Regulatory Commission Information Notice 92-51 Supplement 1, recent revisions to IEEE 471, and the new addition to IEEE 741 currently under development all recommend a minimum of two times locked rotor current as the instantaneous setting for adjustable magnetic only molded case circuit breakers, the South Texas Project has re-evaluated their bases for setting the protective trips. The South Texas Project plans to develop formal calculations for determining the optimal instantaneous trip settings for molded case circuit breakers based on the parameters established in Information Notice 92-51 Supplement 1 and current IEEE standards.

The formal calculations will be developed for the instantaneous trip setting of molded case circuit breakers for each Class 1E motor load including molded case circuit breaker settings for safety-related motor-operated valves. All revised breaker trip settings should be completed prior to startup after the sixth refueling outage for Unit 1 and the fifth refueling outage for Unit 2.

If there are any questions regarding this matter, please contact Mr. K. J. Taplett at (512) 972-8416 or me at (512) 972-8787.



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