

The Impact of Nearby Structures and Trees on Sigma Theta Measurements

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The impetus for this study was the encroachment of trees upon the Zion Nuclear Power plant meteorological tower. Removal of the trees would have unfavorable results with the public because the tower is located within the Illinois Beach State Park. This study was conducted to determine if the nearby trees were impacting the sigma theta measurements on the tower. The impact of nearby buildings, tower shadow, and crossarm sensor shadow were also an outgrowth of this study. To determine average sigma thetas by wind direction, sigma thetas for each tower level were averaged for every 10 degrees of wind direction (0° - 10° , 10° - 20° , etc.). Sigma theta values with wind speeds less than 5 miles per hour were not used. The results show the clear impact of the trees on the 10-meter level sigma thetas. The results for the 76-meter level sigma thetas show the impressive impact of the plant buildings/containment and the frictional differences of onshore versus offshore wind flow. No tower shadow or crossarm sensor shadow was seen. The results from this study prompted an investigation of sigma theta impacts at the Braidwood, Dresden, and LaSalle nuclear plant meteorological towers. Sigma theta results from these plants show similar impacts from nearby trees and the plant buildings/containment and include possible impacts from distant industrial facilities and topographical effects of the Illinois River valley. The results from this type of sigma theta study highlight the importance of proper tower siting, site maintenance, building wake effects, and ultimately atmospheric transport for emergency response efforts.