Forecasting Production Losses at a Swedish Wind Farm

Production loss due to icing has been identified as a problem both when siting turbines in cold climates, and when making forecasts of energy production for wind park management and energy markets. The Makkonen icing model (Makkonen, 2000), driven by output from the WRF mesoscale model, has been shown to predict periods of icing at a wind farm in northern Sweden (Davis et al., 2012) with improved skill compared to persistence and threshold models. Based on these results, we have developed a statistical model to estimate the loss of production at the wind park due to these icing periods. We compared this statistical model with a simpler method that does not rely on a physical icing model. In that method meteorological icing is identified as periods when WRF forecasts clouds and the temperature is below freezing. During these periods it is assumed that there is no production from the turbines, however as soon as the cloud goes away in the model we assume production returns to the idealized power curve. One unique aspect of the wind park we are working with is that it is not required to shut down when icing occurs. Therefore, during icing periods production still occurs, but below the idealized power curve. This enabled us to also examine how much production would have been lost had the turbines been required to shut down during the periods when they were iced.