

**PREDICTION OF REMAINING LIFE OF POWER
TRANSFORMERS BASED ON LEFT TRUNCATED AND RIGHT
CENSORED LIFETIME DATA**

by

**Yili Hong, William Q. Meeker, and James D. McCalley
Iowa State University**

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ABSTRACT

Prediction of the remaining life of high-voltage power transformers is an important issue for energy companies because of the need for planning maintenance and capital expenditures. Lifetime data for such transformers are complicated because transformer lifetimes can extend over many decades and transformer designs and manufacturing practices have evolved. We were asked to develop statistically-based predictions for the lifetimes of an energy company's fleet of high-voltage transmission and distribution transformers. The company's data records begin in 1980, providing information on installation and failure dates of transformers. Although the dataset contains many units that were installed before 1980, there is no information about units that were installed and failed before 1980. Thus, the data are left truncated and right censored. We use a parametric life-time model to describe the lifetime distribution of individual transformers. We develop a statistical procedure, based on age-adjusted life distributions, for computing a prediction interval for remaining life for individual transformers now in service. We then extend these ideas to provide predictions and prediction intervals for the cumulative number of failures, over a range of time, for the overall fleet of transformers.