THE ROLE OF ELECTROSTATIC INDUCTION IN OVERHEAD TRANSMISSION LINE DESIGN

T. M. McCauley, P.E.
Sargent & Lundy, Engineers
Chicago, Illinois

ABSTRACT

The potential hazards of the ground level electrostatic effects of overhead transmission lines are discussed. Approximate and detailed methods of calculating these effects are presented. The influence of line design on the magnitude of these phenomena is examined and measures for reducing them are discussed.

INTRODUCTION

There are a number of electrostatic effects associated with overhead transmission lines. Some of these such as RI, corona and audible noise, while undesirable, are not hazardous. Others such as high ground level voltage gradients and induced voltages and currents in ground level objects can be hazardous.

These ground level electrostatic phenomena occur at all voltage levels. However, for line voltages up to about 345 kV, they are of negligible magnitude. Above 345 kV, in the EHV range, 345 kV to 765 kV, these ground level effects become more significant and the potential hazards increase. For lines operating above 765 kV, in the UHV range, these effects may be decisive factors in line design. The increase in the magnitude of electrostatic effects with increasing voltage is due not only to the higher voltages but also to the line designs required at these voltages.

Public concern as voiced by many environmental groups is focussing attention on the subject and studies Qf electrostatic effects form part of the environmental impact reports on many proposed transmission lines. The electric utility industry is well aware of these problems and in recent years has done considerable analytical and experimental work-on the subject.

This paper will discuss the potential hazards posed by ground level electrostatic effects and will present methods of calculating the magnitude of these effects. The influence of transmission line design on these effects will be discussed as will methods of reducing their magnitude.