It is well over thirty years since some of the early versions of this book were used in our classes, and it is more than a quarter of a century since the first edition appeared in print. Normally, one would have expected users of the book to almost give it up as old-fashioned. Yet, until very recently the questions the authors were frequently asked explained the rationale for the added material in this edition, especially by new users: When will the Second Edition be out?

Over these past thirty years the size of the systems analyzed in stability studies, the scope of the studies (including the kind of answers sought), the duration of the transients analyzed, and the methods of solution may have varied, but central to all is that the proper system model must be used. Such a model must be based on description of the physical system and on its behavior during the transient being analyzed.

This book has focused on modeling the power system components for analysis of the electromechanical transient, perhaps with emphasis on the inertial transient. The one possible exception reflects the concern of the time the book came into being, namely analysis of the linear system model for detection and mitigation of possible poorly damped operating conditions.

Since the 1970s, several trends made stability of greater concern to power system engineers. Because of higher cost of money and delay of transmission construction because of environmental litigations, the bulk power system has experienced more congestion in transmission, more interdependence among networks, and so on. To maintain stability, there has been more dependence on discreet supplementary controls, greater need for studying larger systems, and analysis of longer transients. Since then, additional models were needed for inclusion in stability studies: turbine governors, power plants, discrete supplementary controls, etc. Thus, the need for modeling the power system components that make up mechanical torque has become more important than ever. The authors think it is time to meet this need, as was originally planned.

Now that the electric utility industry is undergoing major restructuring, the question arises as to whether the trend that started in the 1970s is likely to continue, at least into the near future. Many power system analysts believe that the answer to this question is yes.

Since the revised printing of this book appeared, the electric utility industry has undergone a significant restructuring, resulting in heavier use of the bulk power transmission for interregional transactions. It is expected that new engineering emphasis will be given to what engineers refer to as mid-term or long-term analysis. We believe that in the restructured environment, this type of analysis will continue be needed because there will be greater emphasis on providing answers about system limitations to all parties involved in the various activities as well as in the interregional transactions. Modeling of mechanical torque will be important in conducting these studies.

The material on the “mechanical torque” presented in Chapters 10 through 13 and in Appendices F through J are the work of author Paul Anderson and he should be contacted regarding any questions, corrections, or other information regarding these portions of the book. This material is a bit unusual to include in a book on power system stability and control, but we have recognized that a complete picture of stability and the supporting mathematical models cannot
be considered complete without a discussion of these important system components. The models presented here can be described as “low-order” models that we consider appropriate additions to studies of power system stability. This limits the models to a short time span of a minute or so, and purposely avoids the modeling of power plant behavior for the long term, for example, in the study of economics or energy dispatch.

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