# RESOURCE ADEQUACY WITH HIGH PENETRATION OF RENEWABLES

*~ by ~*

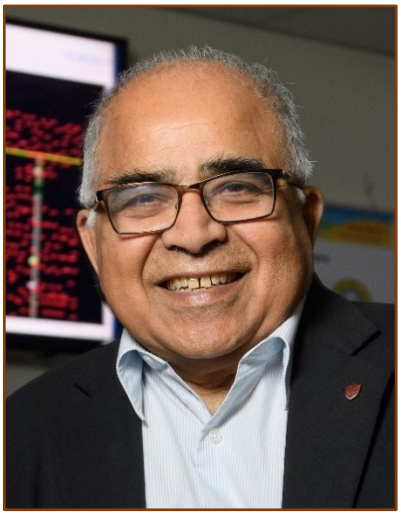

## ANJAN BOSE

Washington State University


**Wednesday, November 5 • 10 A ~ 11 A • EME 26**

## OVERVIEW

In parts of the US in recent years there have been periods when the available generation has not been available to supply the demand. For the last several years the North American Electric Reliability Corporation (NERC) has warned that there may not be adequate generation availability to address the load demand at all times. The NERC standards require that generation can be less than the demand only 2.4 hours per year (which is 24 hours over 10 years and is known as the one-day-in-10-years rule). The NERC standards also require that in addition to have enough generation available to meet the load the transmission system must also be adequate to deliver the generation to the loads even under first contingency conditions; this is known as the N-1 rule. Although the analysis needed to guarantee the N-1 rule has not changed much, the uncertainty of renewable generation has made it much more difficult to calculate the 1-in-10 generation adequacy rule. In this presentation we will cover the complexities of calculating resource adequacy.



## BIO

Anjan Bose is a Regents Professor and the Distinguished Professor of Electric Power Engineering at Washington State University in Pullman, Washington, where he also served as the Dean of the College of Engineering & Architecture from 1998 to 2005. In 2012-13 he served as a Senior Advisor to the US Department of Energy on the electric power grid during the Obama Administration. He is a leading researcher on the operation and control of the electric power grid. He has worked in the electric power industry as well as academe for over 50 years.

Dr. Bose is a Member of the US National Academy of Engineering and a Foreign Member of both the Indian and the Chinese National Academies of Engineering. He is also a Fellow of the IEEE, a Fellow of the CSEE and a Distinguished Member of CIGRE. He was the recipient of the Outstanding Power Engineering Educator Award, the Third Millennium Medal, the Herman Halperin Electric T&D Award, and the Lifetime Achievement Award from the IEEE. He was also awarded the Philip Sporn Award and the CIGRE Medal from CIGRE. He has been recognized by both Iowa State University and the Indian Institute of Technology with their distinguished alumnus awards. He has

served on several editorial boards and on many technical committees and conference organizations. He was appointed by the governor to the board of directors of the Washington Technology Center, and by the US Secretary of Energy on the committee to study the 1999 and 2003 power blackouts. He has served on several committees of the US National Academies and serves on its Governing Board. He was a founding member of the Governing Board of the Washington State Academy of Sciences and served as its President. He has consulted for many electric power companies and related government agencies throughout the world.