CURENT

CENTER FOR ULTRA-WIDE-AREA RESILIENT ELECTRIC ENERGY TRANSMISSION NETWORKS

Vision

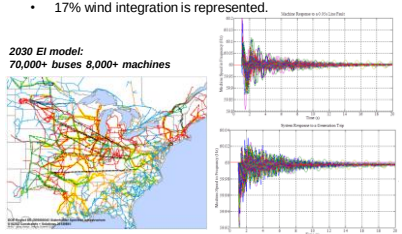
- A nation-wide transmission grid that is fully monitored and dynamically controlled for high efficiency, high reliability, low cost, better accommodation of renewable sources, full utilization of storage and responsive load.
- A new generation of electric power and energy systems engineering leaders with a global perspective coming from diverse backgrounds.

THE UNIVERSITY of TENNESSEE KNOXVILLE · Rensselaer · Northeastern · TUSKEGEE UNIVERSITY

Developing Dynamic Models for the 2030 Eastern Interconnection

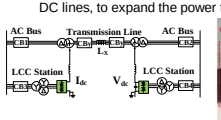
- EIPC has built three major power flow scenarios for the 2030 EI.
  This work aims to build a dynamic equivalent with good convergence.
- Both generic and MMWG dynamic models and parameters are used to assemble the model.
- 17% wind integration is represented.

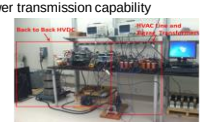
2030 EI model:
70,000+ buses 8,000+ machines

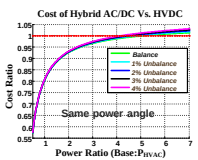


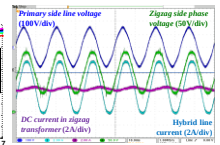
Hybrid AC/DC Transmission System

Objective: Upgrade existing AC lines to hybrid AC and DC lines, to expand the power transmission capability

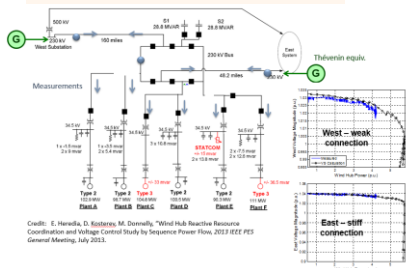








AQ-Bus Method Applied to BPA Wind Hub



Credit: E. Heredia, D. Kosterev, M. Donnelly, "Wind Hub Reactive Resource Coordination and Voltage Control Study by Sequence Power Flow, *2013 IEEE PES General Meeting*, July 2013.

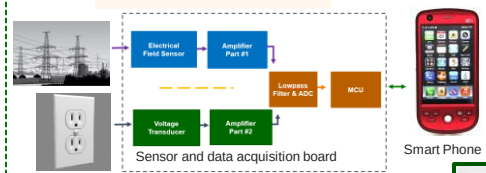
Demonstration Projects

- Wide area frequency control
- Wide area voltage control
- Demonstration platforms
  - LTB – NPCC
  - HTB – Two area system

Power converters for HTB

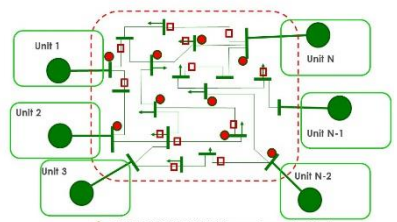
Visualization and control room

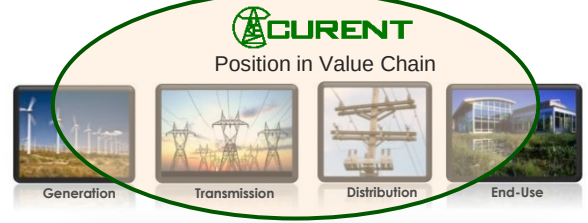
Smart Phone Based FDR

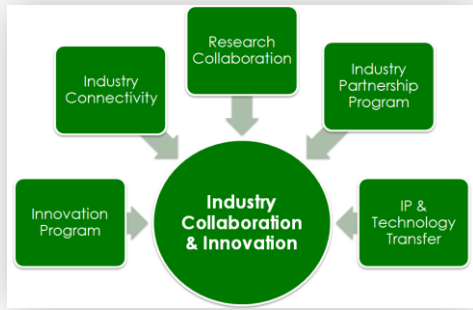


Voltage · Freq-Angle-Voltage

Static and Dynamic State Estimation







Industry Partners

GE · EPRI Electric Power Research Institute · ABB · Oak Ridge National Laboratory · ALSTOM · NREL · Dominion · TVA · Southern Company · ISO New England · Grid Protection Alliance · ISO · Hitachi Inspire the Next · Certes Networks · Global Power Electronics · NRECA · Tektronix · New York Power Authority Generating more than electricity · Huawei · pjm · Mehta Tech, Inc. · Vacon · National Instruments · Scout Cyber Security