

IEEE PES 2004 General Meeting Panel Session

Title: Future Transmission System Options for Long-Term Energy Sustainability

**Panel Organizers: Tom Overbye, University of Illinois at Urbana-Champaign and
Mani Venkata, Iowa State University**

Panel Overview

Mankind has continually pursued cheap and plentiful energy resources. For centuries the major energy resource was firewood, while for over the last one hundred years most of our energy has come in the form of fossil fuels. For example, the U.S. currently gets more than 75% of its energy from fossil fuels. But the reserves for these fuels are finite. The magnitude of the reserves, and when they will run out has been a subject for debate for many years. No one knows for sure when that day will come, or what type of price volatility and geopolitical unrest could accompany global fossil fuel shortages. For some fossil fuels, such as coal, reserves are sufficient for many decades of usage at current rates. But for others the time is growing short, with most experts predicting global oil production to peak in the next ten to twenty years.

Over the next several decades it is likely the sources of energy will switch away for fossil fuels. But most likely new energy sources, such as expanded nuclear power and wind, require the use of electricity for transportation from the energy source to the consumers. Accommodating this potential for greatly increased electric energy flow may require new transmission technology. This panel session explores future transmission system options for greatly expanding the capacity of the existing grid.

Speakers

Speaker: Dale Bradshaw, TVA,
Title: “New transmission technologies needed to develop a sustainable energy infrastructure”

Summary

This presentation discusses several new transmission technologies that are needed to develop a sustainable energy infrastructure.

Speaker: Paul Grant, EPRI,
Title: “The Energy SuperGrid”

Summary

This presentation discusses a proposal originally developed in 2001 by Chauncey Starr, founder and emeritus president of EPRI, for the creation of a “Continental SuperGrid” to

meet the nation's energy needs in the mid to later half of the 21st Century. In brief, the proposal calls for the creation of an Energy Supergrid, delivering both electricity and hydrogen. The electric portion of the grid would use superconducting, high voltage dc cables for power transmission, with liquid hydrogen used as the core coolant. The electric power and hydrogen would be supplied from nuclear and other source power plants spaced along the grid. Electricity would exit the system at various taps, connecting into the existing ac power grid. The hydrogen would also exit the grid, providing a readily available, alternative fuel, for perhaps fuel-cell based automobiles.

The Energy SuperGrid concept goes beyond the vision of a future hydrogen economy, or the simple extrapolation of electrification, to a duality of a hydrogen – electricity future, *hydricity*. In this vision electricity and hydrogen become synergistic elements in the future energy infrastructure. This energy delivery grid interconnects remote sources with load centers, links regional ac interconnections and connects concentrated population centers with remote nuclear and modern renewable resources and integrates hydrogen utilization in combined heat and power facilities and hydrogen storage for mobility or transportation usage.

Speaker: Alex Malozemoff, American Superconductor
Title: “Superconducting Technologies for a Controllable and Reliable High Capacity Grid”

Summary

This presentation discusses superconducting technologies for a controllable and reliable high capacity grid.

Speakers: Ronald Spahr, University of Illinois at Springfield, Don Mundy, Black & Veatch, and Karl F Davis

Title: “A Feasibility Analysis for the TransAmerica Generation Project (TAGG)-A National Grid Proposal”

Summary

This presentation discusses the Trans-America Generation Grid (TAGG) Project (Transmission Component), a new High-Voltage Direct Current (HVDC) transmission line project that would interconnect Arizona, California, Illinois, the Dakotas, Texas, and the states in between to provide a major new conduit for electricity on a national scale. It is proposed that this approximately \$11 billion endeavor be sponsored by the federal government as a Government Sponsored Enterprise (GSE) and would be operated and managed by a private corporation—as is the case with the Federal Home Loan Mortgage Corporation (Freddie Mac) and other GSEs.

The TAGG project has evolved from discussions within the coal industry and among state officials in the upper Midwest over the last 15 years. It addresses three major concerns that are currently facing the U.S. power industry: (1) It provides a means to tap the tremendous coal and wind power resources of the Dakotas, Colorado and Wyoming for use by the rest of the country; (2) It relieves transmission constraints that exist in the southwest and between the upper Midwest and Texas; and (3) It enhances the deregulation of the U.S. power industry by providing existing generation with better access to new markets.

Speaker: Mani Venkata, Clarkson University,
Title: “Research needs for future distribution systems”

Summary

This presentation discusses the research needed to develop the high capacity distribution system of the future.