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To: Dan Breedon

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Subj: Room Temperature Superconductors for use in backbone electric power transmission and rotating machinery.

Background: The current furor over a new 500 kv transmission line passing through Butte County has forced me to sample the literature re superconductor power applications. Covering this field starting with the 1911 discovery of superconductivity to the present is a daunting task.

Ref A: P. Grant, Superconductivity and electric power: promises, promises... past present and future, IEEE Trans on Applied Superconductivity June 1997 pp 112-133

Ref B: Wikipedia, Room-temperature superconductor, http://en.wikipe dia.org/Room _temperature_superconductor, March 2009

REf C: Industry News, New motor for U.S. Navy, the future of propulsion technology, IEEE Power and energy magazine, May/June 2009, p 104

Comments:

1. Ref A & B shows that true room temperature superconducto rs are not available despite heroic efforts. Cryogenic and high pressure techniques are making many applications such as Ref C practical.
2. Per Ref C, the Office of naval research, American Superconductor Corp and Northrop Grumman have demonstrated a 36.5 Mw, 49,000 hp ship propulsion variable speed motor using High Temperature superconductor (HTS) wire that can carry 150 times the capability of a similar copper conductor. It is tempting to scale 500 kv power distribution systems by a factor of 150 or to 3.3 KV and put the system underground using conventional solid dielectric cable typical of college campus installations. Unfortunately, systems of this class have used cryogenic hydrogen as a cooling agent so current application to electric power transmissi on is questionable. Extraordinary currents would present problems for switch gear. Typical 2 ½ cycle breakers used with 500 kv systems are rated at 60,000 amperes and represent a significant investment. So scaling of current is a problem. Work done in the Russian Academy of Science polymer science group and Room Temperature Superconductors Inc in this country suggests that superconductivity may be possible using thin film channels in polymers. The applications are myriad and I am sure that that the Department of energy will be passing out grant money for demonstrations.
3. Conventional 500 kv or even 785 kv transmission systems are an items of commerce in this country and extension to 1200 to 1500 kv does not strain your imagination. Conservation and micro grids can constrain demand but we need to hedge our bets by providing right-of-way corridors that will serve Butte County and the rest of California by 2030 for evolving needs

without pushing too hard on questionable technology. Denial of residential development potential and aesthetic complaints will likely slow down the zoning decisions for utility corridors with or without invoking eminent domain procedures. In any case the BOS needs to protect the county from liability and ratepayer costs resulting from inappropriate protection width allocations based on both present and future applications. Redundancy is important in achieving reliability and we may need to provide for both AC and DC interties. We don't want ratepayers to be buying up residences for additional utility corridor space in the future because of inadequate planning. We need to address the ozone health issue that can drive the upper bound on voltage and tower design and adjacent structure protection spacing.