

Friday, July 03, 2009 (file cac224)

To: Dan Breedon

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Subj: Economic drivers and electric storage technology

Background: Economics can play a major part in stakeholder sign on to general plan constraints/incentives. The following references span the general to the specific samples from the general literature.

Ref A: P. Frank, The economic natural field guide, Common sense principles for troubled times, Basic Books 2009

Ref B: P. Verterger, Cost of fuels, UCTV Jan 1, 2009, 8-9 PM (www.economics.ucsd.edu)

Ref C: B. Arrigoni, TANC project zapped, ER July 3, 2009, A1-17

Ref D: V. Madani (PG&E) et al, Network Systems for meeting the energy and environment future, IEEE Proceedings 2010 (VxM6@pge.com)

Ref E: Multiple authors, Special issue on "bottled energy", IEEE power energy society, Vol 7, #4, Jul/Aug 2009

Comments:

1. Ref A by a Cornell economics professor provides a general overview of economic/political drivers that look at crisis areas, work incentives, health issues and limited analytic tools relating to market relationships in our troubled times.
2. Ref B by a Canadian economics professor looks at the complex drivers affecting fuel availability/costs. He is an advocate of a carbon tax on fuels that are marginally deficient in meeting environmental standards. He believes that compressed natural gas and butinol from waste/low impact biofuels will play a major role in transitioning from foreign fuel sources.
3. Ref C notes the withdrawal of SMUD (Sacramento municipal utility district) from the TANC UHV transmission line development corresponding to 35 % of the funding. It remains to be seen if the project is viable. In Butte county Biggs and Gridley were beneficiaries but not funders. Meetings on routing of TANC Butte County have been canceled. Serious amounts of money have been spent on planning this project and it would be interesting to find the rationale used by SMUD for this turn around. Finding new right of ways, funding problems and distributed energy/storage/enhanced efficiency/reduced demand may have had an influence on this decision.
4. Ref D can be viewed as a summation of the general problem of establishing clear direction for energy and associated environmental issues and we should look to Madani as a focus for Northern California direction.

5. Ref E outlines evolving approaches to power and energy in the period up to 2030. The installed electric power capacity of the U.S. is near 1 TW (10^{12} watts) and the potential energy that can be delivered is approximately 10,000 TWhr. The actual energy (2007 data) was 4159 TWhr or a capacity factor of 43%. This a crude measure of our current limitations in generating, using and storing electrical energy. Spinning reserves (large conventional generators in standby) and hydro storage have dominated the storage field in the past. New requirements for renewable sources like wind and PV have aggravated the problem by requiring fast ramp up or reconfiguration using a variety of new storage techniques along with fast acting load management. The Electric Energy Association and the American electric Power organizations are trying to get a handle on optimum handling of storage. DOE, MIT and EPRI are typically leading the way e.g. reduced frequency/voltage based load shedding and compressed air/high speed flywheels/ pumped batteries and mega capacitors are all under active investigation. Biomass derived energy sources that dominate Butte County resources by virtue of their transport limited cost structure are necessarily distributed and this can effect decision making re transmission and distribution of electric power. Ref E and the future Ref D offer hope that the Butte County Board of supervisors will not bog down in analysis paralysis and can find ways to grease the skids for promising developments.