



Energy and Climate Change: Research Needs

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Outline

- Summary of PIER activities in this area of research
- Non-PIER activities
- Research Gaps
 - Adding resilience to the energy supply system
 - Exploring long-term development paths for the energy system in California

Summary of PIER Research Activities: Past studies

- Hydropower generation associated with large water reservoirs (Jay Lund et al.)
- Hydropower generation at a high elevation SMUD System (Vicuña et al.) and statewide analysis (Jay Lund et al.)
- The long-term potential for energy efficiency in the residential sector (Rufo et al.)
- Climate change and electricity demand (Franco/Sanstad, and Miller et al.)
- Advanced energy pathways (Ogden et al.)
- Exploratory study about the evolution of the California energy system in the context of a national energy system (Smith et al.)
- **Development of clean low-carbon energy technologies (rest of the PIER program)**

Summary of PIER Research Activities: On-going studies

- Continuation of the studies on high elevation hydropower units (Vicuña et al, Lund et al.)
- Enhancements to CALVIN: tracking energy consumption in the water sector
- Use confidential household electricity (Auffhammer) and water (Larry Dale) data to estimate response to climate
- INFORM as an adaptation tool (Hydrologic Research Center)
- Long-term potential for energy efficiency in California (LBNL)
- Development of a long-term energy model for California using MiniCAM (Smith et al. PNNL)

Non-PIER activities

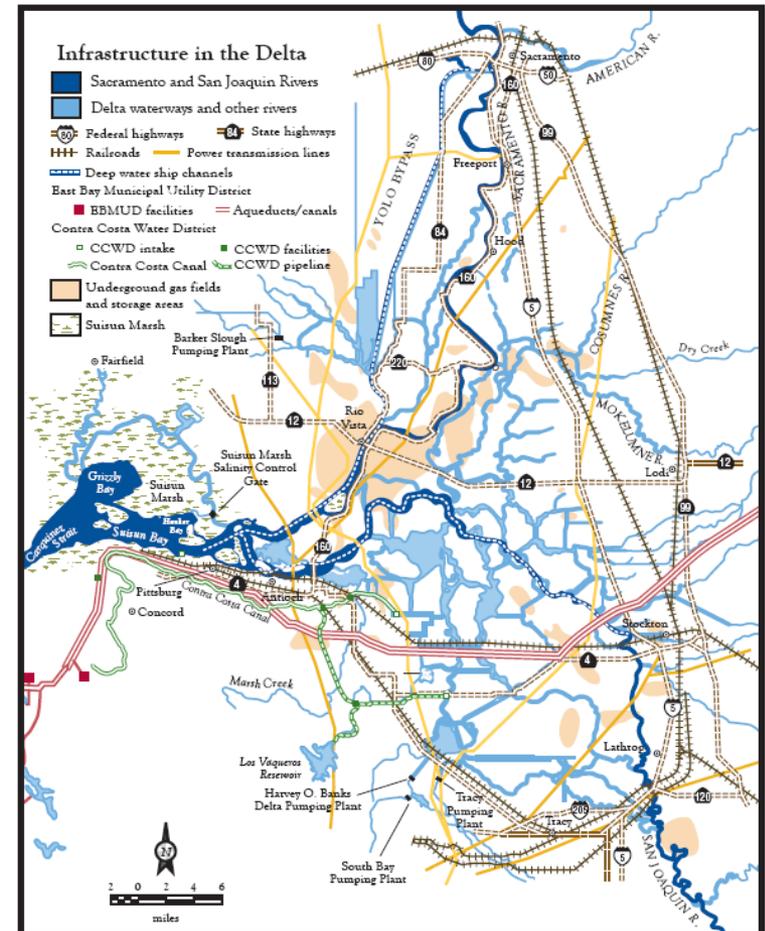
- Several groups are engaged in the development and use of energy models
- The Western Governors Association has commissioned a study
- Several regulatory studies are being conducted by CPUC, CEC, ARB in California

Research Gaps: Drivers

- The Scoping Plan requires substantial GHG emission reductions from the electricity and natural gas systems
- The June 1, 2005 Executive Order: reducing emissions in CA by 80% will require the transformation of our energy system
- A changing climate will affect energy generation and demand (CCSP's synthesis and assessment product 4.5)

Research Gaps

- Potential impacts of climate change to our energy system: extreme events
 - Heat waves: demand for energy, failures in the distribution system, reduced capacity of transmission lines, reduced efficiency of thermal plants
 - Other extreme events: failure of the Sac/SJ Delta system, sea levels during storm events, high runoff levels and hydro facilities (?)

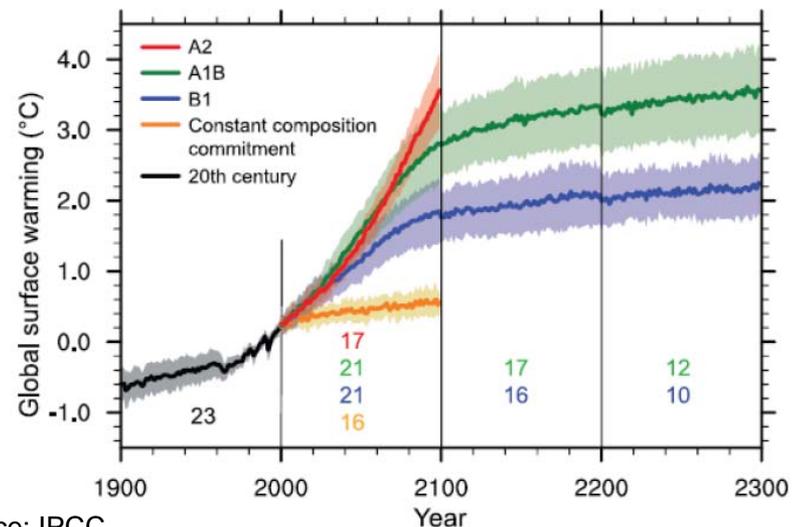
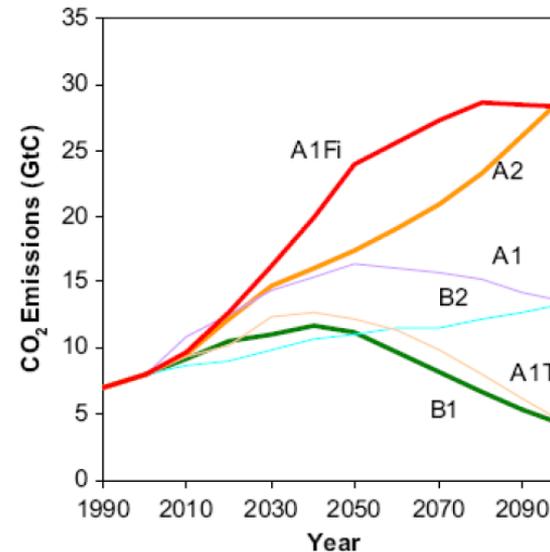


Source: PPIC 2007

http://www.ppic.org/content/pubs/report/R_207JLR.pdf

Research Gaps

- Integrated studies of the energy system in California:
 - Models should take into account changes in energy demand/generation with T,P
 - Differentiated assumptions about available technologies and costs
 - Improve the economics (e.g., econometric relationships, treatment of offsets)
 - Cap-and-trade. What can be done to properly study this option?
 - Identification of offsets to limit the impact on electricity rates



Source: IPCC

Thanks!

Questions?