

# The California Energy System Prepares for Climate Change:

Research Strategy on Impacts and Adaptation Options for the Energy Sector



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# Outline

- ▣ Historical context
- ▣ Direct and indirect impacts of climate change to the energy system
- ▣ The evolution of the energy system in California taking climate change into account



# Historical Context

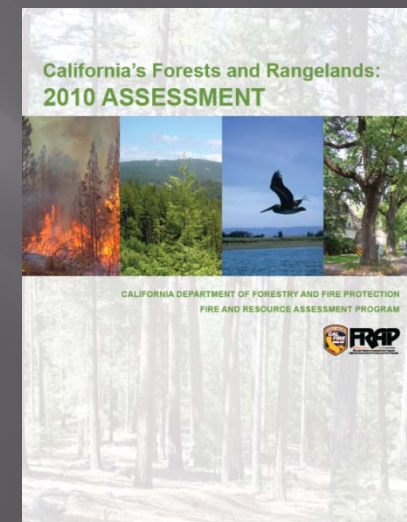
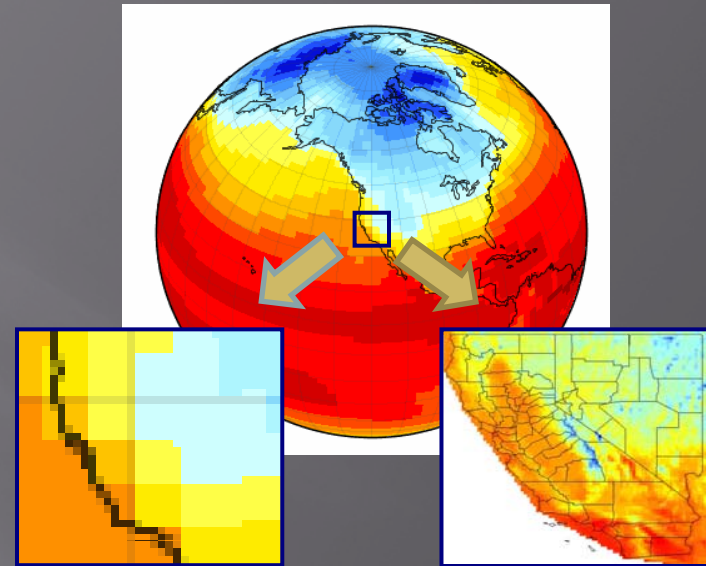


- ▣ PIER has been engaged in climate change research since 2001
- ▣ In 2003 created a virtual organization known as the California Climate Change Center. The first state sponsored climate change research program in the Nation



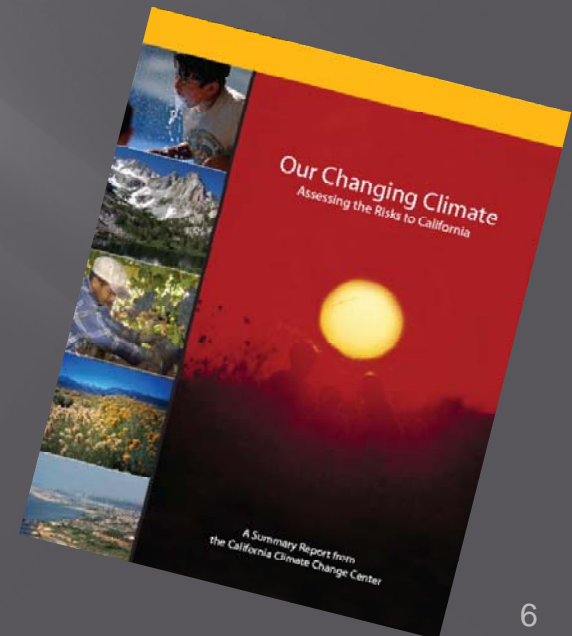
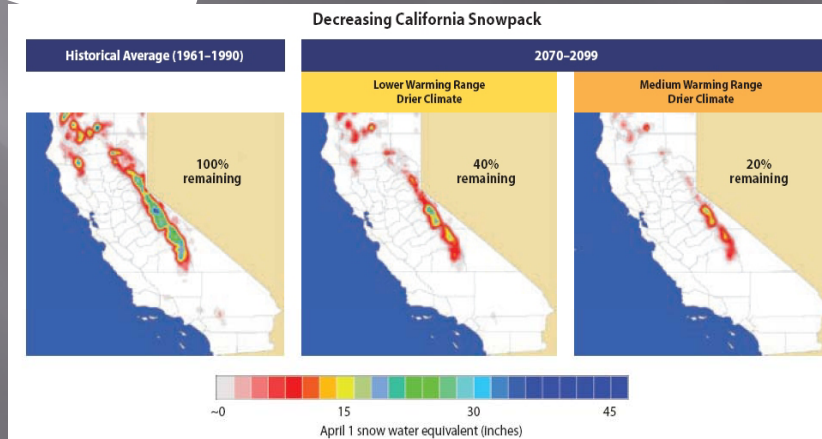
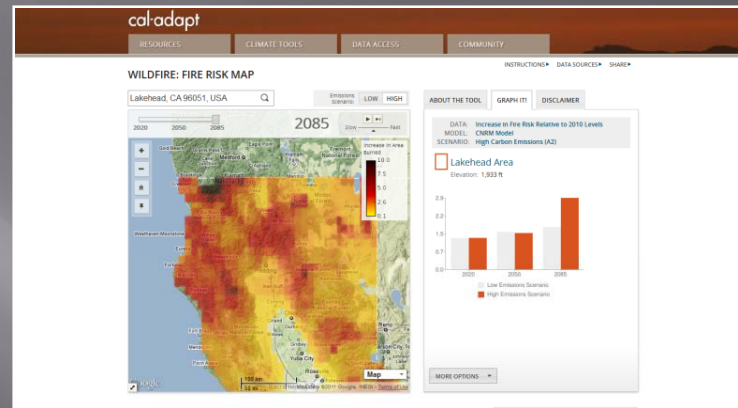
# PIER Research Strategy

- ▣ Complement and enhance federal efforts producing California specific studies
- ▣ Generation of tools and information that can also be used for long-term planning. For example:
  - Ecological model used for the “California's Forests and Rangelands: 2010 Assessment” (CAL FIRE)
  - Climate and sea level scenarios for research and long-term planning





# Research Products Have Informed Policy (e.g., AB32, Adaptation Activities)



- *“The quality of research contained in the scenario analysis performed by PIER far exceeded our expectations. The findings of the report contributed greatly to our understanding of the effects of climate change emissions in California. These findings were the basis of the scientific evidence reflected in the March 2006 Climate Action Team report and in AB 32, the California Global Warming Solutions Act of 2006.”* Eileen Wenger Tutt CalEPA Assistant Secretary for Climate Change Activities.
- *“California is unique in the United States as a state that has examined possible effects of climate change on its energy production and use... Led by the California Energy Commission ..., the state is developing a knowledge base on this subject that could be a model for other states and regions (as well as the nation as a whole).”* Effects of Climate Change on Energy Production and Use in the United States. US Climate Change Science Program. 2008.
- *“Cal-Adapt will allow people to identify climate change risks in specific areas around the state,”* California Secretary for Natural Resources John Laird.
- *“ For the past 10 years PIER has been the main source of scientific information for state agencies. We would not had been able to consider climate change in our planning process without PIER products”* Cathy Bleier. California Dept. of Forestry and Fire Protection .
- *“Incredibly important and useful research. ...there isn't anybody else doing this work for California. ...so important to our planning and management of San Francisco Bay. ...my highest ranking”* Steve Goldbeck. Chief Deputy Director . San Francisco BCDC. 2011



# Current Focus for Climate Change Science: PIER

## ▣ HISTORIC

### ▣ Four research areas:

- ▣ Climate analyses and modeling
- ▣ GHG Inventory Methods
- ▣ Options to Reduce GHG Emissions
- ▣ Impacts and Adaptation Studies

## ▣ CURRENT

### ▣ Three research areas:

- ▣ Climate analyses and modeling (no change)
- ▣ No PIER projects planned
- ▣ Narrowed focus to what energy utilities could do to reduce net GHG emissions
- ▣ Narrower focus on the energy sector





# EPIC: The Future CPUC Proposed Decision

- ▣ The primary and mandatory guiding principle of the Electric Program Investment Charge (EPIC) shall be to provide electricity ratepayer benefits, with the following subordinate guiding principles:
  - ▣ Societal benefits;
  - ▣ Greenhouse gas emissions mitigation and adaptation in the electricity sector at the lowest possible cost;
  - ▣ The loading order;
  - ▣ Low-emission vehicles/transportation;
  - ▣ Safe, reliable, and affordable energy services;
  - ▣ Economic development; and
  - ▣ Efficient use of ratepayer monies.

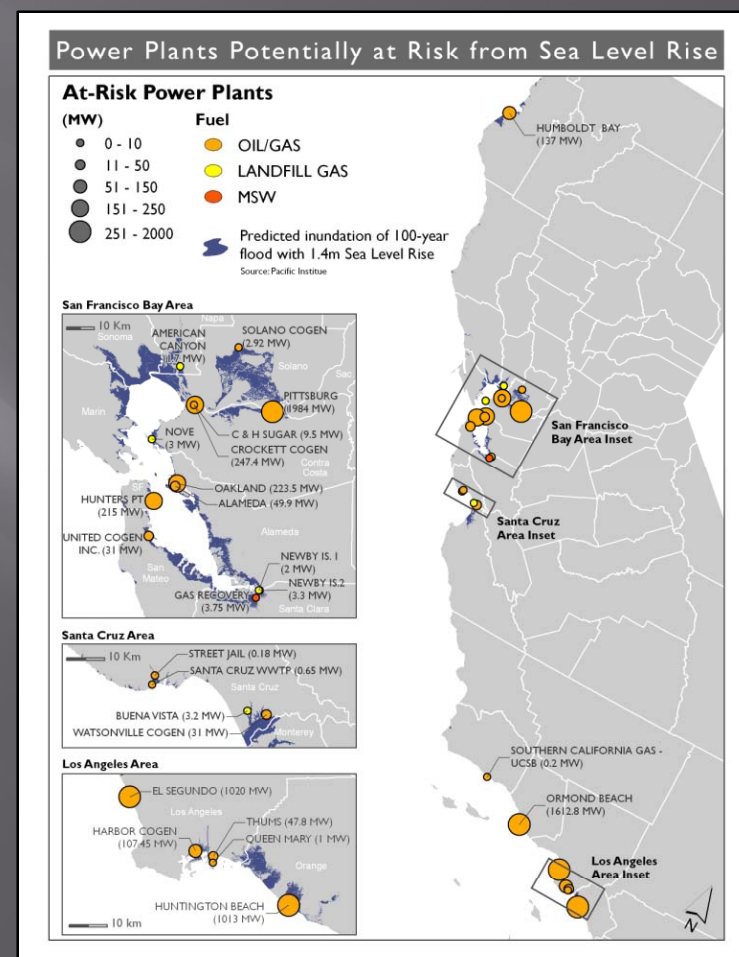


# Impacts of Climate Change to the Energy System



# Direct Impacts (some examples)

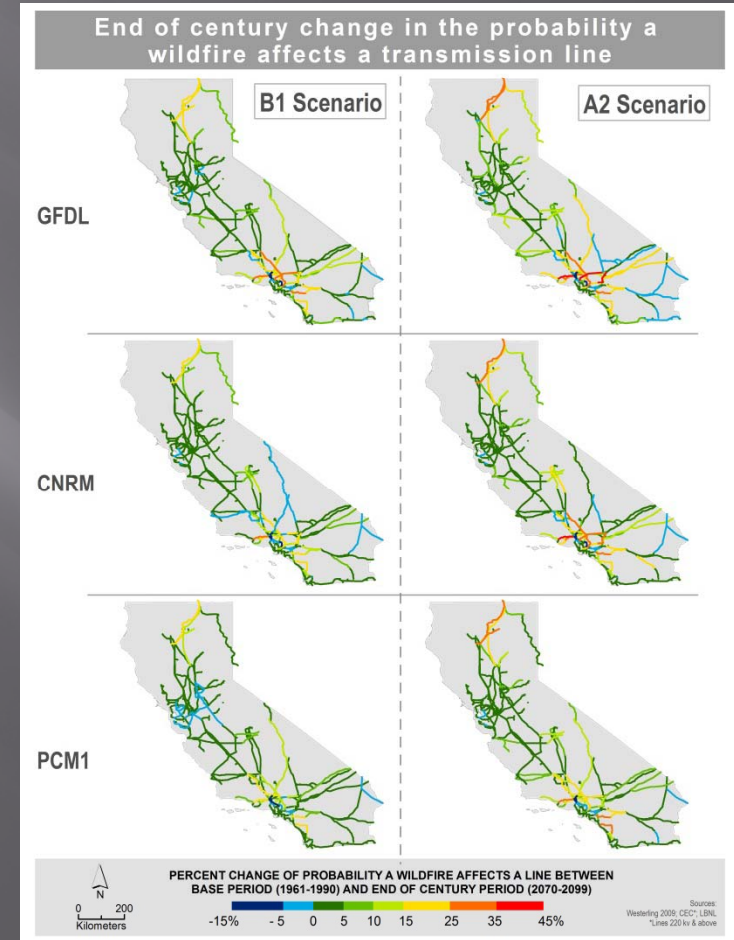
- ❑ Impacts to energy demand
- ❑ Potential impacts to hydropower generation and adaptation options
- ❑ High temperatures and the performance of thermal power plants
- ❑ Identification of energy systems at risk from sea level rise



Source: Sathaye et al., 2012. Draft Final PIER Report

# Indirect Impacts (some examples)

- ▣ Wildfires and transmission lines
- ▣ Ecological impacts and the siting of energy facilities



Source: Sathaye et al., 2012. Draft Final PIER Report

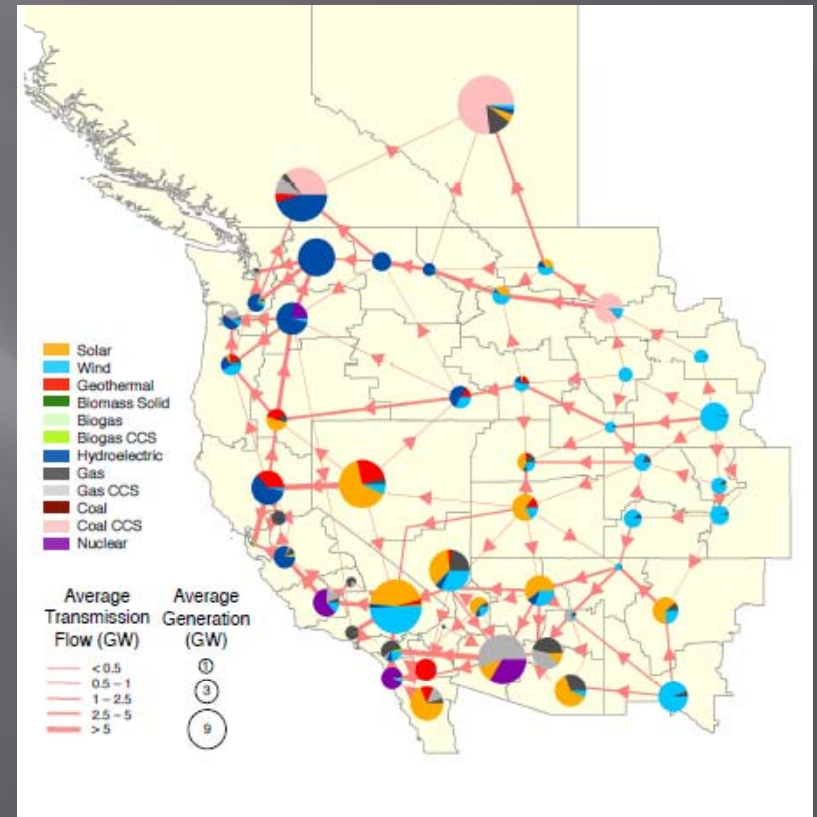


# The Evolution of the Energy System Taking Climate Change into Account



# Potential Evolution of the Energy System

- ▣ Multiple foundational studies
  - California Energy Balances
  - Long-term energy efficiency potential studies
  - California Carbon Challenge
- ▣ Energy Scenarios for California and their environmental implications



Source: J. Nelson and D. Kammen.  
Draft Final PIER Report by Weil et al., 2012.



# Thank You!

