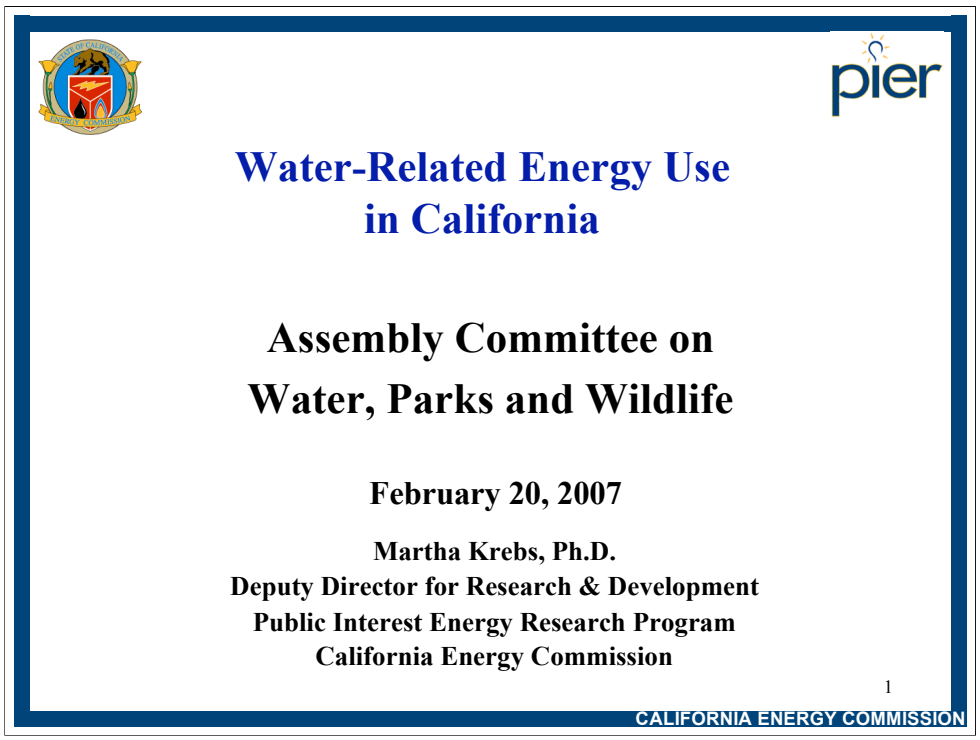
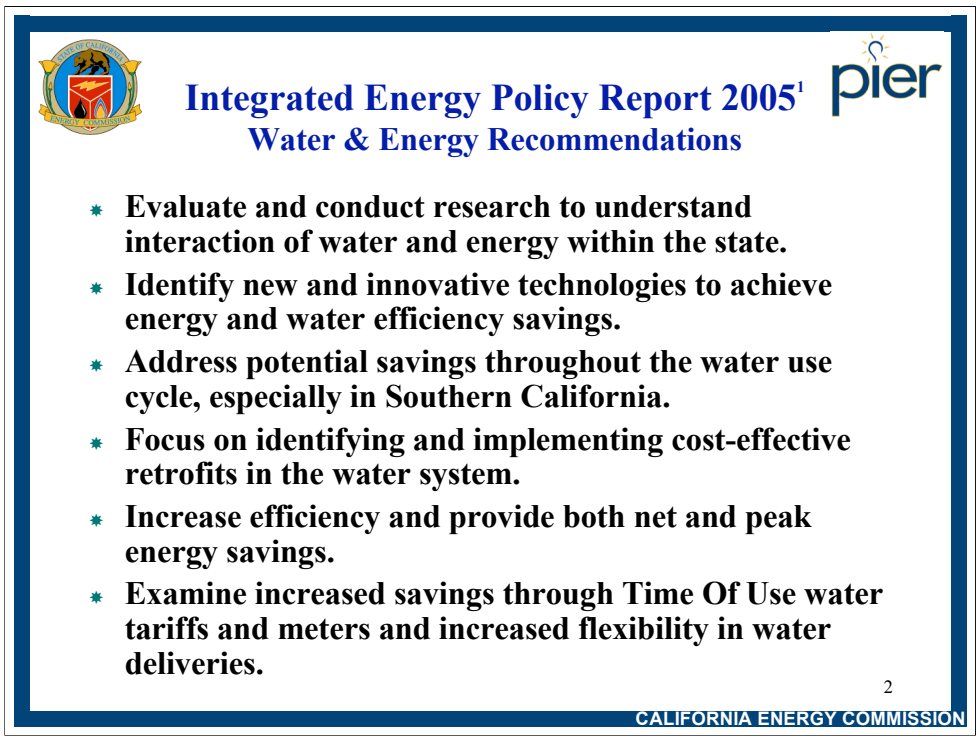


Chairman and Members of the Committee

I am Martha Krebs, Deputy Director for Research and Development at the California Energy Commission. I am accompanied today by Mr. Richard Sapudar our specialist in Energy and Water technical issues. I oversee the Public Interest Energy Research (PIER) program, which was reauthorized by the legislature in 2006. PIER is an approximately $80M per year program funded by the electricity and natural gas ratepayers of the California Investor Owned Utilities. The program carries out research that focuses on advanced technology for energy efficiency, renewables and clean energy generation. In addition, we also explore advancements in California's transmission and distribution systems as well as understanding the impacts of energy use and generation in California. An important element of this research has been understanding the possible impacts of climate warming on our energy system. Within this framework, the water system of California has been of critical importance to energy production and energy use and its continued contribution to California in a warming environment is of special interest.

As water demand grows in the state, so grows water related energy demand. Since population growth drives demand for both resources, water and energy demand are growing at about the same rate and, importantly, in many of the same geographic areas.

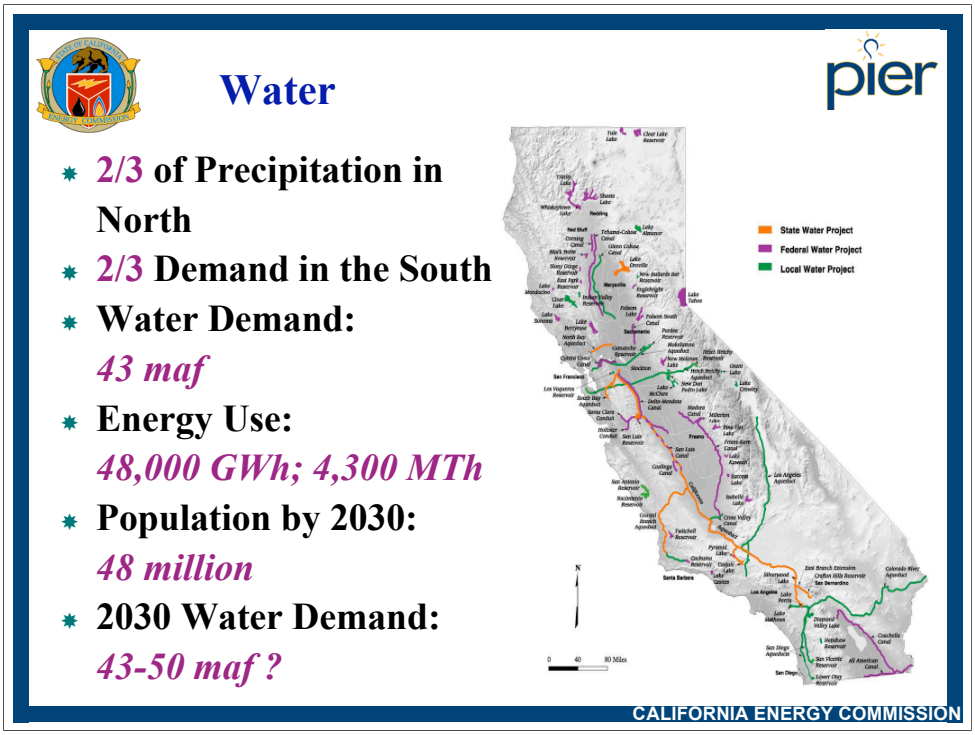
In the time I have I would like to give a broad overview of the State's water and energy relationship, and a quick look at few important findings from the recently released CEC PIER Program Report: REFINING ESTIMATES OF WATER RELATED ENERGY USE IN CALIFORNIA .



The CEC's 2005 IEPR and supporting Staff Paper "California's Water – Energy Relationship", was the Commissions first investigation of the State's water related energy use, and made a number of findings and recommendations.

If there is one overarching finding of the IEPR, the staff paper, and the current report, it is that a major portion of the solution to water & energy efficiency is closer coordination between the water and energy sectors.

The CEC analysis showed that significant energy benefits can be reaped through the twin goals of the efficient use of water by end users and the efficient use of energy by water systems.



The state water plan concludes that the largest single new supply available for meeting this expected growth in water demand over the next 25 years is water use efficiency.

The remainder must be provided by the development of new water supplies including water recycling, and desalination of both brackish and seawater, all of which will increase energy demand over current levels.

This dynamic is also driven by the fact that two-thirds of the state's precipitation falls in Northern California while two-thirds of the population resides in Southern California.

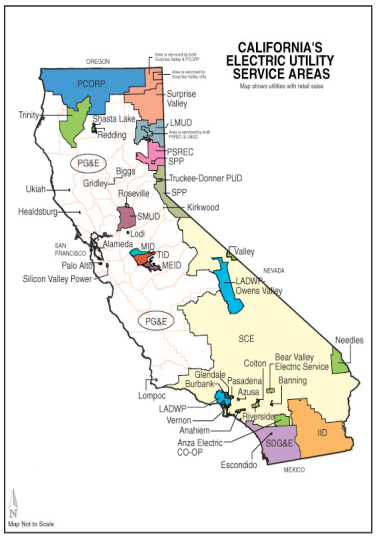
Water demand and electricity demand are growing rapidly in many of the same parts of the state stressing already constrained electricity delivery systems.

In California, water related energy use, which includes the conveyance, storage, treatment, distribution, wastewater collection, treatment, and discharge sectors of the water use cycle, which I will discuss later, consumes about 19 percent of the state's electricity, 30 percent of its natural gas, and 88 billion gallons of diesel fuel every year – and this demand is growing.

This water related energy use is termed water embedded energy, since each time water is moved or treated using energy, that energy is considered to be embedded in that water or part of the value of that water.

Energy

- **Population:** *34 million, 1.2% per year growth*
- **Multiple Utility Service Territories**
- **2004 Electricity Use:** *271,000 GWh*
- **2004 Peak Demand:** *56,435 MW*
- **Annual growth:** *Consumption - 1.4%* *Peak - 1.65%*



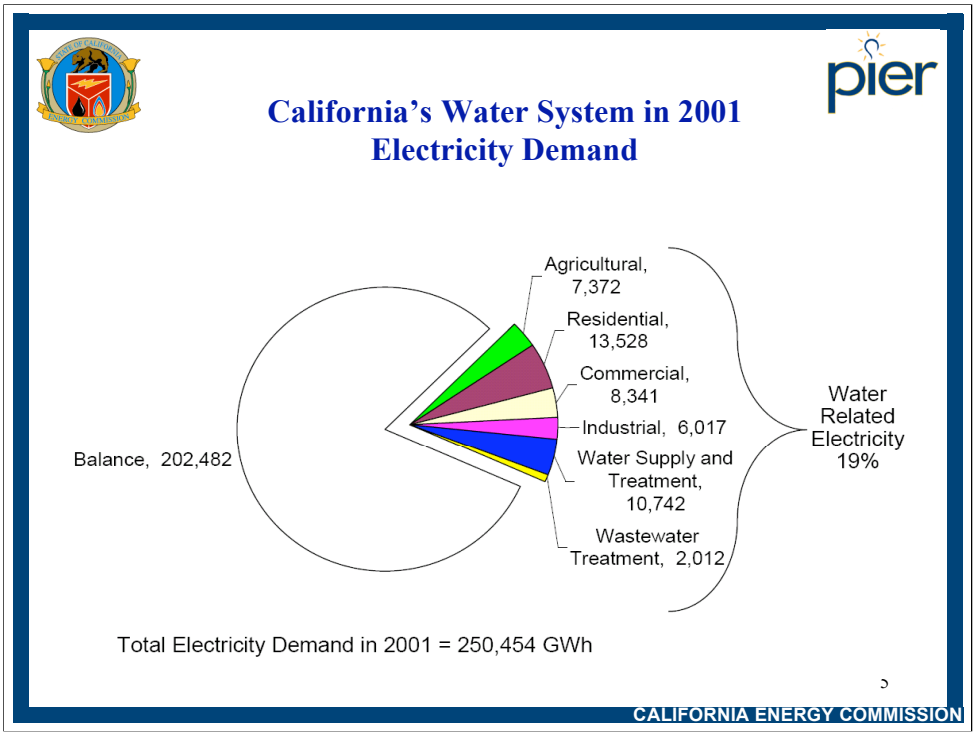
CALIFORNIA ENERGY COMMISSION

Using 2004 as an example, approximately 60% of the State's energy supply was generated by thermal power plants burning coal and natural gas, with the associated emission of greenhouse gases.

Nearly all new generation in the State is natural gas powered, either simple cycle or combined cycle gas fired power plants.

Many of the issues of concern that are common to both water and energy are directly related to supply and demand:

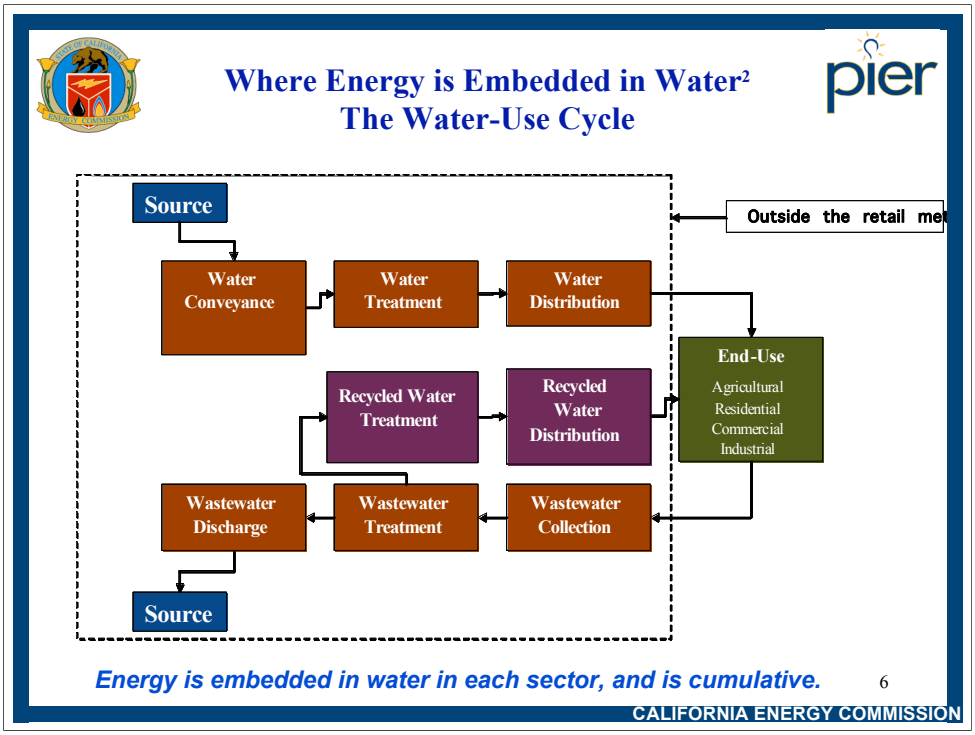
Growing Demand, Resource Adequacy, Resource Quality, Infrastructure, Cost, Environmental Protection, Long-term Uncertainty, Increasing Energy Use (Water), Increasing Net and Peak Load (Energy)



This chart show how and where power is used in the State's water systems. The CEC's water and energy research is designed to obtain a greater understanding of how this energy is used within these sectors, and how it can be used more efficiently.

Water-related use of electricity is about 19% of our total electricity use.

For comparison, Water Related Natural Gas Demand is 32% of total non-thermal power generation natural gas use.

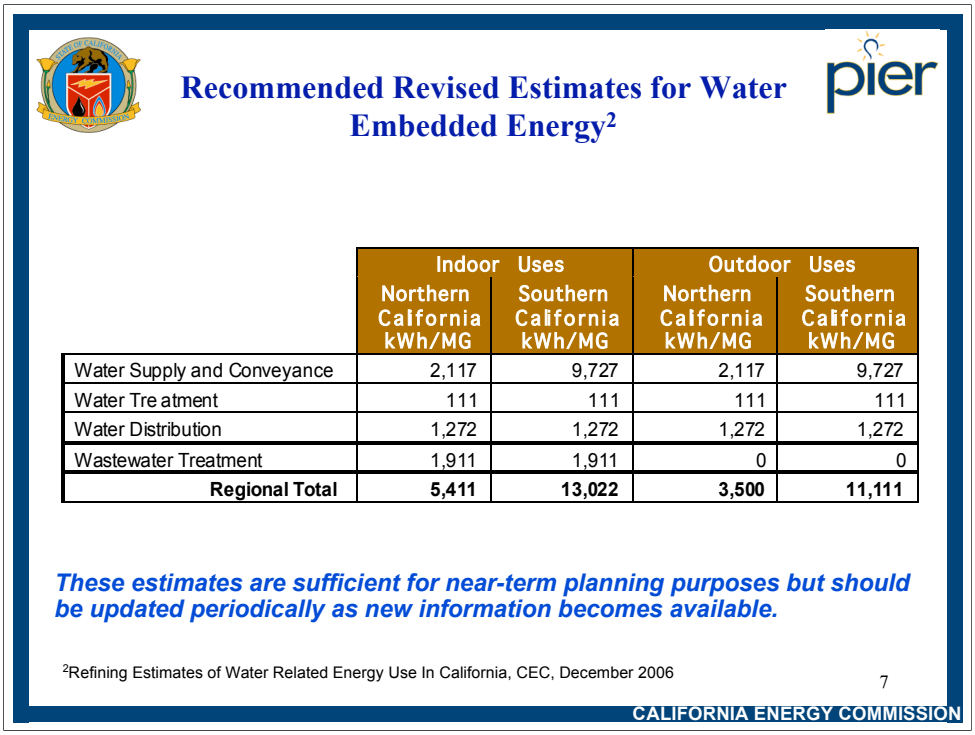


This schematic systems approach was used in both the IEPR and the current study, and is based on previous work by Dr. Robert Wilkinson of UCSB.

One important aspect of this approach is that each unit of water may have a different amount of energy embedded in it depending on how much it is processed or conveyed before it is delivered to the user. This energy is quite different if you are in Northern or Southern California, because it depends on pumping requirements related to distance and topography.

Treatment and Distribution before end use is better defined and fairly consistent across California and the USA.

One of the CEC and PIER goals has been to look deeper into each element of the water system before and after the water end user makes use of the water for more information on how energy is being used in the water system.



As with the 2005 IEPR, the current report found that distinct differences in the regional characteristics of the state's water supply and conveyance systems suggested that two separate proxies be established—one for Southern California and one for Northern California.

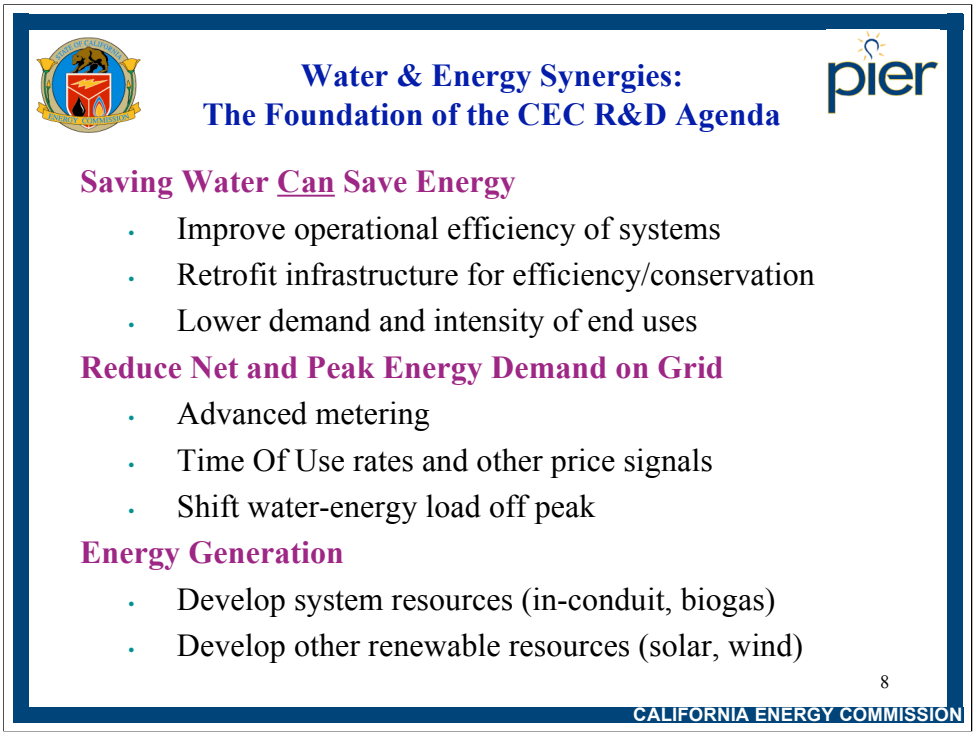
The principal difference between north and south is the energy embedded by conveyance. The pumping of water along the Federal and State Water projects and across the Tehachapi mountains into the LA Basin account for the significant differences.

The current study estimated the amount of energy needed for each sector of the water-use cycle in terms of the number of kilowatt-hours (kWh) needed to collect, extract, convey, treat, and distribute one million gallons (MG) of water, and the number of kWh needed to treat and dispose of the same quantity of wastewater.

Further, this study provided adjusted water-energy estimates that are sufficient for informing policy and prioritization of research and development investments.

The study also describes important data gaps and includes the collection of primary data from water utilities and the disaggregation of data geographically and within water-use cycle sectors, to the extent possible.

This review indicates that while the data and methods used to prepare the Energy Commission's 2005 report were not perfect, they offered a reasonable starting place for prioritizing water-energy research and development, as outlined in the Energy Commission's 2005 Integrated Energy Policy Report.



These are the synergies that were determined in IEPR and confirmed in the update report.

•Saving water can save energy, but not always – we need to verify the energy savings prior to the adoption of water conservation Best Management Practices. (example is evaporative air conditioning or cooling - less energy more water - verses refrigerated air conditioning or cooling – more energy less water.)

•We must find ways to reduce or shift peak demand to off peak.

•There are opportunities to off-set water related energy use by on-site generation.

•These findings are currently being used to focus and guide our R&D efforts.

California Energy Commission

pier

Thank You

www.energy.ca.gov

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