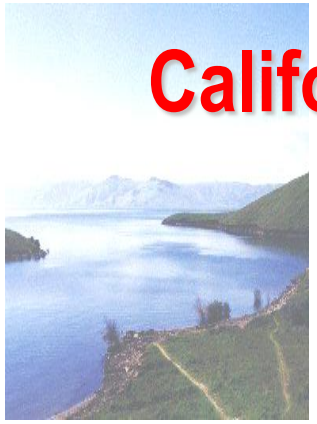
California's Water-Energy Nexus Programs





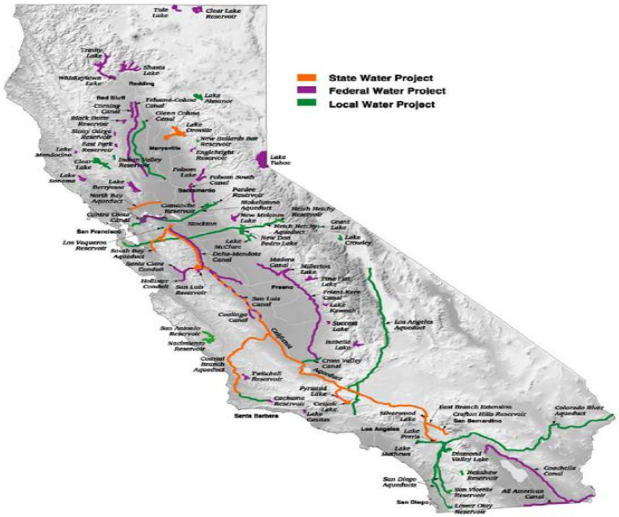



Workshop on Water & Energy Efficiency
Atlantic Council of the United States

Presented by:
Shahid Chaudhry
California Energy Commission

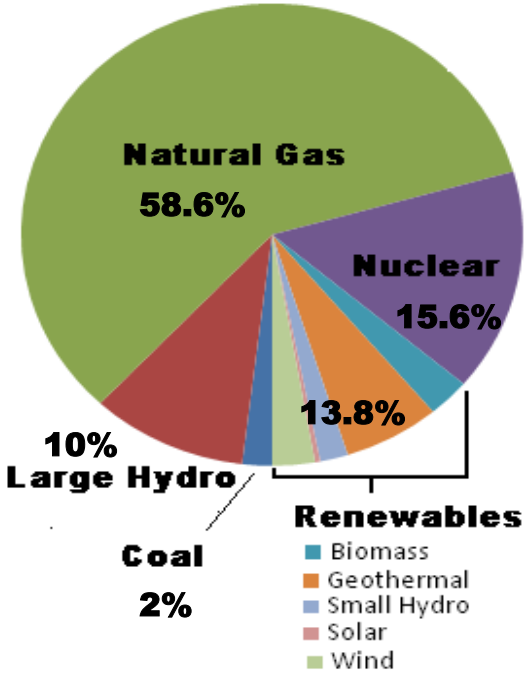
June 19, 2012

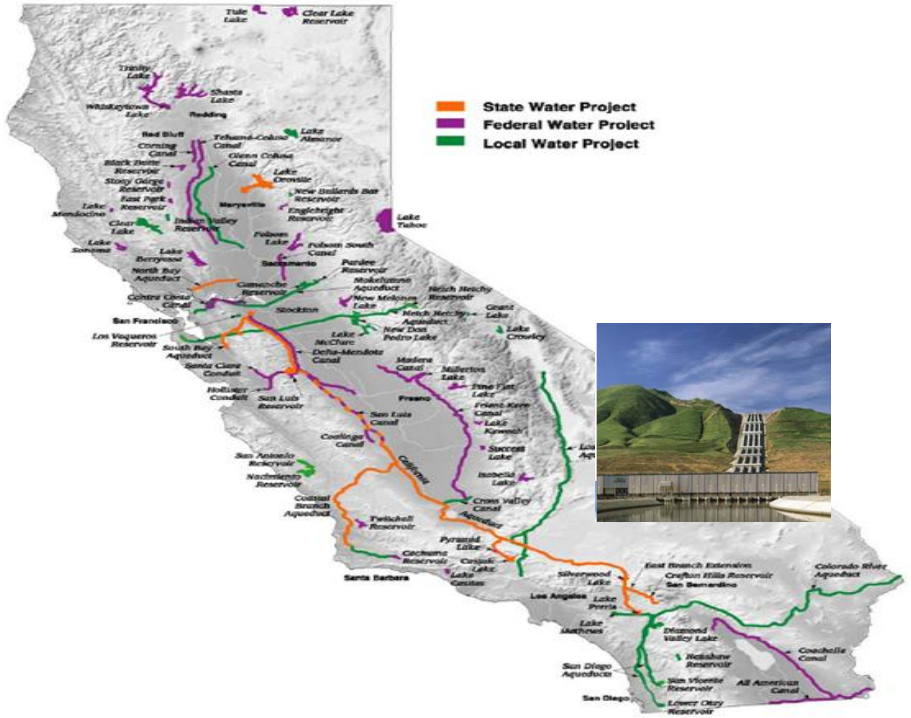
- **Key Players in California Water Sector**
  - ➢ Dept. of Water Resources
  - ➢ Water Resources Control Board
  - ➢ Dept. of Health Services
  - ➢ Public Utilities Commission
  - ➢ Cities, Counties, and Water/Sanitation Utilities
  - ➢ Energy Commission



U.S. 75×10^3 GWhr (~ 3%)
California: 22×10^3 GWhr (~ 7.5%)

- # California's Electricity & Water Resources

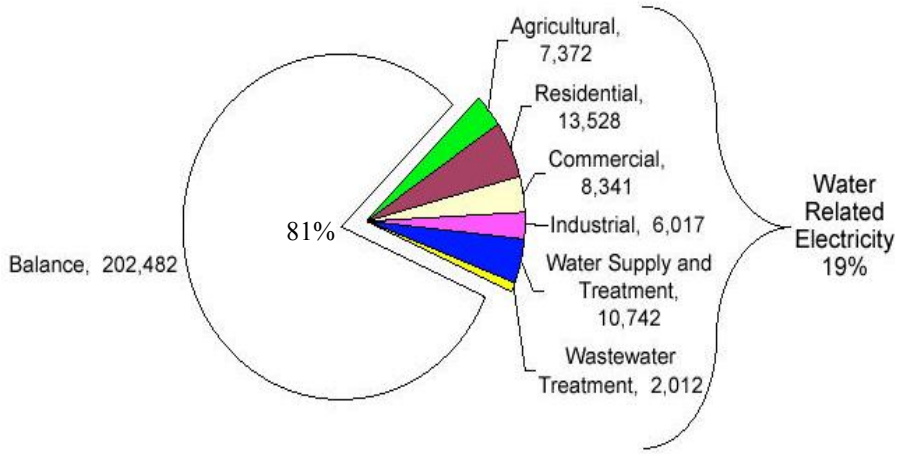




CA's Elec. Generation: 208,600 GWh → 5,680 kWh / person
(2008) Consumption: 287,780 GWh → 7,840 kWh / person

Annual Water Available in California
→ 82.5 MAF *i.e.* 101.76 km^3

- **Energy Use by Water Sector – California Case Study**



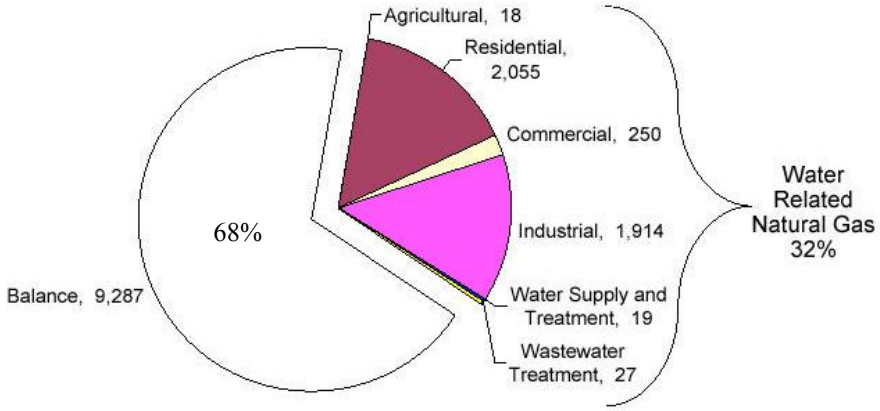
Total Electricity Demand in 2001 = 250,454 GWh

Electricity Use:

Water Supply & Treatment:	4.3%
Industrial:	2.4%
Commercial:	3.3%
Residential:	5.4%
Agricultural:	2.9%
WW Treatment:	0.8%

Nat. Gas Use:

Ag., W & WWT:	0.5%
Residential:	15.1%
Commercial:	1.8%
Industrial:	14.1%



Total Natural Gas Demand in 2001 = 13,571 therms

CEC: W-E Report 2005 (using data for 2001)

- **Emerging Challenges in W-E Nexus**
  - **Increasing Population → More Water & Energy Needs**
  - **Traditional Water Sources**
    Dwindling Supplies + Deteriorating Quality + New Contaminants + Environmental & Regulatory Constraints (i.e. Stringent Regulations)
  - **Energy Intensive Technologies**
    (UF, MF, UV, Ozone, MBRs, Desalination)
  - **Water Related Energy Demand is Increasing @ Much Faster Rate – May be 50% More by 2030**
  - **New Kids on the Block**
    GHG Emissions / Climate Change Impacts & Role of W / WW Sector, Carbon Neutrality, & Sustainability Considerations

• Sustainable Water-Energy Nexus

Energy Efficiency, D. Generation, Load Shifting

Premium Efficiency Motors; EE Pumps / Motor Systems;
Alternative Treatment Processes;
VFDs, DO Controls;
Fine Bubble Aerators;
SCADA Systems/Automation;
Water Storage /Pumping Management;
CHP & CH4 Utilization @ WWT Plants

Renewable Energy Sources

--- Pros & Cons

PV, Wind — Mature Technologies
Fuel Cells, Solar Thermal -- Emerging Technologies
CPV — RD&D Stage

Reducing Water Demand / Use

Loss Reduction, Water Use Conservation / Efficiency

Improving Operational & Transfer Efficiency

Reducing Water Losses in Conveyance, Transfers, & Distribution Systems

Developing Local Water Supply Sources

Conjunctive Management & Groundwater Storage
Surface Storage
Water Recycling
Desalination

- **Energy Partnership / Technical Assistance Program**

  Provides Technical Assistance in Identifying EE Projects through a Wide Range of FREE OF COST Services:

  - **Conducting Energy Audits**
  - **Reviewing Existing Proposals & Designs / Equipment Performance Specifications, Reviewing Schematics / Construction Plans**
  - **Reviewing Equipment Bid Specifications**
  - **Comparing Different Technologies**
  - **Assisting in Contractor Selection & Commissioning, etc.**

  - **Eligibility:**

    Cities, Counties, Special Districts (Water & Wastewater Utilities),
    Public and/or Non-Profit Hospitals,
    Public Care Facilities, and
    Schools / Colleges / Universities.

- **Energy Financing Program**

  Low-Interest Loans to Implement Energy-Saving Measures

  Eligible Projects - Examples:

  Interior & Exterior Lights / Streetlights / LED Traffic Signals,
  Pumps, Motors, VFDS, HVAC Modifications,
  Building Insulation,
  Automated Energy Management Systems / Controls,
  Energy Generation including RE Projects & Cogeneration,

  Financing Criteria - Easiest & Simplest

  Projects Must be: Technically & Economically Feasible;
  Simple Payback Period < 12 years based on Energy Costs Savings; &
  The Loan Term Can't Exceed the Useful Life of the Equipment.

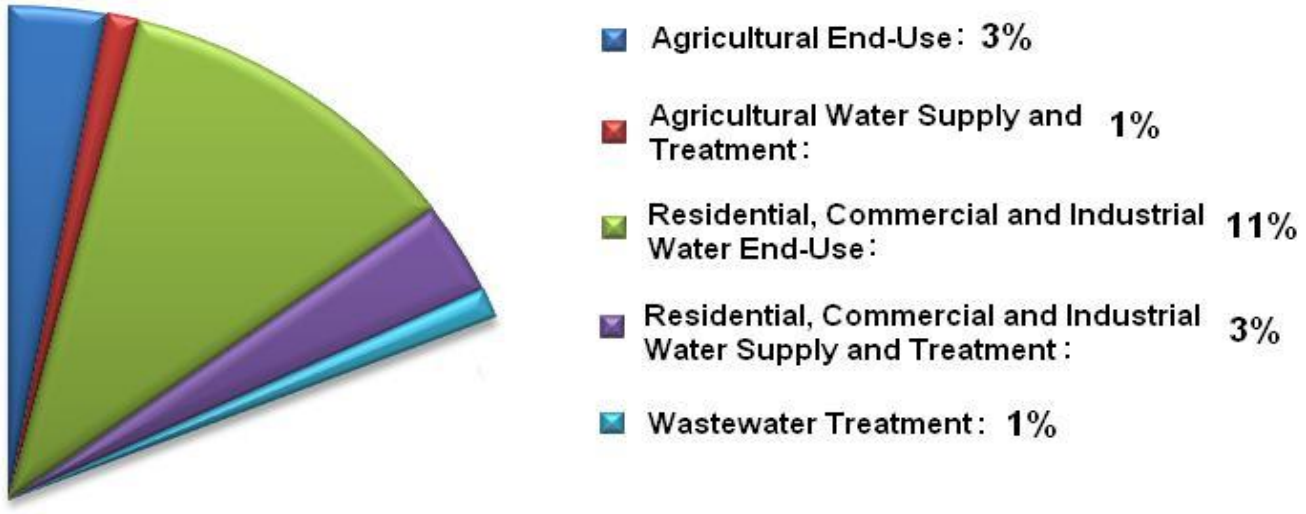
  Financing Amount:

  Up to 100% of the Cost of EE / RE Projects or $3 million per Application - Which Ever is Less.

- # Public Interest Energy Research (PIER) Program

  California's Unique Energy RD&D Program – Advances Science & Technology in:

  - **EE, RE, Advanced Electricity Generation & Non-Generation Technologies, Energy-Related Environmental Protection; and T&D and Transportation Technologies.**
  - **$86.5 million / year through Competitive Solicitations and Interagency Agreements.**
  - **Water-Energy Funding from IAW Research Category - About 250 R&D Projects for > $76 million**



- **Energy Innovations Small Grant (EISG) Program –**
  Big Ideas, Small Investments

  A Component of PIER Program,

  Manages through San Diego State University Foundation,

  Provides Individuals, Small Businesses, Non-Profits, & Academic Institutions up to:

  - **$95,000 for Hardware Projects**
  - **$50,000 for Modeling Projects that Show the Practical Side of New, Innovative Energy Concepts.**

  Eligibility:

  - **Work Must Advance Science or Technology Not Adequately Addressed by Competitive and Regulated markets,**
  - **Provides An Original Innovative Solution to a Significant Energy Problem,**
  - **Proposes Work That is Still in the Proof-of-Concept Phase,**
  - **Focuses on California Market Needs,**
  - **Provides a Clear Potential Benefit to California Electricity Ratepayers, and**
  - **Recipient and/or Subcontractor Must be California-Based Entity.**

  About 10 Projects: > $766,000

- **Emerging Technology Demonstration Program**

  Specifically for IAW Sector Due to Huge Energy Use & Savings Potential

  Eligibility Projects:

  - **Must Have Passed the "Proof-of-Concept" Stage,**
  - **Have Had a Convincing Laboratory OR Pilot Scale Demonstration,**
  - **Are Ready to be Demonstrated in Real-World in an Industrial Setting in an IOU Territory,**
  - **Overcome Technological Barriers to Meeting State Policy Goals.**

  Round 1

  - **19 Projects Funded ($400K Max Award)**
    (Industrial: 3, Data Centers: 4, Energy Storage: 3, W/WW: 9)
  - **$5.75M in PIER Funds and $5.21M in Match Funds**

  Round 2 – 2010/11 & 2011/12

  - **20 Projects Funded $6.89M with $15M in Match**
    (Industrial: 3, Data Center: 4, Energy Storage: 4, W/WW: 9)

- **CPUC –**
  - **Embedded Energy in Water Pilot Programs**
    - **IOUs to Develop Partnerships with Water Agencies, Implement Specific Water Conservation & EE Programs, and Measure Embedded Energy Savings.**
  - **Operational Energy Efficiency Program (OEEP)**
    - **Investigating 10% Reduction in Electricity Use by Induction Motors Employed in Water Utilities.**
- **California Process Optimization Program (CalPOP)**
  - **Specifically for Wastewater Utilities to Reduce Energy Use in Aeration Processes.**
- **Cal DWR & Cal WRCB**
  - **20% Loans for Green Projects**

- **Got Questions?**