

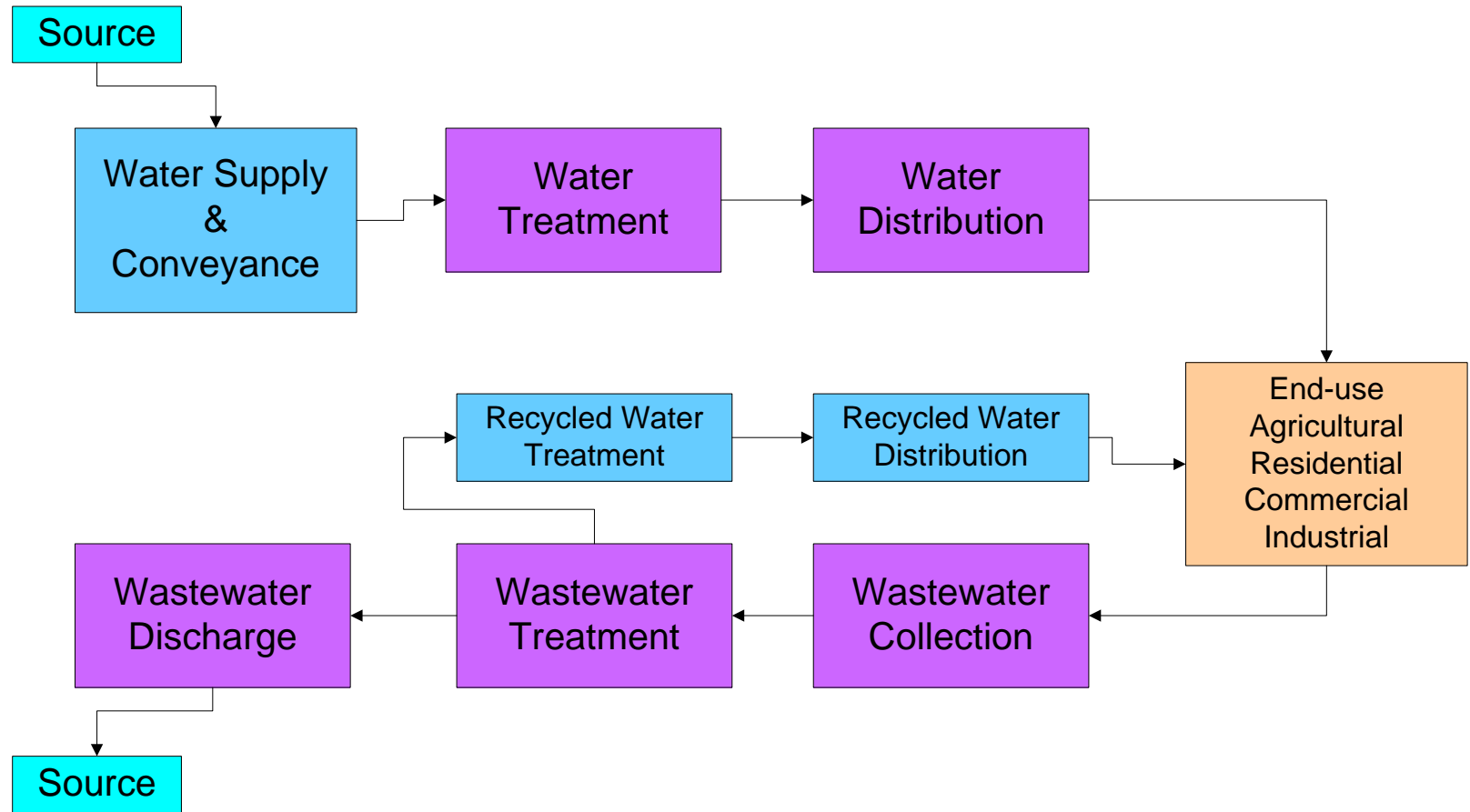
Energy Embedded in Water: Potential Savings, Barriers, and Strategies

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WATER USE CYCLE



Source: California's Water-Energy Relationship, California Energy Commission, November 2004, Figure 1-1, p 7

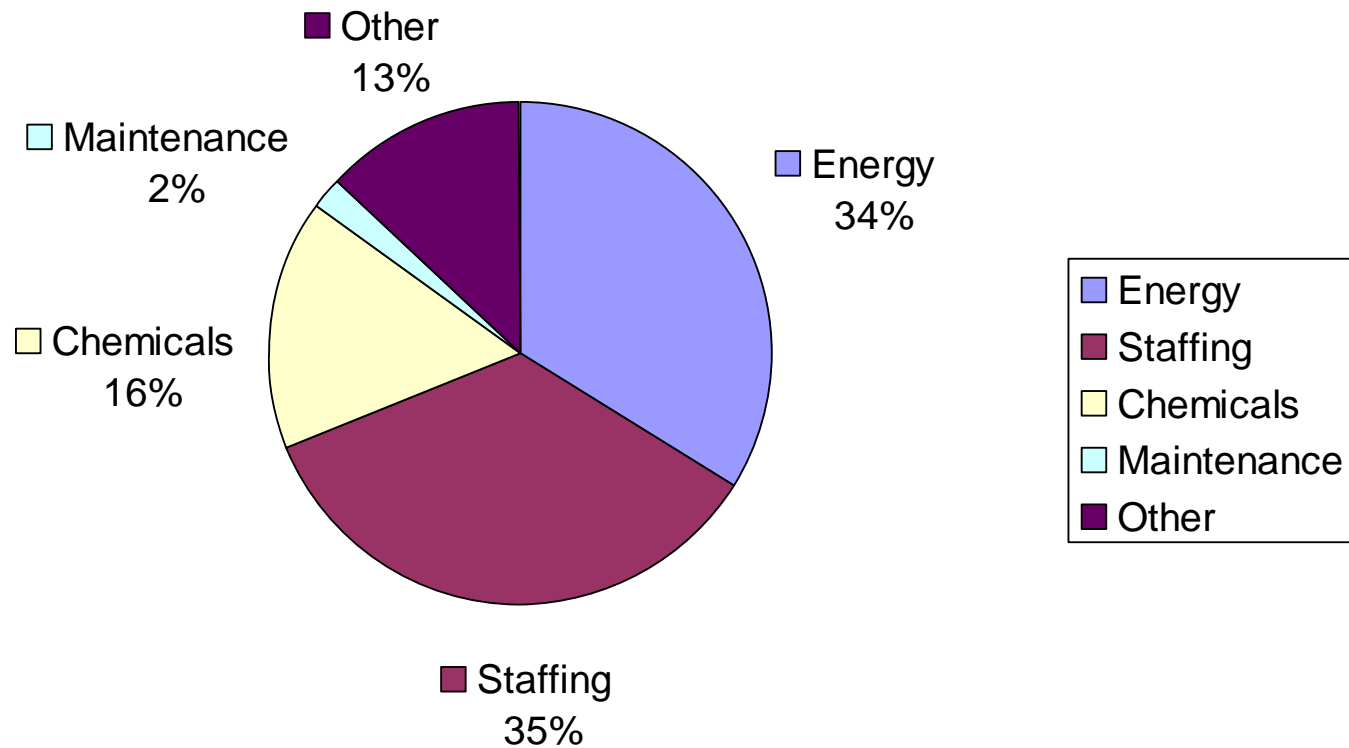
Electricity Use in Water Cycle

	Northern CA* (kWh/MG)	Southern CA* (kWh/MG)	Nat'l Average** (kWh/MG)
Water Supply, Conveyance, and Distribution	3,389	11,638	1,150
Water Treatment	111	111	350
Wastewater Treatment	1,911	1,911	1,200
Total	5,411	13,660	2,700

*Source: Refining Estimates of Water-related Energy Use in California, California Energy Commission, December 2006, Table ES-1, p 2.

**Source: Presentation by Keith Carns, EPRI, July 29, 2004.

O&M Costs at Typical Water Plant



Electricity Savings Potential

- **Improvements in Plant Efficiency.** Various mature technologies increase the efficiency of pumping and wastewater treatment, reducing electricity requirements.
- **Water Conservation and Efficiency.** Water efficient technologies and conservation practices reduce energy at all stages of water use cycle.
- **Biogas Recovery.** Using recovered biogas in heating and on-site electricity generation yields net energy savings.
- **Electric Load Shifting.** Scheduling pumping and other electric intensive activities in off-peak periods can reduce costs of electricity supply.

Plant Efficiency Technologies

- Variable frequency drives
- High efficiency motors
- Process optimization and SCADA systems
- Fine pore diffusers
- Dissolved oxygen control systems
- Efficient blowers
- Blower control systems
- Improved storm water management

Water Conservation/Efficiency Measures

- Ultra Low Flow Toilets
- High efficiency washing machines
- Landscape conservation programs
- Water audits (residential, non-residential)
- Pre-rinse spray valves
- Cooling tower conditioning meters
- X-ray processors

Barriers to Adopting Efficient Measures and Practices

- Misalignment of benefits and costs
- Water and electricity pricing
- Capital budgeting constraints
- Technical/Performance uncertainty
- Diverse plant designs and requirements
- O&M costs and requirements for specialized technologies

Strategies for Promoting Efficiency in Water

- Adopt integrated resource planning process in water
- Increase collaboration between water agencies and energy utilities
- Increase technical cooperation and assistance among water agencies
- Increase shared savings programs with performance guarantees