Policies and Programs to Deliver Cost Effective Water and Energy Use Efficiency

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The Water-Energy Nexus

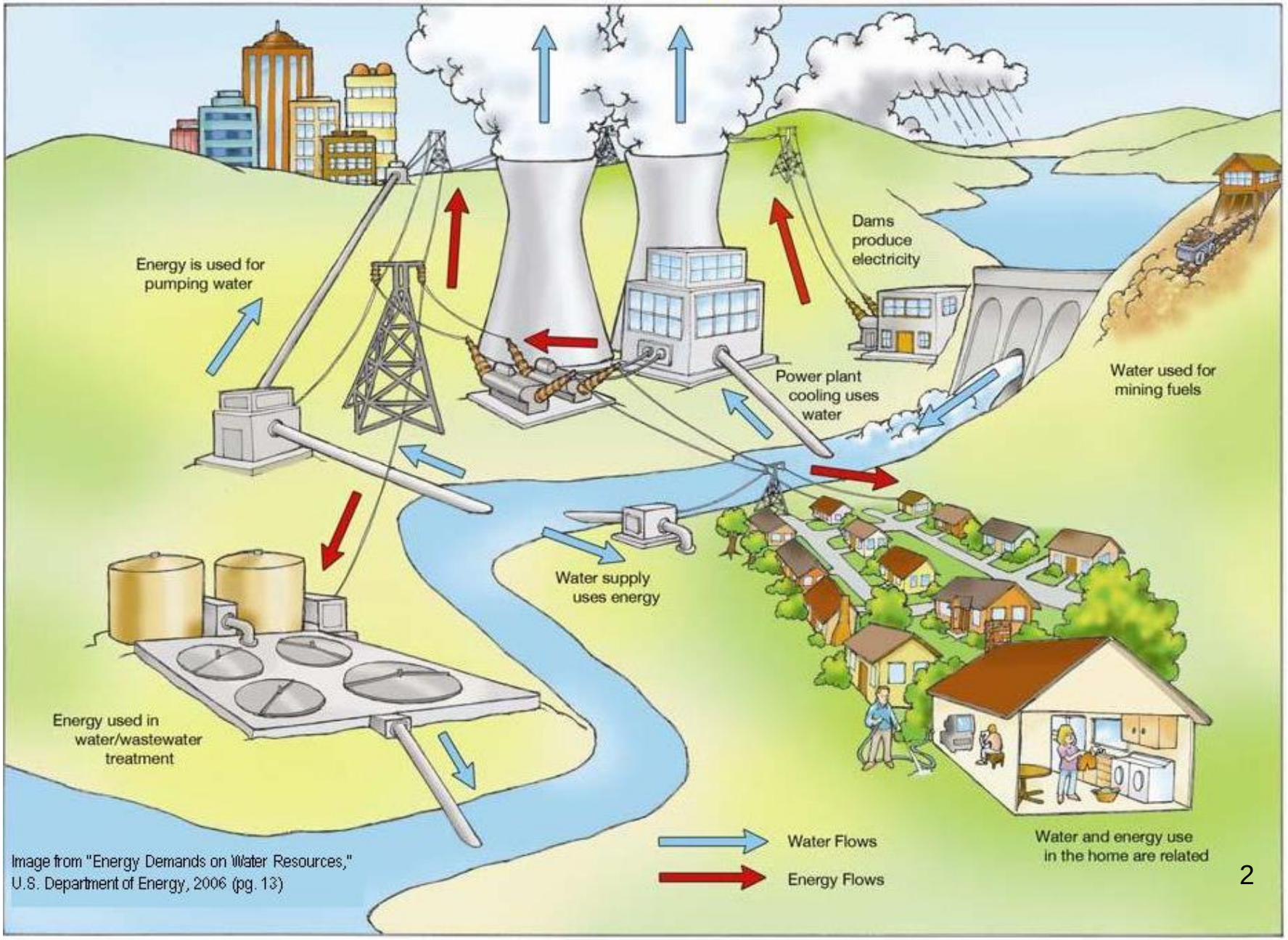
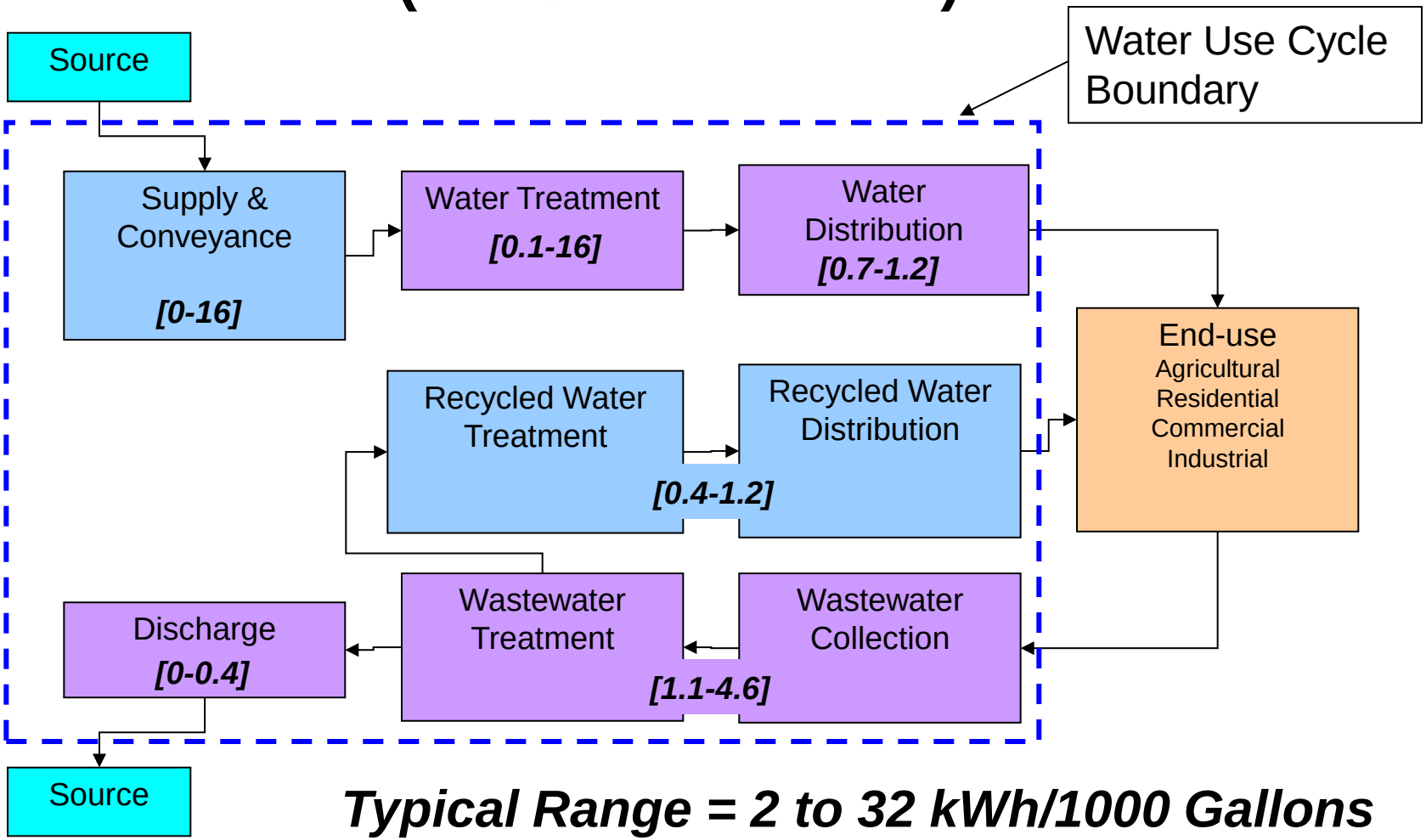


Image from "Energy Demands on Water Resources," U.S. Department of Energy, 2006 (pg. 13)

Water Use Cycle Energy Intensities

(kWh/1000 Gallons)



Typical Range = 2 to 32 kWh/1000 Gallons

Source: California Energy Commission, 2005 Integrated Energy Policy Report

Water Use Efficiency Strategies

- **Outdoor**
  - Landscape
  - Hardscape
- **Advanced Systems**
  - Graywater collection
  - Reclaimed water reuse
  - Rainwater collection and use
  - Mechanical Systems
- **Indoor**
  - Cold
  - Hot

Water Use Efficiency

- **Outdoor**
  - Landscape
    - Climate appropriate plant selection
    - Watering methods
    - ‘Need-based” controls
  - Hardscape
    - Solid
    - Porous

Water Use Efficiency

- **Advanced Systems**
  - Graywater
    - On-site collection and reuse
      - Separate drain lines
      - Separate delivery piping
  - Reclaimed water reuse
    - Outdoor or indoor use?
  - Rainwater collection and use
    - Outdoor or indoor use?
  - Mechanical Systems
    - Cooling towers
    - Condensate recovery

Water Use Efficiency

- **Indoor**
  - Cold
    - Toilets, Faucets, Aerators, Showerheads, Dish machines, Clothes washers, Ice machines
  - Hot
    - Wring out the Wastes
      - Improve hot water delivery
      - Capture waste heat running down the drain
      - Insulate hot water piping
    - Install water use efficient hot water devices
    - Select Water Heaters Compatible with WUE

Why Do I Work on Hot Water?

- Energy Intensity of Indoor Cold Water
  - Range from 5 to 32 kWh per 1000 gallons
- Energy Intensity of Hot Water

	Electric		Natural Gas	
	Resistance (85% Efficient)	Heat Pump (COP = 2)	(50% Efficient)	(95% Efficient)
kWh/1,000 Gallons	201	85	342	180
Relative Energy Intensity compared to 5 kWh/1,000 gallons	40	17	68	36

- Typically 40-68 times more energy intensive than indoor cold water.

The most valuable water to conserve is hot water at the top of the tallest building, with the highest elevation, in the area with the greatest pressure drop.

What Are We Aiming For?

- People want the service of hot water, as efficiently as possible.
- It does not make sense to discuss efficiency until the desired service has been provided.

The delivery of hot water ends at the plumbing fixture or appliance, not at the customer's meter

Water-Energy Relationship: Synergies

- ✓End-User Water and Energy Conservation
  - ✓ Saving water can save energy
  - ✓ Saving energy can save water
- ✓Water and Wastewater Utility Operational Efficiency
  - ✓ Increasing water and wastewater system efficiency reduces energy in the water use cycle
- ✓Water Storage
  - ✓ Increased water storage and more flexible water storage shifts peak energy requirements
  - ✓ Pumped storage increases peak electric generation and improves electric system efficiency
- ✓Improve Price Signals
  - ✓ Time of use water rates and meters
  - ✓ Time of use electric rates and meters
- ✓Renewable Generation by Water and Wastewater Utilities
  - ✓ Increase generation from in-conduit hydro and biogas. Add generation from solar and wind.
  - ✓ Assist in meeting California's renewable generation goals

If we did all this,

what would be the combined impact on GHG emissions?

The Unintended Consequences of Increasing Water Use Efficiency

Given human nature,
it is our job
to provide the infrastructure
that supports efficient behaviors.

Thank You!

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