

Watering National Energy Policy

Dan Watkiss

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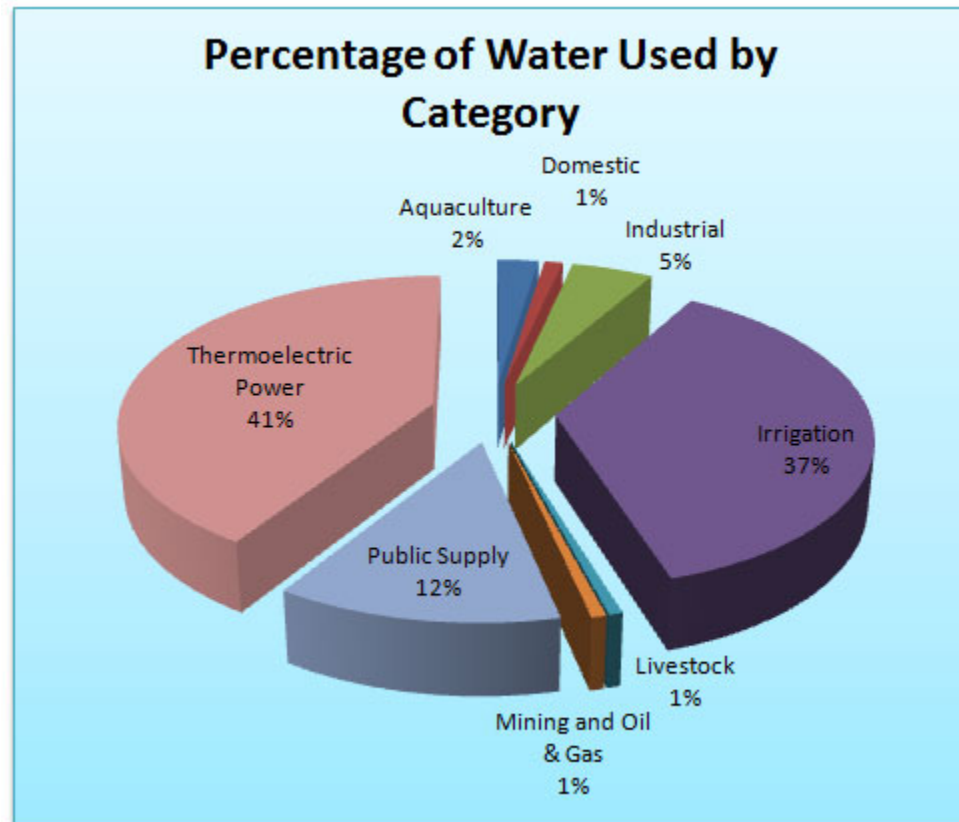
Gallons of Water Needed to Generate One Conventional Megawatt of Electricity:

- 7,400-20,000 gallons for gas/steam combined cycle
- 21,000-50,000 gallons for coal and oil
- 25,000 to 60,000 gallons for nuclear

Gallons of Water Needed to Travel in a Light Duty Vehicle

- < 1 gallon H₂O/mile: Conventional gasoline/diesel, non-irrigated biofuels, hydrogen from methane or electrolysis, electricity from non-thermal renewable source (e.g., wind)
- > 5-20 gallons H₂O/mile: Electricity or hydrogen from U.S. electric grid (primarily fossil fuel and nuclear generated)
- >8-10 gallons H₂O/mile: Irrigated soy diesel
- > 28-30 gallons H₂O/mile: Irrigated corn ethanol

Current Water Consumption, by Sector

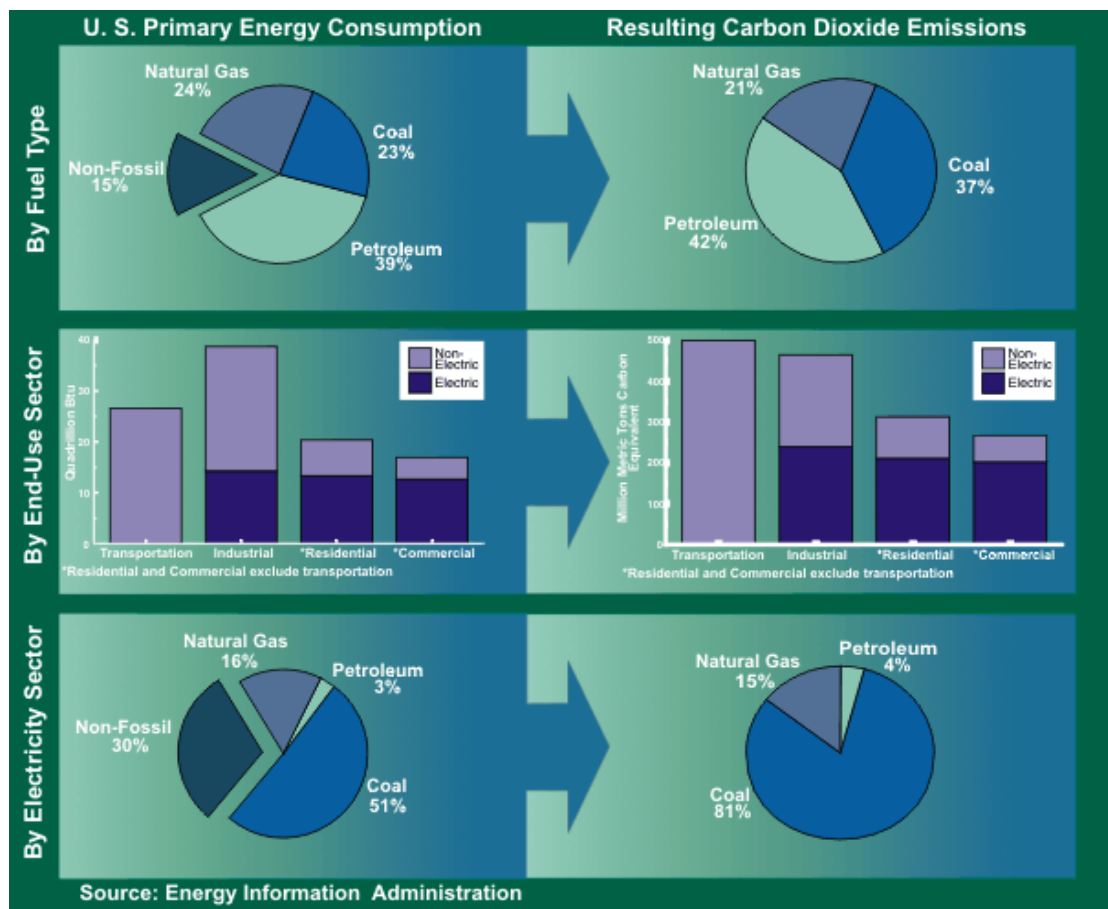


Looking Glass: Kilowatt Hours Needed to Deliver One Million Gallons of Clean Water

- 1,400 KWh from a lake or river
- 1,800 KWh from ground water
- 2,350-3,300 KWh from wastewater
- 9,780-16,500 KWh to desalinate seawater

- Electricity generation and transportation are the primary sources of emissions of climate-changing greenhouse gasses in the U.S.
- Most paths toward sustainable concentrations of atmospheric greenhouse gasses involve converting:
 - Transportation from gas-powered to electric-powered
 - Electric generation toward reduced carbon-equivalent emissions

U.S. Energy Consumption and Carbon Emissions



- Natural gas combined-cycle generation is increasingly recognized as the best available control technology for new electricity-generating stations under the Clean Air Act
- In the near-term planning horizon for national energy and climate policy, natural gas will have to displace the Nation's aging coal fleet and serve as a bridge to a predominantly renewable-based electricity sector
- Hydraulic fracturing has sufficiently increased the supply of natural gas and reduced its overall price, so that natural gas can serve as bas-load electric generation

- Water is an essential component of deep shale natural gas development
- *Drilling* a typical deep shale natural gas well requires between 65,000 and 600,000 H₂O gallons of water
- *Hydraulic fracturing* of a typical horizontal deep shale natural gas well requires an average of 4.5 million H₂O gallons of water per well

4.5 Million H₂O Gallons in Context

- 4.5 million H₂O gallons is the amount of water consumed by:
 - New York City in 6.3 minutes
 - 1000 MW coal-fired plant in 10.8 hours
 - Golf course in 22.5 days
 - 6.75 acres of corn crop in a season

» Source: Chesapeake Energy

- Current trajectory of anthropogenic climate change is expected to:
 - Alter the timing of winter snows and spring rains in ways that could swamp reservoirs early in the spring, forcing hydroelectric operators to dump water in order to maintain capacity
 - Mountain West
 - New York City
 - California
 - Accelerate desertification of much of the arid southwest that could be the source of significant solar generation to offset reduced amounts

- Inconvenient Truth: Some renewable sources of energy can require a lot of water:
 - Biofuel refineries
 - Coal gasification
 - Wet-cooled solar steam plants (“Trough Technology”)
- Some Trough Technology projects in the desert southwest have been cancelled due to inability to secure sufficient water supplies

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