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Highlights

Highlights of GAO-11-225, a report to the Ranking Member, Committee on Science, Space, and Technology, House of Representatives

March 2011

ENERGY-WATER NEXUS

Amount of Energy Needed to Supply, Use, and Treat Water Is Location-Specific and Can Be Reduced by Certain Technologies and Approaches

Why GAO Did This Study

Providing drinking water and wastewater services are two key functions needed to support an urban lifestyle. To provide these services, energy is needed to extract, use, and treat water and wastewater. As the demand for water increases, the energy demands associated with providing water services are similarly expected to grow.

GAO was asked to describe what is known about (1) the energy needed for the urban water lifecycle and (2) technologies and approaches that could lessen the energy needed for the lifecycle and barriers that exist to their adoption. To address these issues, GAO reviewed scientific studies, government-sponsored research, and other reports and interviewed specialists from a variety of organizations, including drinking water and wastewater utilities; federal, state, and local government offices responsible for water or energy; and relevant nonprofit groups, about the energy needed to move, use, and treat water. GAO also selected three cities—Memphis, Tennessee; San Diego, California; and Washington, D.C.—as illustrative case studies to help understand the energy demands of the lifecycle in different areas of the country.

GAO is not making any recommendations in this report. A draft was provided to the Departments of Defense, Energy (DOE), and the Interior, and the Environmental Protection Agency (EPA). DOE and EPA provided technical comments, which we incorporated as appropriate.

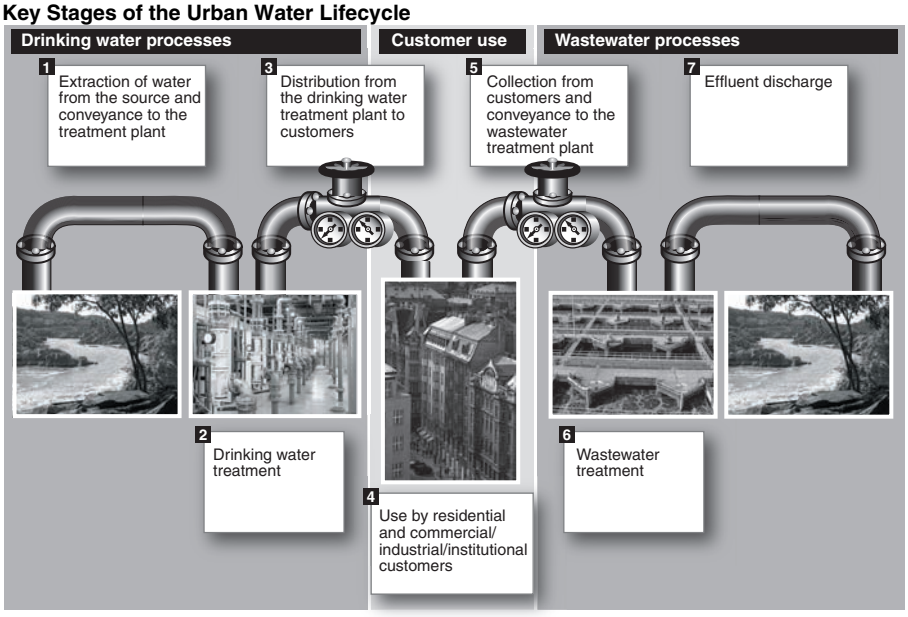
View GAO-11-225 or key components. For more information, contact Anu Mittal or Mark Gaffigan at (202) 512-3841 or mittala@gao.gov or gaffiganm@gao.gov.

What GAO Found

Comprehensive data about the energy needed for each stage of the urban water lifecycle are limited. In particular, few nationwide studies have been conducted on the amount of energy used to provide drinking water and wastewater services, and these studies do not consider all stages of the lifecycle in their analysis. Specialists GAO spoke with emphasized that the energy demands of the urban water lifecycle vary by location. Considering location-specific and other key factors is necessary to assess energy needs. The specialists mentioned such factors as the topography of the area over which water is conveyed, the level and type of treatment provided, and the quality of the source water. For example, systems relying on groundwater as their source for drinking water generally use less energy than systems relying on surface water because groundwater usually contains fewer contaminants and, therefore, requires less treatment before distribution to customers.

A variety of technologies and approaches can improve the energy efficiency of drinking water and wastewater processes, but barriers exist to their adoption. Installing more efficient equipment, adopting water conservation measures, and upgrading infrastructure are among some of the approaches that can decrease energy use, according to specialists GAO spoke with and studies GAO reviewed. For example, technologies to identify potential pipeline leaks throughout water systems can reduce water loss and the energy required to pump and treat that "lost" water. However, according to specialists, adoption of technologies and approaches to improve energy efficiency may be hindered by the costs of retrofitting plants with more energy-efficient equipment and competing priorities at treatment facilities, among other barriers.

Key Stages of the Urban Water Lifecycle



Sources: GAO analysis. Photos from left to right: GAO; US EPA Photo, Eric Vance; Art Explosion; DC Water; and GAO.