

The U.S. Department of Energy's (DOE) Federal Energy Management Program (FEMP) facilitates the Federal Government's implementation of sound, cost-effective energy management and investment practices to enhance the nation's energy security and environmental stewardship.

PURCHASING SPECIFICATIONS
FOR ENERGY-EFFICIENT PRODUCTS

Gas Storage Water Heaters



Legal Authorities

Federal agencies are required by the National Energy Conservation Policy Act (P.L. 95-619), Executive Order 13423, Executive Order 13514, and Federal Acquisition Regulations (FAR) Subpart 23.2 and 53.223 to specify and buy ENERGY STAR®-qualified products or, in categories not included in the ENERGY STAR program, FEMP-designated products, which are among the highest 25 percent of equivalent products for energy efficiency.

Performance Requirement for Federal Purchases		
Water Heater Fuel & Type	Energy Factor (EF) ^a	Annual Energy Use ^b
Gas, Storage	0.67 or higher	224 therms ^c /year or less

a) EF is the ratio of the energy supplied in heated water divided by the energy input to the water heater.
 b) Based on DOE test procedure (10 CFR 430, Sub-Part B, Appendix E).
 c) 1 therm = 100,000 British Thermal Units (Btu).

Buying Energy-Efficient Gas Storage Water Heaters

This *Specification* applies to residential gas storage-type water heaters with capacities between 20 and 100 gallons, first hour rating (FHR) of 67 gallons or higher, and maximum energy input of 75,000 Btu per hour. Commercial and condensing gas water heaters are excluded. See FEMP's *Purchasing Specification for Commercial Gas Water Heaters* for information on these products. The Federal supply sources for gas storage water heaters are the General Services Administration (GSA) and the Defense Logistics Agency (DLA). GSA sells water heaters through its Multiple Awards Schedule program and online shopping network, *GSA Advantage!* DLA offers them through the Defense Supply Center Philadelphia and online through DLA E-Mall. When purchasing gas storage-type water heaters, choose models that are ENERGY STAR-qualified, all of which meet the *Performance Requirements* shown above. A list of qualified products is available on the ENERGY STAR Web site.

These requirements apply to all forms of procurements, including: guide and project specifications; construction, renovation, repair, energy service, operation and maintenance (O&M) contracts; lease agreements; and solicitations for offers. Energy performance requirements should be included in all evaluations of solicitation responses. Buyers shall insert the standard clause from FAR section 52.223-15 into contracts and solicitations that deliver, acquire, furnish, or specify energy consuming products for use in Federal facilities. Agencies can claim an exception to these requirements through a written finding that no ENERGY STAR-qualified or FEMP-designated product is life cycle cost-effective for a specific application.

Buyer Tips

Storage-type water heaters are common, but they are inefficient due to high standby losses. Other more efficient options that Federal buyers may want to consider include:

- **Tankless Water Heaters:** Also called demand or instantaneous water heaters, these products heat water as it is needed. Absence of a storage tank reduces standby losses and increases efficiency. See FEMP's *Purchasing Specification for Whole-Home Gas Tankless Water Heaters* for more information.
- **Indirect Water Heaters:** A space heating system that also provides hot water. In this type of system, hot water is typically circulated from a home's boiler through a heat exchange coil in a separate insulated tank. Domestic hot water is drawn from this storage tank.
- **Integrated Water Heaters:** A hot water heater that also provides space heating. In this type of system, the hot water heater is connected to a coil in the air handling unit. Hot water is circulated through this coil whenever space heating is needed.
- **Solar-Assisted Water Heaters:** A water heater connected to a solar collector that, depending on sky conditions and location, can meet most, if not all, of the hot water requirements. An instantaneous or storage-type water heater is used to meet excess demand or during extended periods of cloudy weather.

For More Information:

Federal Energy Management Program
(202) 586-5772
www.femp.energy.gov/procurement/

Lawrence Berkeley Laboratory provided product research and life cycle cost analysis in support of this specification.
(202) 488-2250

EPA/DOE ENERGY STAR
(888) 782-7937
www.energystar.gov/

The American Council for an Energy Efficient Economy (ACEEE)
www.aceee.org/

Air Conditioning, Heating and Refrigeration Institute (AHRI) has the *Directory of Certified Product Performance*, online at:
www.ahrinet.org/

NIST publishes *Energy Price Indices and Discount Factors for Life-Cycle Cost Analysis – 2010 Annual Supplement to NIST Handbook 135 and NBS Special Publication 709* (NISTIR 85-3273-25, Rev. 5/10). This document is online at:
www1.eere.energy.gov/femp/pdfs/ashb10.pdf

Federal Supply Sources:

General Services Administration
(816) 926-6760
www.gsa.gov/
www.gsaadvantage.gov/

Defense Logistics Agency
(Access to DLA’s Web sites requires enhanced security measures. Civilian Federal agencies may have difficulty accessing these sites.)
www.dla.mil/
dod-email.dla.mil

Defense Supply Center Philadelphia
(800) DLA-BULB
www.dscp.dla.mil/

Depending on climate and energy costs, these options can provide energy and cost savings. However, they require additional analysis and design in order to work properly.

Storage-type water heaters must be sized properly. Oversized water heaters not only cost more to install but increase energy use due to excessive cycling and higher standby losses. The American Council for an Energy Efficient Economy (ACEEE) publishes the *Consumer Guide to Home Energy Savings* that contains a chapter on water heating and provides guidance on proper sizing. A water heater should be selected based on FHR, not tank size. Some water heaters with small tanks and large burners have higher FHRs and are more efficient than models with larger tanks.

User Tips

Energy costs increase with temperature. Dishwashers require the hottest water of all household uses, typically 135 to 140°F. However, these devices are usually equipped with booster heaters to raise the incoming water temperature by 15 to 20°F. Setting the water heater between 120 and 125°F and turning the dishwasher’s booster on should provide sufficiently hot water while saving energy and reducing the chances for scalding.

Cost-Effectiveness Example

Performance	Base Model	Required ^a	Best Available ^b
Energy Factor (EF)	0.58	0.67	0.70
Annual Energy Use (therms/year)	258	224	214
Annual Energy Cost	\$230	\$200	\$192
Lifetime Energy Cost	\$2,660	\$2,300	\$2,205
Lifetime Energy Cost Savings	—	\$360	\$455

a) The EF of the *Base Model* is the minimum allowed by current DOE appliance standards.

b) Performance data for the *Best Available Model* is from the AHRI directory of residential water heaters. More efficient products may have been introduced to the market since this *Purchasing Specification* was published.

Cost-Effectiveness Assumptions

The example above is based on gas-fired, 40-gallon storage type water heaters with FHRs of 70 gallons. The *Annual Energy Use* is determined using the standard DOE test procedure with an assumed inlet water temperature of 58°F, a setpoint of 135°F, daily hot water demand of 64 gallons, and 365 days per year of use. The assumed price for natural gas is \$0.90 per therm, the average at Federal facilities in the U.S. *Lifetime Energy Cost* is the sum of the discounted value of the *Annual Energy Cost* based on average usage and an assumed water heater life of 12 years. Future natural gas price trends and a discount rate of 3.0 percent are from the May 2010 version of *Energy Price Indices and Discount Factors for Life-Cycle Cost Analysis* (NISTIR 85-3273-25).

Using the Cost-Effectiveness Example

In the example above, the *Required* water heater is cost-effective if its purchase price is no more than \$360 above that of the *Base Model*. The *Best Available* model is cost-effective if its purchase price is no more than \$455 above the *Base Model*.

What If My Energy Price Is Different?

FEMP provides a Web-based cost calculator for water heaters at femp.energy.gov/technologies/eep_waterheaters_calc.html. This calculator allows the user to input site-specific values for Energy Factor, Recovery Efficiency, and input the rate for natural gas. The output section will automatically display results that better reflect your energy costs.

Version 6: March 2011