



ENERGY STAR

Residential Water Heaters

June 5, 2007

Purpose



The purpose of this meeting is to review the draft criteria, discuss the comments received and obtain additional stakeholder feedback.

Product Development



ENERGY STAR considers the following guiding principles when determining whether to develop a product specification:

- Significant energy savings will be realized on a national basis.
- Product energy consumption and performance can be measured and verified with testing.
- Product performance will be maintained or enhanced.
- Purchasers of the product will recover any cost difference within a reasonable time period.
- Specifications do not unjustly favor any one technology.
- Labeling will effectively differentiate products to purchasers.

ENERGY STAR may also be a vehicle to deploy energy-efficient products and practices into the market.

Impact of ENERGY STAR



ENERGY STAR has effectively transformed markets.

- ENERGY STAR Qualified Clothes Washers
 - At program's inception in 1997, qualified clothes washers accounted for 0.5% of the washer market.
 - 2006 market share was 35%
 - Every clothes washer in today's market would qualify according to the program's original criteria.
 - Criteria revisions occurred in 2001, 2004 and 2007 to progress with the washer market and differentiate washers that have earned the ENERGY STAR label.

Water Heating and Energy



- Water Heating is a major consumer of energy in the residential sector.
- Represents 13% - 17% percent of national residential energy consumption.
 - The third largest energy end use in homes, behind heating and cooling and kitchen appliances.
- As homes become more energy efficient, the percentage of energy used for water heating steadily increases.
- Water heating is the only major residential energy end use that ENERGY STAR does not address.

Historical Criteria Development



Historical Perspective

- In 2003, ENERGY STAR reviewed water heaters and determined not to establish water heater criteria at that time for the following reasons:
 - Conventional technologies would not offer sufficient market differentiation or savings to consumers.
 - “Non-conventional” technologies would not insure product performance.
 - Purchasers would not recover their incremental investment within a reasonable time period with “non-conventional” technologies.
 - Product availability and infrastructure for “non-conventional” products was not yet broad-based.

Present Criteria Development



Criteria Development

- Present Perspective
 - Manufacturer and stakeholder interest has increased.
 - Efficiency stakeholders have stated their interest in offering program support, such as rebates, trainings and educational materials, when and if a program is established.
 - Manufacturers have stated their interest in differentiating their products.
 - Water heater product development has progressed.
 - Manufacturers have invested in research and development.
 - Prototype testing
 - Product design development

Current State of the Water Heater Market



Dominated by conventional electric and gas water heaters

- Conventional electric-resistance and gas storage water heaters capture 97% of the market.
 - Majority of water heaters sold are either near or at the federal standard.

Replacement Market

- Two-thirds of consumers replace their water heaters due to sudden failure of their existing model.
 - Of those replacements, 60% are emergency replacements.
 - When a water heater fails suddenly, most consumers have their water heater replaced with the cheapest, most readily available and easily installed model from their plumber or contractor.

Conventional Technologies



Electric Resistance Storage Water Heaters

- Limited Energy Savings Potential and Differentiation.
 - For a fifty-gallon model, Energy Factor ranges from 0.904 to 0.95 in the market.
 - Best available models have a savings of 4.8% in comparison to the typical fifty-gallon electric resistance water heater with an Energy Factor of 0.904 at the Federal standard

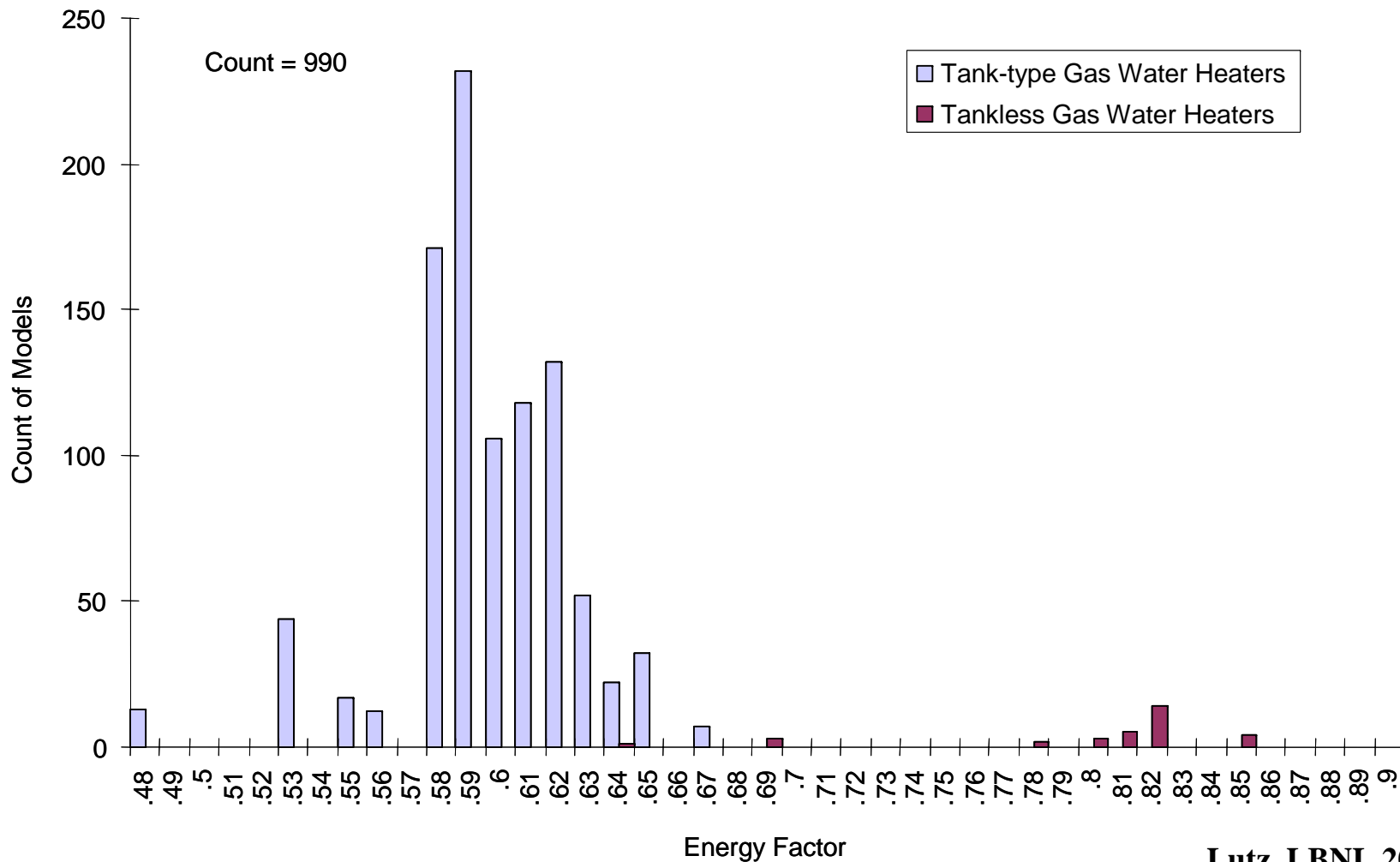
Conventional Technologies



Gas Storage Water Heaters

- Limited Energy Savings Potential and Differentiation
 - The majority of product sales and models available on the market fall in the 0.58 – 0.62 range in Energy Factor.
 - Best available models have a savings of 7.3% in comparison to the typical conventional gas storage water heater with an Energy Factor of 0.58 at the Federal standard.

Gas Water Heater Availability



Lutz, LBNL 2006

Water Heater Criteria Development



Technologies under consideration:

- Whole-Home Tankless
- Heat Pump
- Gas-Condensing
- Advanced Non-Condensing
- Solar

Advanced Technologies



Energy Savings Potential

- Technologies were chosen based on their individual potential to save energy.

Fuel Neutral

- No energy source will be favored over another.

Each technology will have its criteria based on its own merits

- Electric, gas and solar water heaters are each categorically unique in relation to the efficiency they can achieve heating water.

Criteria Chosen



Developed the Draft Criteria weighing the following:

- Manufacturer and Stakeholder Input
- Review of the Market
- Tax Credits

Note: The brief technology descriptions were not intended to restrict or omit specific types of each technology. They were included to provide an example of each.

Market Share Concerns



ENERGY STAR has set criteria for products with little to no market share in the past.

- Refrigerators (1997)
- Clothes Washers (1997)
- Digital TV Adapters (finalized January 31, 2007) - there are no models on the market today that meet the criteria.

We anticipate there may be certain technologies that will not have products meeting the criteria at the very onset of the program.

Manufacturers have indicated they have products in development.

ENERGY STAR will allow manufacturers to prepare for the effective date of the criteria.

Gas-Fired Whole House Tankless



Draft Criteria

- A minimum Energy Factor of 0.80.
- A minimum gallons-per-minute (gpm) requirement of 3.5 gpm at a 77°F rise.
- A minimum ten-year warranty.

Savings/Payback

- Savings of nearly 30%, or 74 therms, in comparison to the typical gas storage water heater.
- The monetary savings will pay for the price premium in 6-16 years, 3.5 - 13.5 years when taking the tax credit into account.

Gas-Fired Whole House Tankless



Some Potential Issues/Concerns:

- **Retrofit Complications**
 - Proper venting, gas line replacement and electric wiring are expensive.
- **Maintenance becomes an issue for regions with hard water.**
 - Scale build up on the heat exchanger decreases performance.
- **Increased water consumption**
 - Attributed to the time it takes for the heat exchanger to heat up.
 - Consumers tend to consume more water due to the perception of endless hot water.
- **Energy savings potential is questionable under real use patterns.**
 - Short draws and time intervals between draws.
- **Burners won't fire unless a minimum 0.5 - 0.8 gpm is reached.**

Electric Whole House Tankless



Limited Energy Savings Potential and Differentiation.

- Achieve a 0.99 Energy Factor, which is just 9.5% more efficient than the Federal standard.
- Nearly all have an Energy Factor of 0.98 or 0.99.

Energy savings may not cover the cost of retrofit.

- Upgrading from 100 amps service to 200 amps costs an estimated \$1,000.

Peak load issues are a serious issue for utilities.

Federal tax credit is not available for electric tankless water heaters.

Heat Pump Water Heaters



Draft Criteria

- A minimum Energy Factor of 2.0.
- A minimum First-Hour Rating (FHR) requirement of 50 gallons-per-hour.
- A minimum six-year warranty.

Savings/Payback

- Savings of nearly 55%, or 2,662 kilowatt-hours, in comparison to the typical electric resistance water heater.
- The monetary savings will pay for the price premium in 3 years, 2.5 years when taking the tax credit into account.

Heat Pump Water Heaters



Some Potential Issues/Concerns

- Lack of product availability.
- Historic questionable performance and reliability.
- Water heater contractors are reluctant to stock product.
- Water heater contractors tend to have little to no expertise in maintaining heat pump technology.

Gas Condensing Water Heaters



Draft Criteria

- A minimum Energy Factor of 0.80.
- A minimum First-Hour Rating of 50 gallons-per-hour.
- A minimum eight-year warranty.

Savings and Payback

- Savings of nearly 30%, or 74 therms, in comparison to the typical gas storage water heater.
- The monetary savings will pay for the price premium in 5-10 years, 3.5 - 8 years when taking the tax credit into account.

Gas Condensing Water Heaters



Some Potential Issues/Concerns

- Lack of product availability
- Product performance or reliability, given the infancy of this technology.
- Retrofit Complications
 - Proper venting, condensate drainage and electric wiring are expensive.

Advanced Non-Condensing Gas Water Heaters



Draft Criteria

- A minimum Energy Factor of 0.70.
- A minimum First-Hour Rating of 50 gallons-per-hour.
- A minimum eight-year warranty.

Savings and Payback

- Savings of nearly 18%, or 47 therms, in comparison to the typical gas storage water heater.
- The monetary savings will pay for the price premium in 4 years.

Advanced Non-Condensing Gas Water Heaters



Some Potential Issues/Concerns

- Lack of product availability.
- Product performance or reliability.
- Retrofit Complications
 - Proper venting, condensate drainage and electric wiring are expensive.

Solar Water Heaters



Draft Criteria

- A minimum Solar Fraction of 0.50.
- OG-300 certification from the SRCC.
- A minimum fifteen-year warranty.

Savings/Payback

- Savings of 50%, or 2,418 kilowatt-hours, in comparison to the typical electric-resistance water heater.
- Savings of 43%, or 111 therms, in comparison to the typical gas storage water heater.
- The monetary savings will pay for the price premium in 10 - 15 years, 6 - 9 years when taking the tax credit into account.

Solar Water Heaters



Some Potential Issues/Concerns

- High first cost, particularly solar water heaters with freeze protection.
- An overall lack of trained solar technicians.
- A lack of consumer education of maintenance requirements.

ENERGY STAR Development Schedule



Criteria Development Schedule

May 2007	Released Draft Criteria
May-Jun 2007	First Comment Period on Draft Criteria
Jun 2007:	Stakeholder Meeting
Jun 2007:	Second Comment Period Post Meeting
Aug 2007:	Release Revised Criteria
Aug – Oct 2007:	Third Comment Period on Revised Criteria
Dec 2007:	Release Final Criteria
Sep 2008:	Criteria Effective Date

Next Steps



Second Round of Comments, Post-Meeting
Deadline: July 13, 2007