2017 Sales and Marketing

Evolution of Appliances
Image Disclaimer

• Depictions of actual products are not intended to be interpreted as an endorsement of these products. They serve only as “real life” examples used for educational purposes.
Content Disclaimer

• This presentation highlights specific provisions of the topic. It is not considered, nor is it intended to be a comprehensive analysis of the entire topic. The content is the opinion of the author and is not to be used for legal purposes. Be sure to review applicable codes for proper installations.
Agenda

• Energy Efficiency Regulation
• Water Heaters
• Warm Air Furnaces
• Boilers
• New Technology
• Distribution Systems
The ENERGYGUIDE label provides key information about the appliance you're looking at and similar models to help you understand the cost and energy efficiency.

Estimated Yearly Operating Cost:
- **$67**

630 kWh
- Estimated Yearly Electricity Use

Your cost will depend on your utility rates and use.

- Cost range based only on models of similar capacity with automatic defrost, side-mounted freezer, and through-the-door ice.
- Estimated operating cost based on 2007 national average electricity cost of 10.85 cents per kWh.
- For more information, visit www.ftc.gov/appliances.

The cost range helps you compare the energy use of different models by showing you the range of operating costs for models with similar features.

An estimate of how much electricity the appliance uses in a year based on typical use. Multiply this by your local electricity rate on your utility bill to better judge what your actual operating cost might be.

If you see the ENERGY STAR logo, it means the product is better for the environment because it uses less energy than standard models.

The maker, model, and size tell you exactly what product this label describes.

Lists key features of the appliance you're looking at and the similar models that make up the cost range below.

What you might pay to run the appliance for a year, based on its electricity use and the national average cost of energy. The cost appears on labels for all models and brands, so you can compare energy use just like you would price or other features.
NAECA 1986

- Storage water heater efficiency: 0.57
- Furnace efficiency: 80 %
- Boiler efficiency: 80 %
- Dishwashers
- Air Conditioners
- Washing Machines
- Refrigerators
- Light Bulbs
- Televisions
2016 Units Manufactured

- Water Heaters
  - Gas Storage-4.2 million
  - Electric Storage 3.9 Million
- Furnaces
  - Gas- 2.9 Million
  - Oil- 37,000
- Boilers
  - Mid Efficiency- 91,000
  - High efficiency- 108,000
DOE February 2017

- Hold on Energy Regulations
- Will be Reviewed by Incoming Administration
- Boilers
- Furnaces
- Water Heaters
- Air Conditioners
- Heat Pumps
WATER HEATER EFFICIENCY

Federal minimum efficiency, residential 40 G gas water heater: Energy Factor = .59

Energy Star Criteria:

<table>
<thead>
<tr>
<th>Water Heater Type</th>
<th>Energy Star Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>STORAGE (ENDS 8/31/2010)</td>
<td>EF ≥ 0.62</td>
</tr>
<tr>
<td>STORAGE (STARTS 9/1/2010)</td>
<td>EF ≥ 0.67</td>
</tr>
<tr>
<td>WHOLE-HOME TANKLESS</td>
<td>EF ≥ 0.82</td>
</tr>
<tr>
<td>CONDENSING STORAGE</td>
<td>EF ≥ 0.8</td>
</tr>
</tbody>
</table>
Storage Water Heater

- Hot water outlet
- Vent pipe
- Cold water inlet
- Pressure/temperature relief valve
- Flue tube/heat exchanger
- Flue baffle
- Anode rod
- Insulation
- Thermostat and gas valve
- Gas burner
- Combustion air openings
Tankless Water Heater

1. Hot water tap is turned on.
2. Water enters the heater.
3. The water-flow sensor detects the entry of water into the unit, switching on the computer.
4. The computer ignites the burner.
5. Water circulates through the heat exchanger.
6. The heat exchanger heats water.
7. When the tap is shut off, the unit shuts down.

Gas line must be sized to max. BTU rating to deliver max. hot water.
AC-HP-Furnace Agreement Map

Alaska HDD ≥ 5000
Hawaii
Puerto Rico
U.S. Territories

South-HDD < 5000

North-HDD ≥ 5000
FURNACE EFFICIENCY

As more models are available the range of AFUEs for condensing models has increased.

<table>
<thead>
<tr>
<th>AFUE Range</th>
<th>Number of Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 &lt; 92</td>
<td>245</td>
</tr>
<tr>
<td>92 &lt; 95</td>
<td>382</td>
</tr>
<tr>
<td>95 and Higher</td>
<td>105</td>
</tr>
</tbody>
</table>
### Federal Minimum Standards Consensus Agreement

<table>
<thead>
<tr>
<th>System Type</th>
<th>≥ 5000 HDD</th>
<th>&lt; 5000 HDD</th>
<th>CA/AZ/NM/NV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas-Pack (weatherized)</td>
<td>81% AFUE (14 SEER)</td>
<td>81% AFUE (14 SEER)</td>
<td>81% AFUE (14 SEER)</td>
</tr>
<tr>
<td>Gas Furnaces (non-weatherized)</td>
<td>90% AFUE</td>
<td>80% AFUE</td>
<td>80% AFUE</td>
</tr>
</tbody>
</table>

- **Effective dates:**
- May 1, 2013 for non-weatherized furnaces
- Jan 1, 2015 for weatherized furnaces (gas packs)
- **Effective dates of subsequent standards:**
- **2019 for non-weatherized furnaces**
- 2022 for weatherized furnaces (gas-packs).
Building Energy Codes – Efficiency Levels for Baseline Building

<table>
<thead>
<tr>
<th>System Type</th>
<th>≥ 5000 HDD</th>
<th>&lt; 5000 HDD</th>
<th>CA/AZ/NM/NV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas Furnaces</td>
<td>92% AFUE</td>
<td>90% AFUE</td>
<td>92% AFUE</td>
</tr>
</tbody>
</table>

- Effective date: January 1, 2013
- Applies to new construction, not one for one replacement
- Next levels – To be established by DOE through rulemaking; effective no sooner than Jan 1, 2018
DOE vs. APGA

• On January 15th a settlement was announced which requires the DOE to go back and start new efficiency rulemaking for gas furnaces. This means that there will be no new restrictions on gas furnace efficiency standards going into effect on May 1, 2013. Manufacturers will have 5 years before they are required to implement the new standard once the DOE sets it.
**Typical Ordinary Furnace Operation**

*Electromechanical Thermostat*

**Constant Cycling, Wide Temperature Swings**

- **Blue Line**: 90 PLUS Modulating Furnace Heating Requirement at less than 40% Capacity
- **Red Line**: 90 PLUS Modulating Furnace Heating Requirement greater than 40% Capacity

Ordinary furnace operating with typical electromechanical thermostat constant cycling causes wide temperature swings.

**Room Temperature**

Set Point

- + 2°
- + 1°
- - 1°
- - 2°

**Time - Minutes**

0 20 40 60 80 100 120 140 160
BOILER EFFICIENCY

Market Penetration
Residential condensing boilers becoming a part of the market

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of Models</th>
<th>No. of Manufacturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>2003</td>
<td>41</td>
<td>9</td>
</tr>
<tr>
<td>2008</td>
<td>61</td>
<td>13</td>
</tr>
<tr>
<td>2009</td>
<td>159</td>
<td>19</td>
</tr>
</tbody>
</table>
## BOILER EFFICIENCY

Revised Federal minimum efficiency requirements for residential boilers, effective September 1, 2012

<table>
<thead>
<tr>
<th>Boiler Type</th>
<th>Minimum AFUE</th>
<th>Design Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas Hot Water</td>
<td>82</td>
<td>No Constant Burning Pilot; Automatic Means for Adjusting Water Temperature</td>
</tr>
<tr>
<td>Gas Steam</td>
<td>80</td>
<td>No Constant Burning Pilot</td>
</tr>
<tr>
<td>Oil Hot Water</td>
<td>84</td>
<td>Automatic Means for Adjusting Water Temperature</td>
</tr>
<tr>
<td>Oil Steam</td>
<td>82</td>
<td>None</td>
</tr>
<tr>
<td>Electric Hot Water</td>
<td>None</td>
<td>Automatic Means for Adjusting Water Temperature</td>
</tr>
<tr>
<td>Electric Steam</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>
COMBINED APPLIANCES

Gas appliances that provide space and water heating are available in several forms:

- Water heater and air handler
- Boiler and indirect water heater
- Wall hung boiler/water heater

Interest growing in establishing separate efficiency requirement for such products
EFT Combi
Space Heating & Endless Hot Water
New Technology

• ECM Circulators and Motors
• Heat Pump Water Heaters
• Energy Control Systems
• Materials:
  – Pressed fittings
  – Plastic pipe
  – Wireless/ Bluetooth controls
PhD technology has the installer in mind.
PhD technology is built around proven, engineered components that have been in operation for many years.

Variable speed motor that matches combustion output to heating needs.
Appliance vs. Distribution

- Heating Source - Distribution System
- Distribution Systems
- Steam Radiators
- Fin Tube Baseboard
- Warm Air Distribution Ducts
- Design Systems - Appliance to Distribution
Counterflow Steam System

- Header Pipe
- Drip Line
- Hartford Loop
- Wet Return
- Steam
- Condensate
- Slope
- Main Vent
The air intake on this installation was not properly installed according to the manufacturer's installation instructions and caused a problem...