

Gas-Fired Commercial Water Heaters: Proposed Specifications for FEMP

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Product Definition

Definitions of Commercial Water Heaters				
<i>Appliance</i>	<i>Definition</i>	<i>Input (BTUH)</i>	<i>Size (Volume)</i>	<i>Input to Volume Ratio</i>
Gas storage water heaters	a water heater that heats and stores water within the appliance at a thermostatically-controlled temperature for delivery on demand.	> 75,000	any	< 4,000 Btu/hr/gal
Gas instantaneous water heaters	a water heater that has an input rating of at least 4,000 Btu per hour per gallon of stored water.	>200,000	< 10 gal	≥4,000 Btu/hr/gal
			≥10 gal	
Gas hot water supply boilers	a packaged boiler that is industrial equipment and that is suitable for heating potable water.	≥300,000 & <12,500,000	< 10 gal	≥4,000 Btu/hr/gal
			≥10 gal	

source:CEC-400-2009-013

Test Methods

Test Methods for Commercial Water Heaters			
<i>Appliance</i>	<i>Energy Efficiency Descriptor</i>	<i>Use Test setup equipment and procedures in subsection labeled “Method of Test” of</i>	<i>With these additional stipulations</i>
Gas-fired Storage and Instantaneous Water Heaters and Hot Water Supply Boilers*	Thermal Efficiency	ANSI Z21.10.3–1998, §2.9**	A. For all products, the duration of the standby loss test shall be until whichever of the following occurs first after you begin to measure the fuel and/or electric consumption: (1) The first cutout after 24 hours or (2) 48 hours, if the water heater is not in the heating mode at that time.
	Standby Loss	ANSI Z21.10.3–1998, §2.10**	B. For oil and gas products, the standby loss in Btu per hour must be calculated as follows: $SL \text{ (Btu per hour)} = S \text{ (\% per hour)} \times 8.25 \text{ (Btu/gal-F)} \times \text{Measured Volume (gal)} \times 70(^{\circ}\text{F})$.

* As to hot water supply boilers with a capacity of less than 10 gallons, these test methods became mandatory on October 21, 2005.

** Incorporated by reference, see 10 CFR 431.105 (2008).

source: 10CFR431.106

Federal Standards

Standards for Commercial Water Heaters				
Appliance	Input to Volume Ratio	Size (Volume)	Minimum Thermal Efficiency (%)	Maximum Standby Loss^{1, 2}
Gas storage water heaters	< 4,000 Btu/hr/gal	any	80	$Q/800 + 110(Vr)^{1/2}$ Btu/hr
Gas instantaneous water heaters	≥4,000 Btu/hr/gal	< 10 gal	80	–
		≥10 gal	80	$Q/800 + 110(Vr)^{1/2}$ Btu/hr
Gas hot water supply boilers	≥4,000 Btu/hr/gal	< 10 gal	80	–
		≥10 gal	80	$Q/800 + 110(Vr)^{1/2}$ Btu/hr

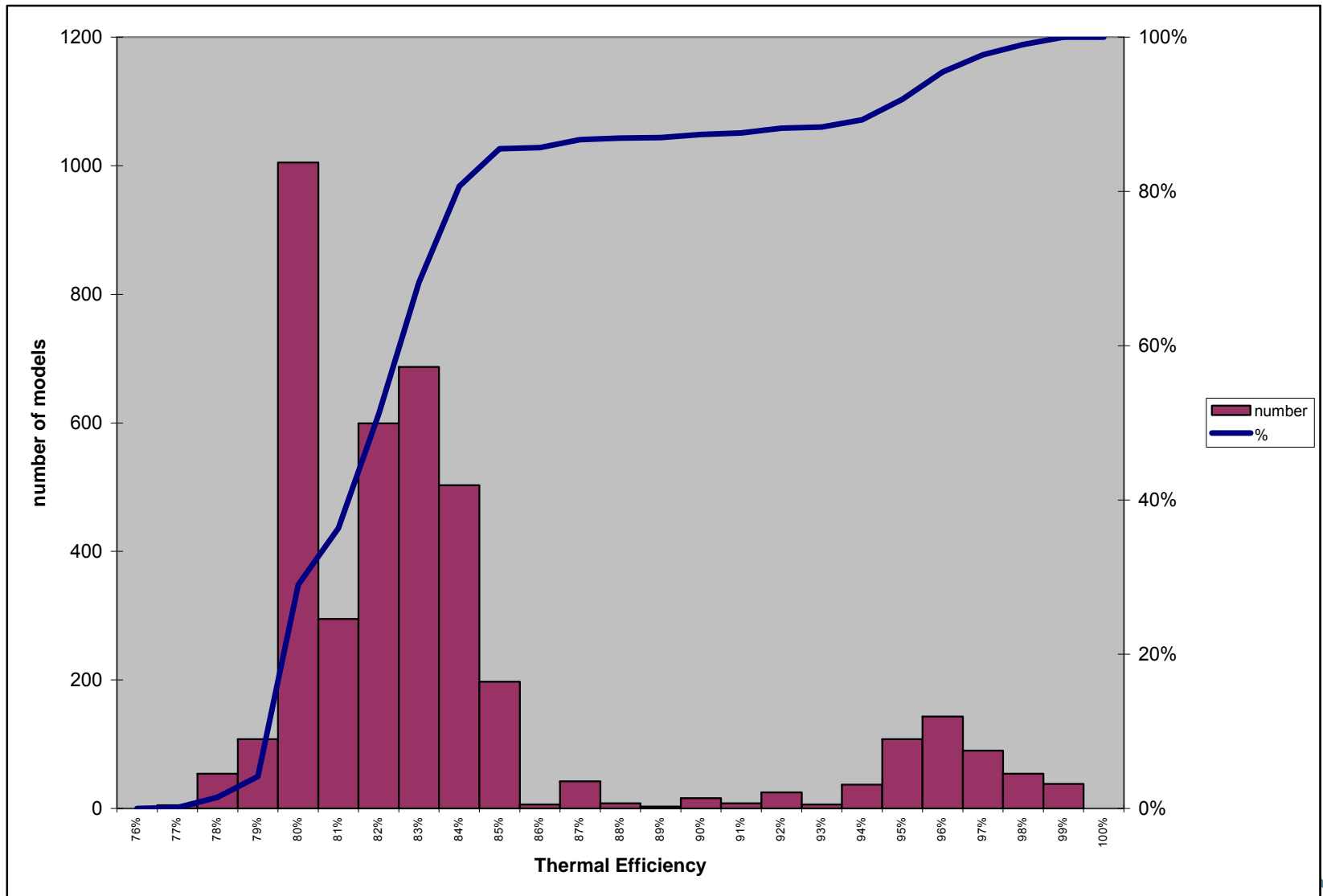
for products manufactured on and after October 29, 2003

¹ Standby loss is based on a 70° F temperature difference between stored water and ambient requirements. In the standby loss equations, Vr is the rated volume in gallons, Vm is the measured volume in gallons, and Q is the nameplate input rate in Btu/hr.

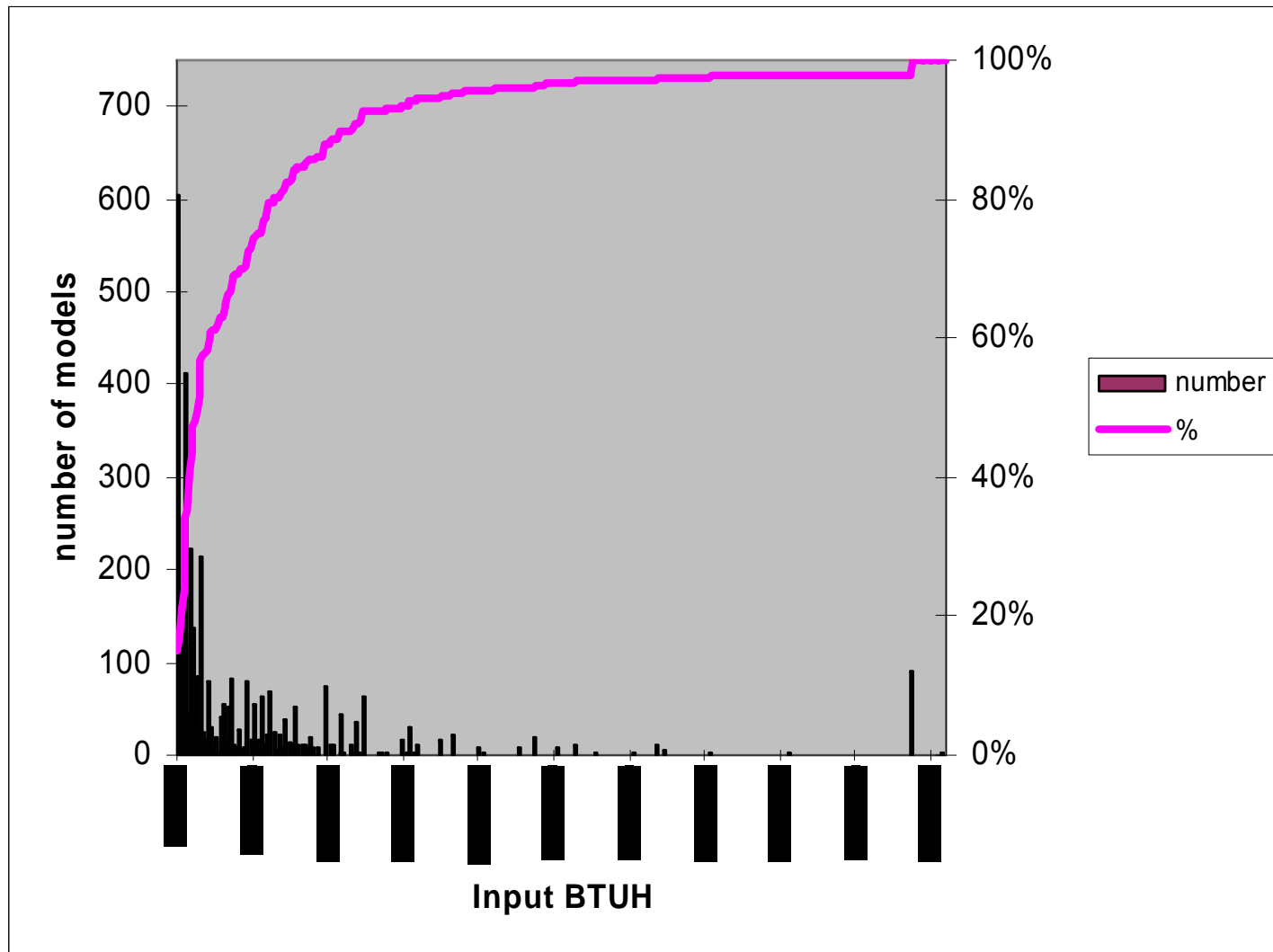
² Water heaters and hot water supply boilers having more than 140 gallons of storage capacity are not required to meet the standby loss requirement if the tank surface is thermally insulated to R-12.5, if a standing pilot light is not installed, and for gas- or oil-fired storage water heaters, there is a flue damper or fan-assisted combustion.

source:10CFR431.110

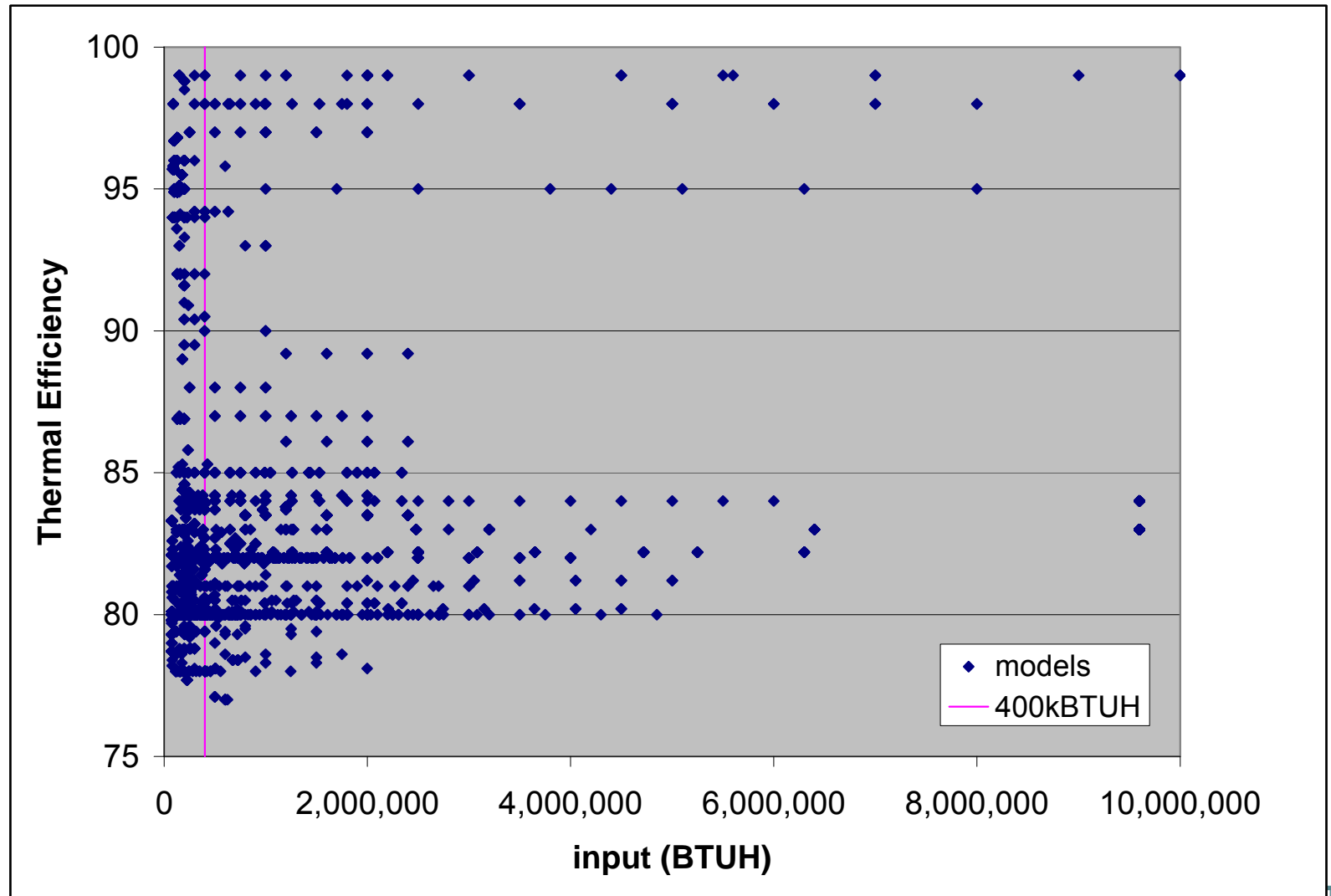
CEC: Range of Efficiencies



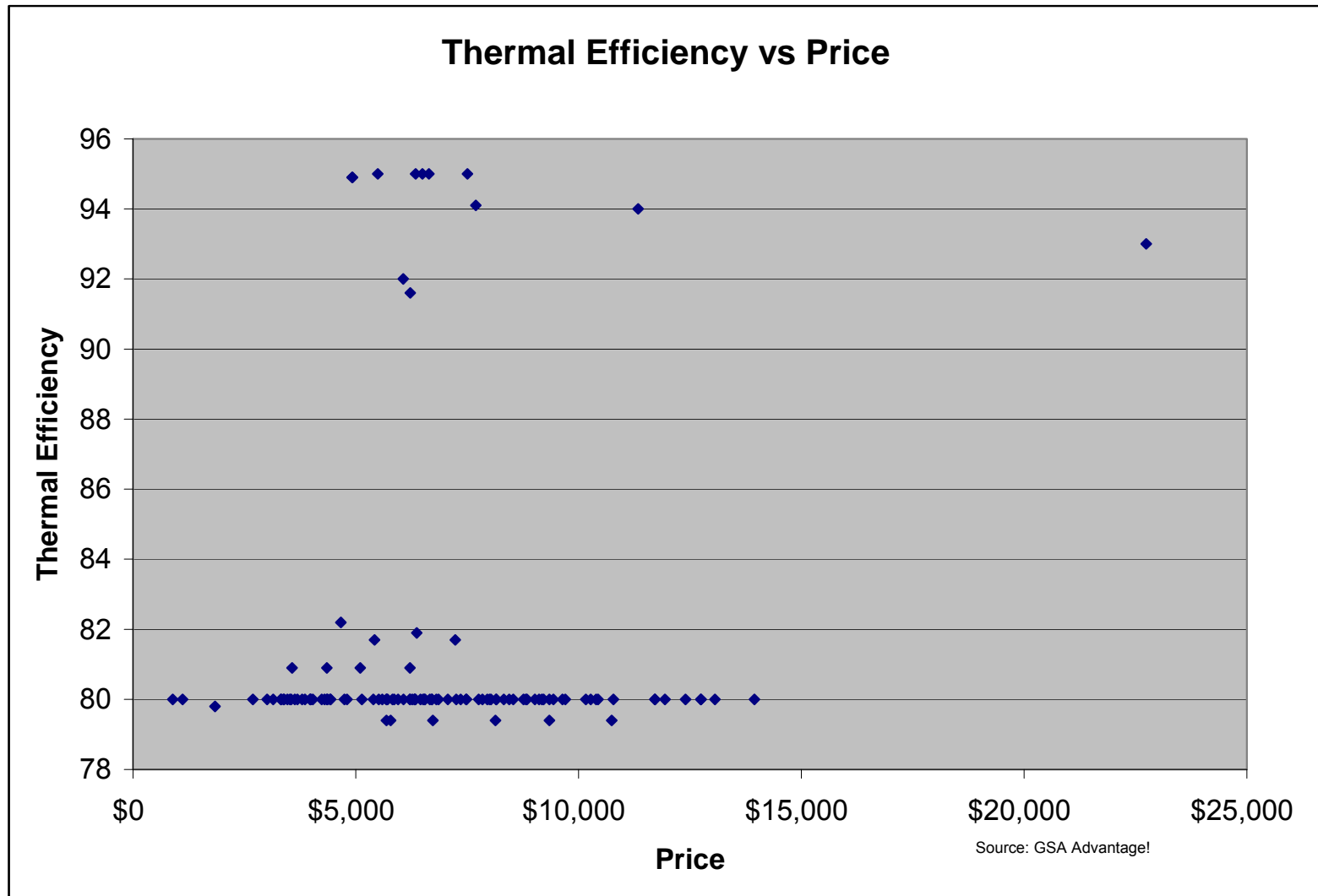
CEC: Range of Input Ratings



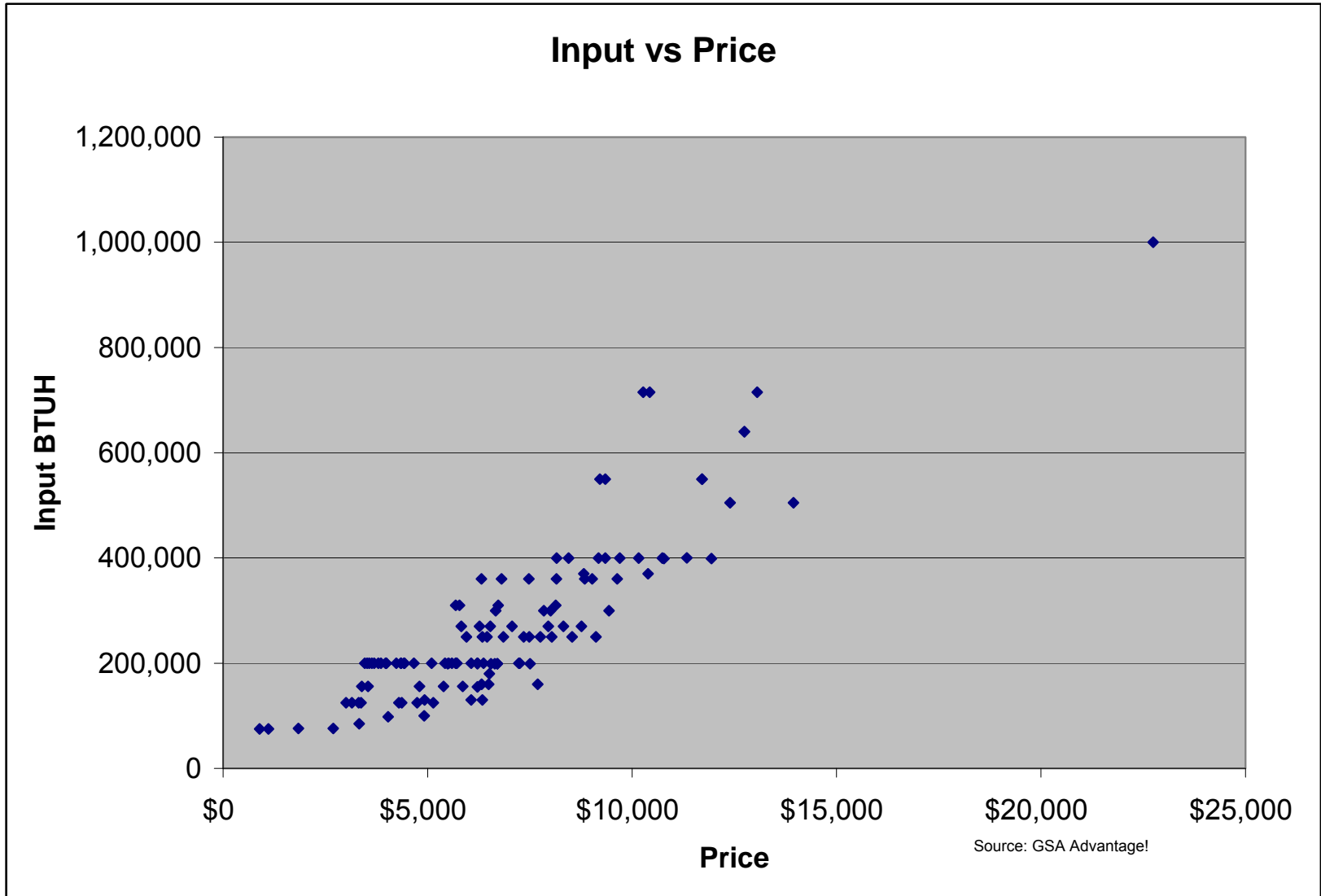
CEC: Efficiency vs Input



GSA: Efficiency vs Price



GSA: Input vs Price



Example Savings Calculations

Assumptions:

Hot water use 1000 gallons per day

Days per year 250

Temperature 90 °F increase

Gas cost \$1.20 therm

Incremental Cost \$1500 (equipment & install)

Example Savings Calculations

Results:

Heat to water	742,500 BTU per day
Gas to water heater	
80% efficiency	2320 therms per year
94% efficiency	1975 therms per year
Energy savings	346 therms per year
Cost savings	\$415 per year
Payback	3.6 years