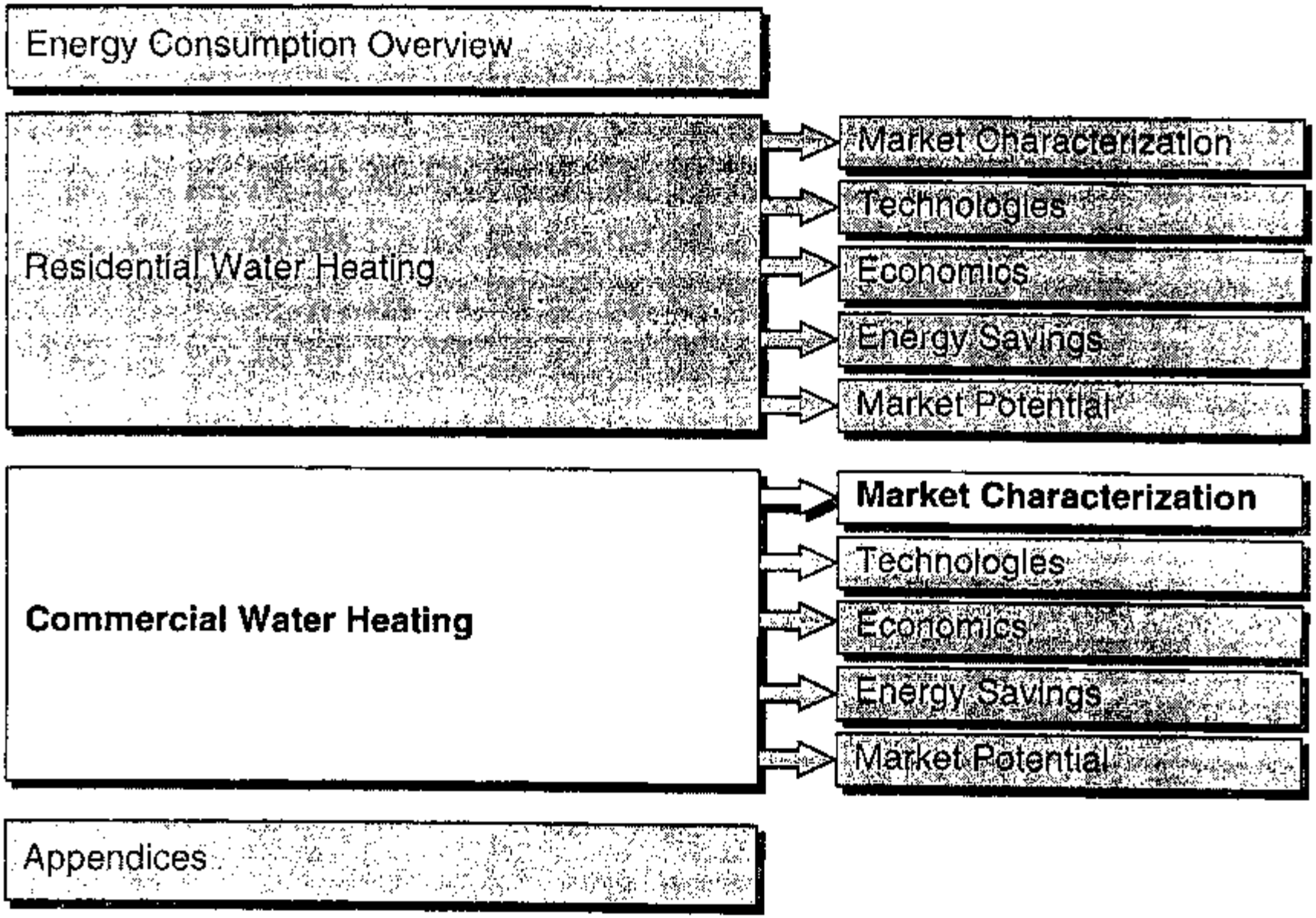
Outline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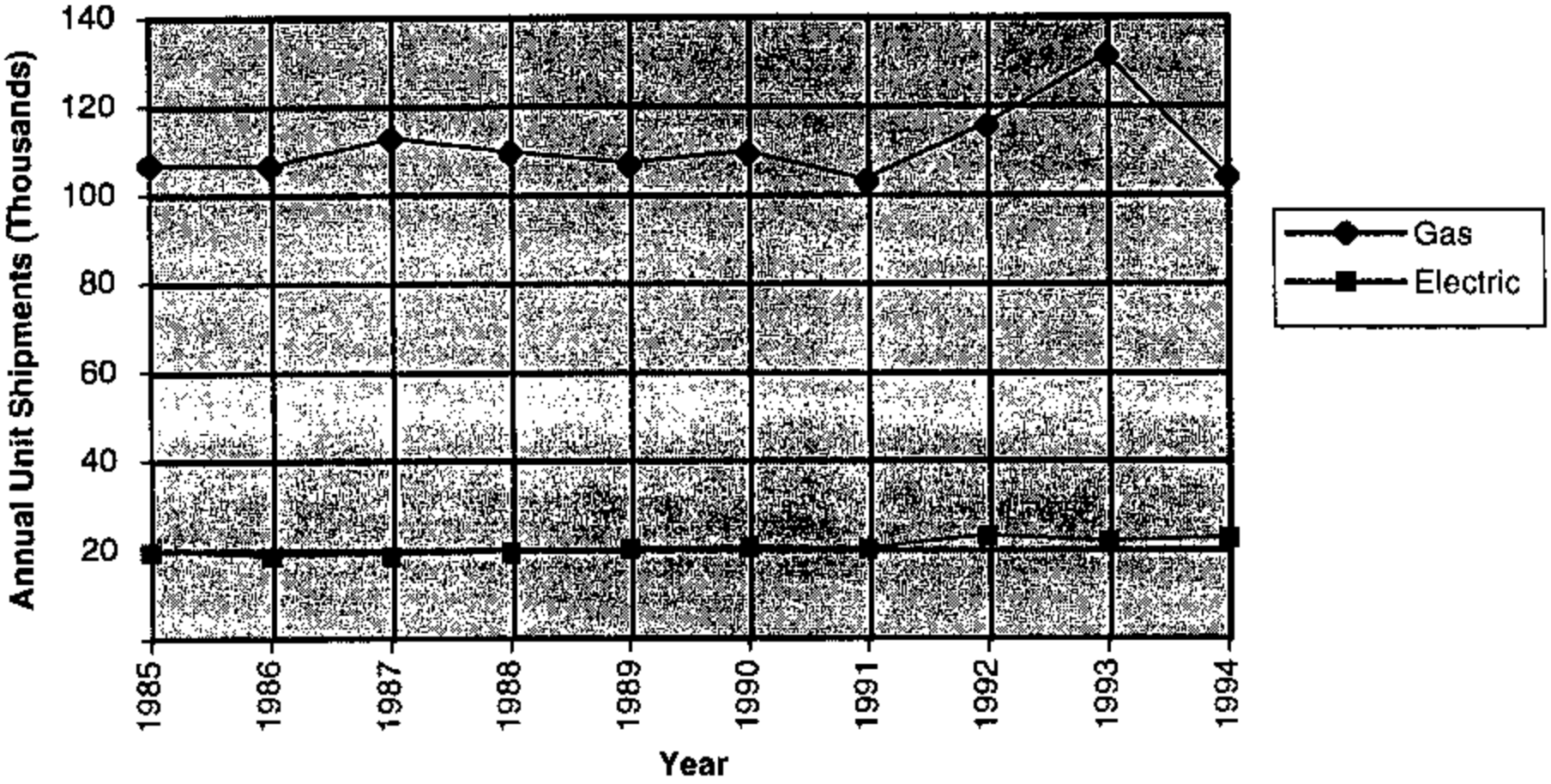
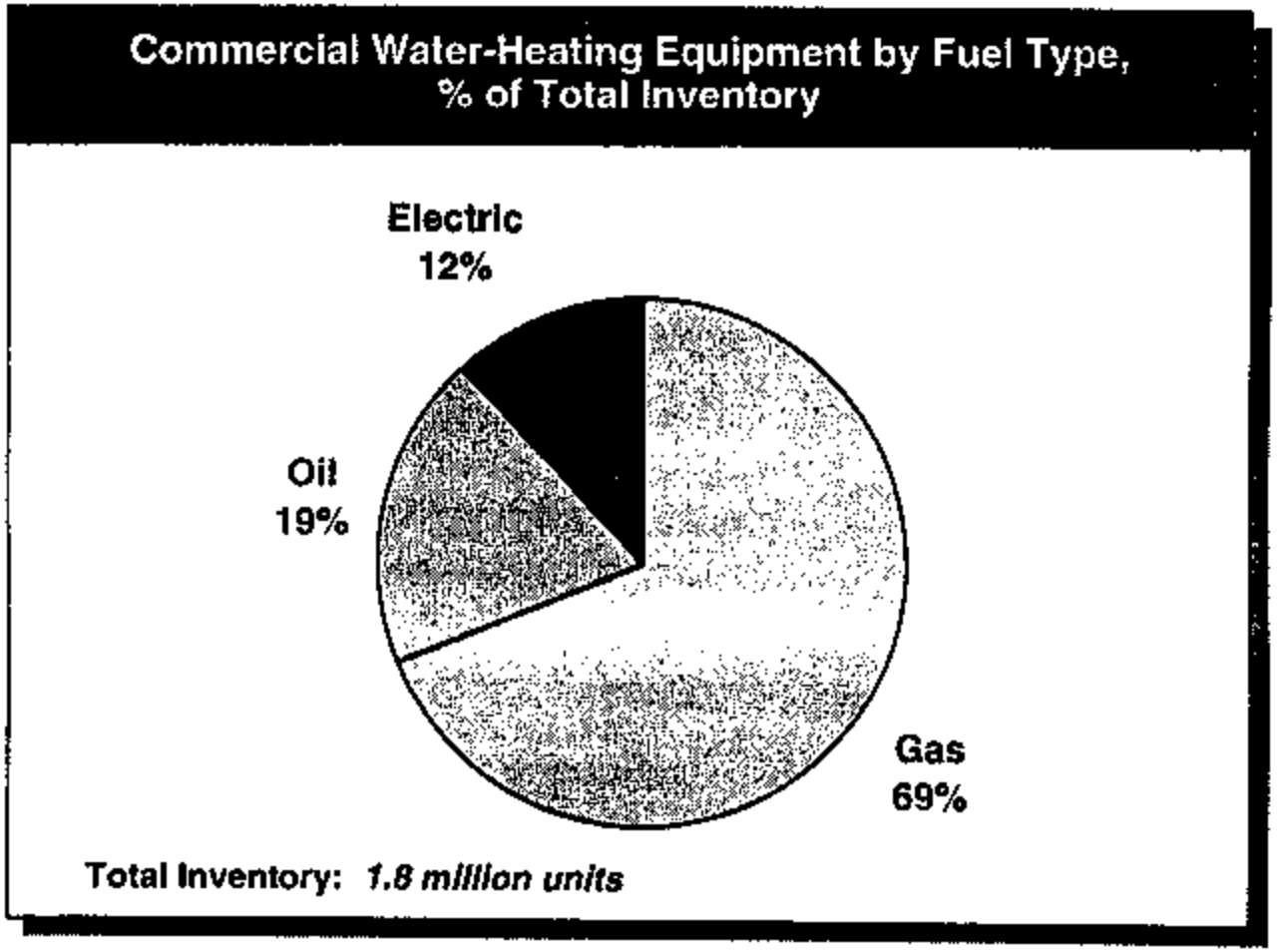
The gas/electric water-heater shipment ratio has held constant for at least a decade.

Gas and Electric Water Heater Sales



In commercial applications, gas is the dominant choice for water heating.

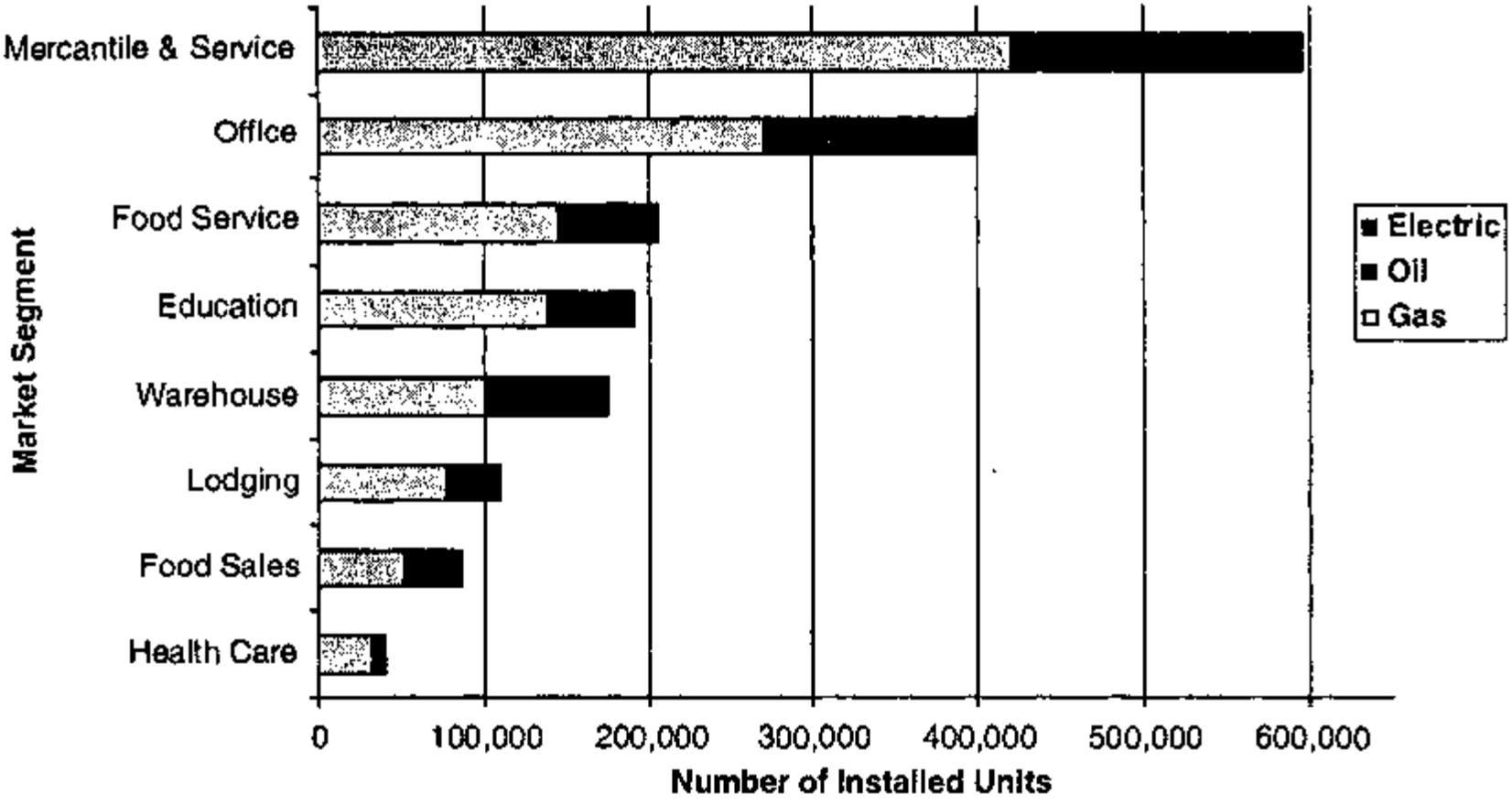


Source: Characterization of Commercial Building Appliances, ADL for U.S. Dept. of Energy, August 1993.

Commercial end users will generally select gas water heaters over electric, if gas is readily available.

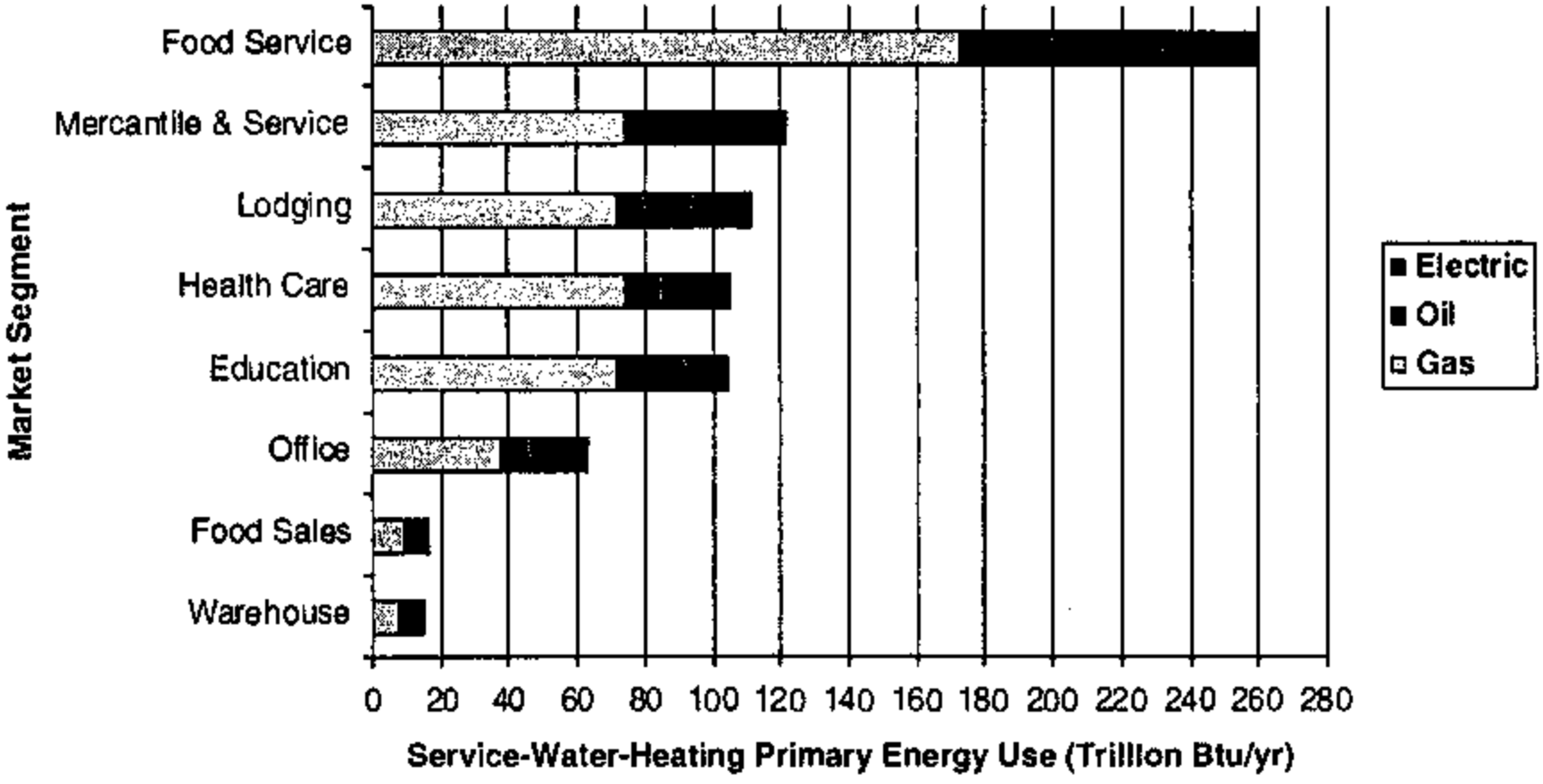
- Commercial locations more likely to have gas available.
- Commercial water heaters tend to be larger than residential units. As water heaters increase in size, gas-water-heater equipment costs are lower per MMBtu delivered relative to electric water heaters.
- Commercial end users are generally more cognizant of the energy-cost differential between gas and electric, relative to residential end users.

The Mercantile and Service market segment has the largest number of installations.



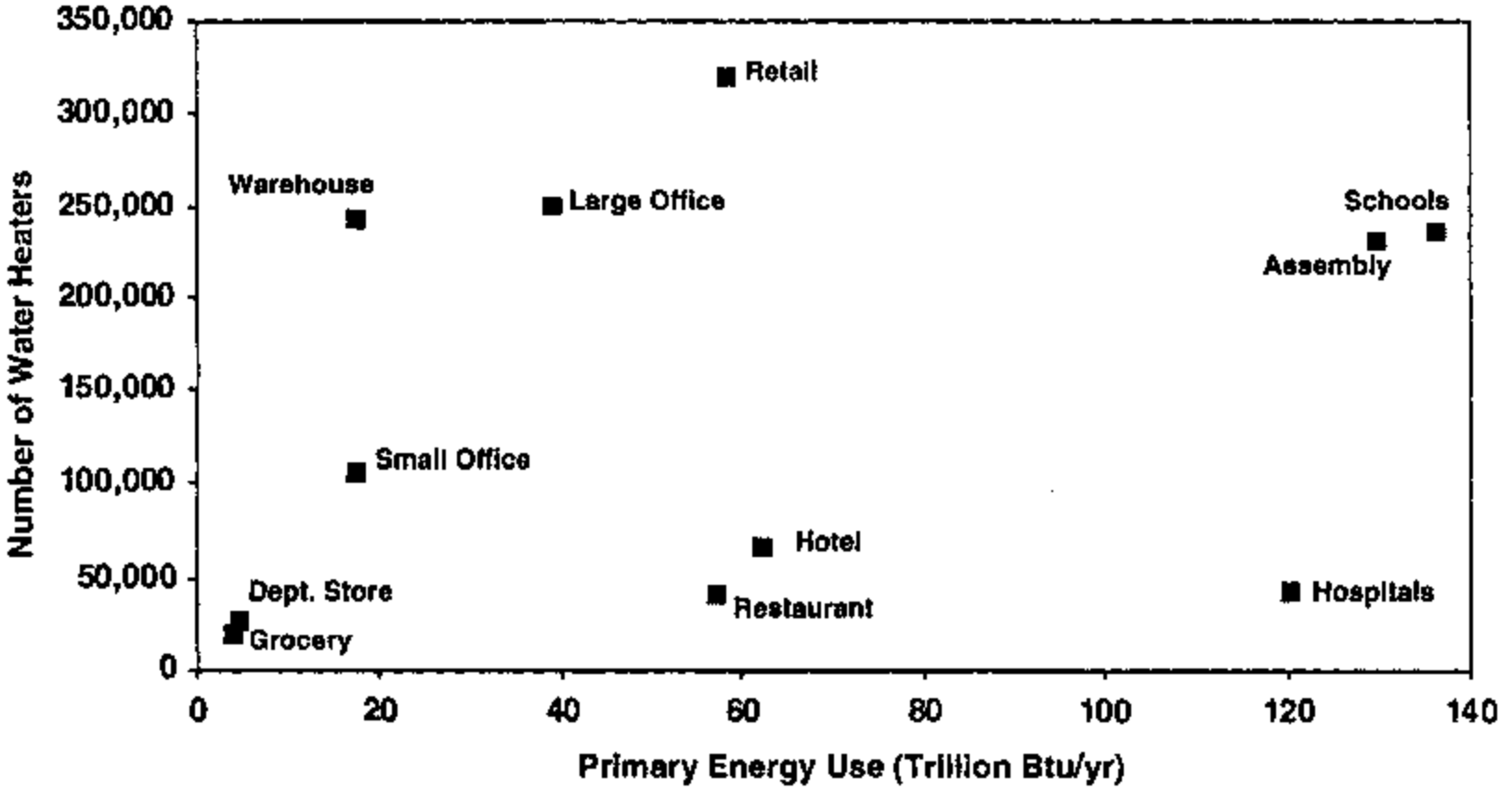
Source: Characterization of Commercial Building Appliances, (ADL for DOE) June 1993.

The Food Service segment consumes the most energy for service water heating.



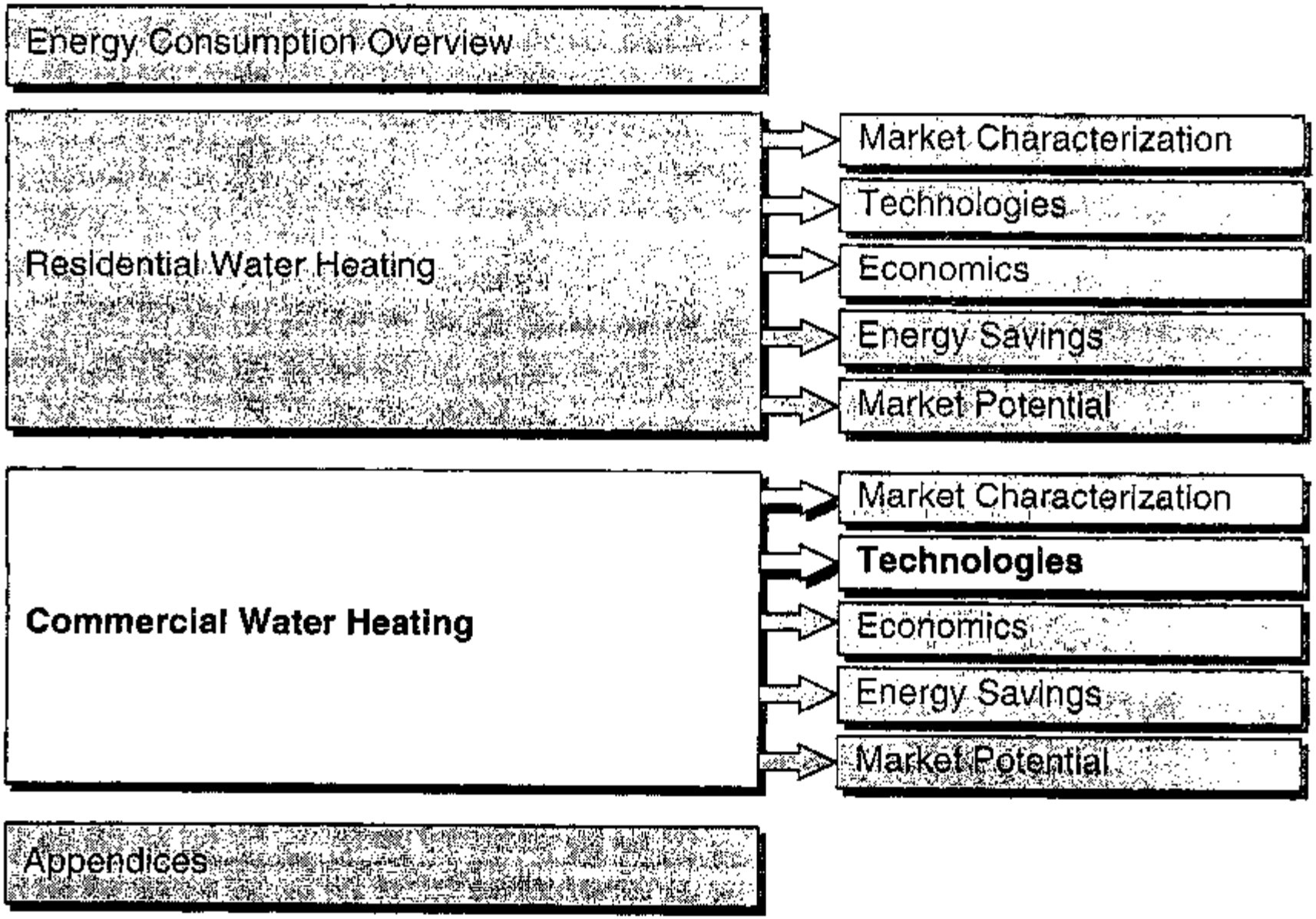
Source: Characterization of Commercial Building Appliances, (ADL for DOE) June 1993.

Hospitals tend to use large, high-capacity water heaters, while warehouses, retail stores, and large offices tend to use small, low-capacity water heaters.



Shipment data underestimate the true size of the commercial water-heater market due to the use of residential-type water heaters in many light-commercial applications.

- Many quick-service restaurants and small retail stores use residential-type water heaters.
- Marketed differently than traditional commercial water heating.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Commercial storage water heaters have slightly larger storage volumes and much higher heat-input rates relative to residential models.

- Storage volumes are typically 80–120 gallons or larger.
- Heat-input rates are up to 500,000 Btu/hr for gas and up to 54 kW for electric.

Type	Criteria: Storage Volume and Heat-Input Rate
Commercial, Electric	More than 105,000 Btuh
Commercial, Gas-Fired	More than 75,000 Btuh; input-to-volume ratio less than 4,000 Btuh per gallon

Several manufacturers of commercial HPWHs have been identified.

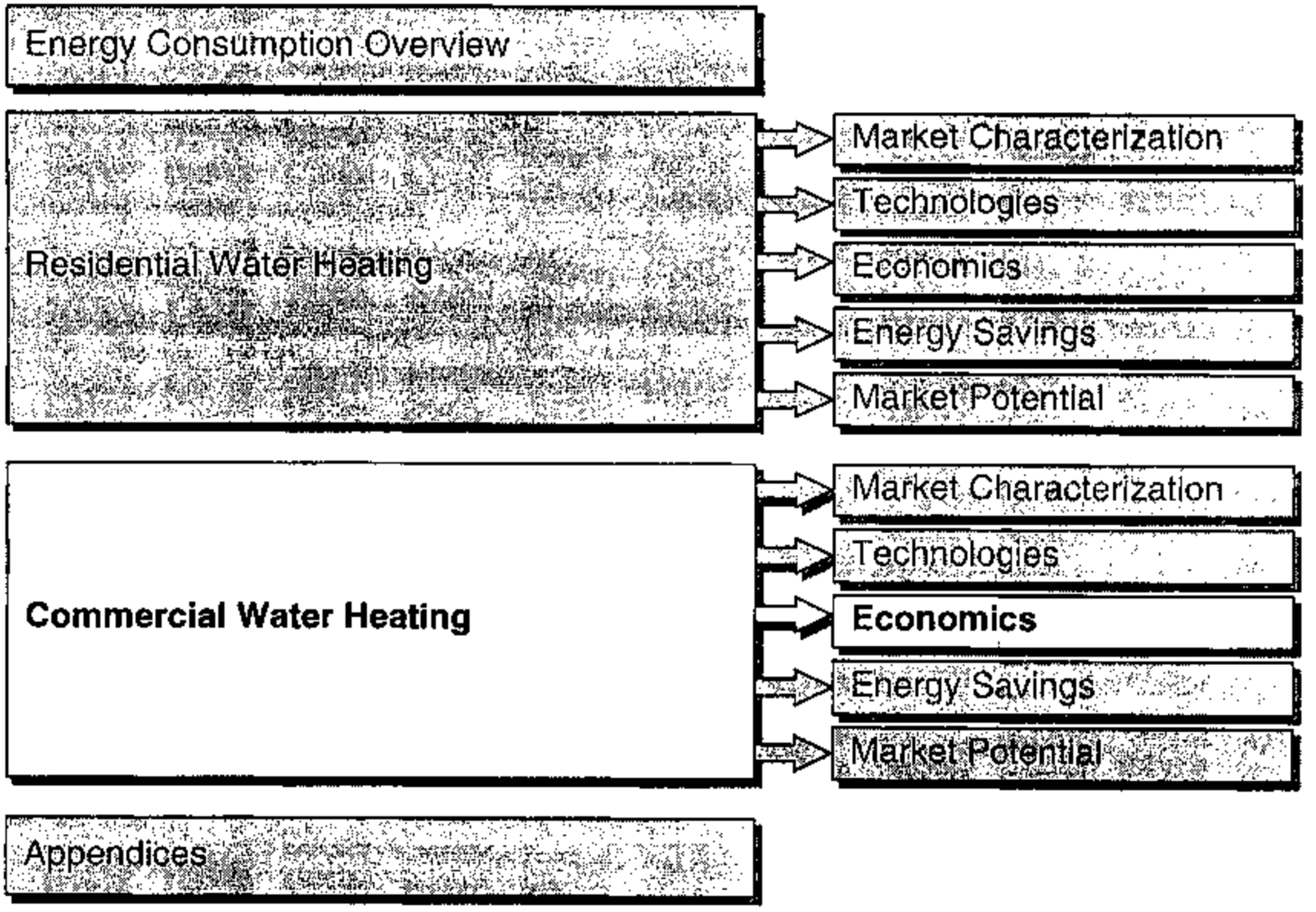
- Addison Products Company (water and air source)
- Colmac Coil Manufacturing (water and air source)
- Crispaire (water and air source)
- DEC Therma-Stor (air source)
- Econar Energy Systems Corporation (water source)
- FHP Manufacturing (air and water source)
- Paul Mueller Company (air source)
- Wallace Energy Systems (air source)
- Water Furnace International, Inc. (water source)

Source: Directory of Heat Pump Water Heater Manufacturers and Equipment, EPRI, Commercial Water Heating Information office, 1996.

Commercial HPWHs available today cover a broad capacity range:

- Water-heating capacities from 20,000 to over 200,000 Btu/hr.
- Typically COPs over 3.0, with some efficiencies approaching 4.0.

Outline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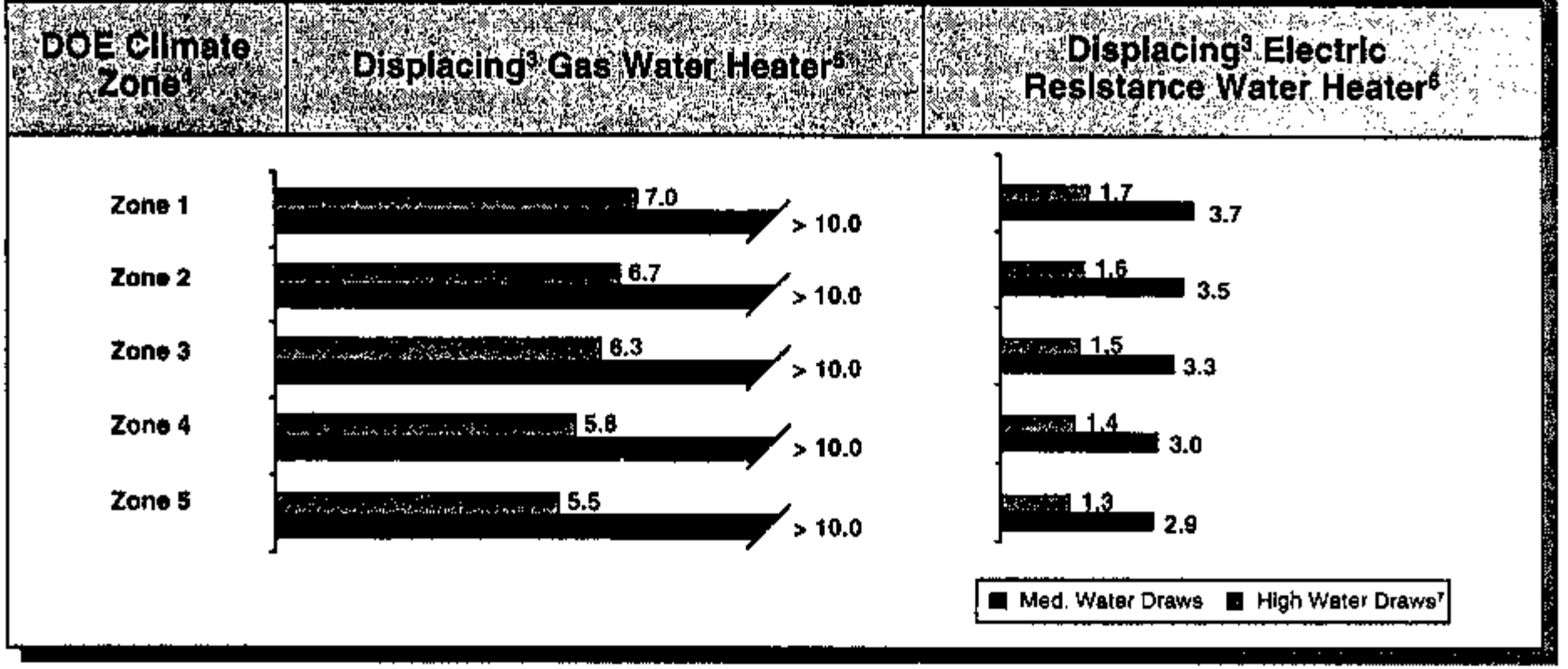
Typical Payback Periods[1] (Years)—HPWH[2] Displacing[3] Gas or Electric Resistance Water Heater[8]



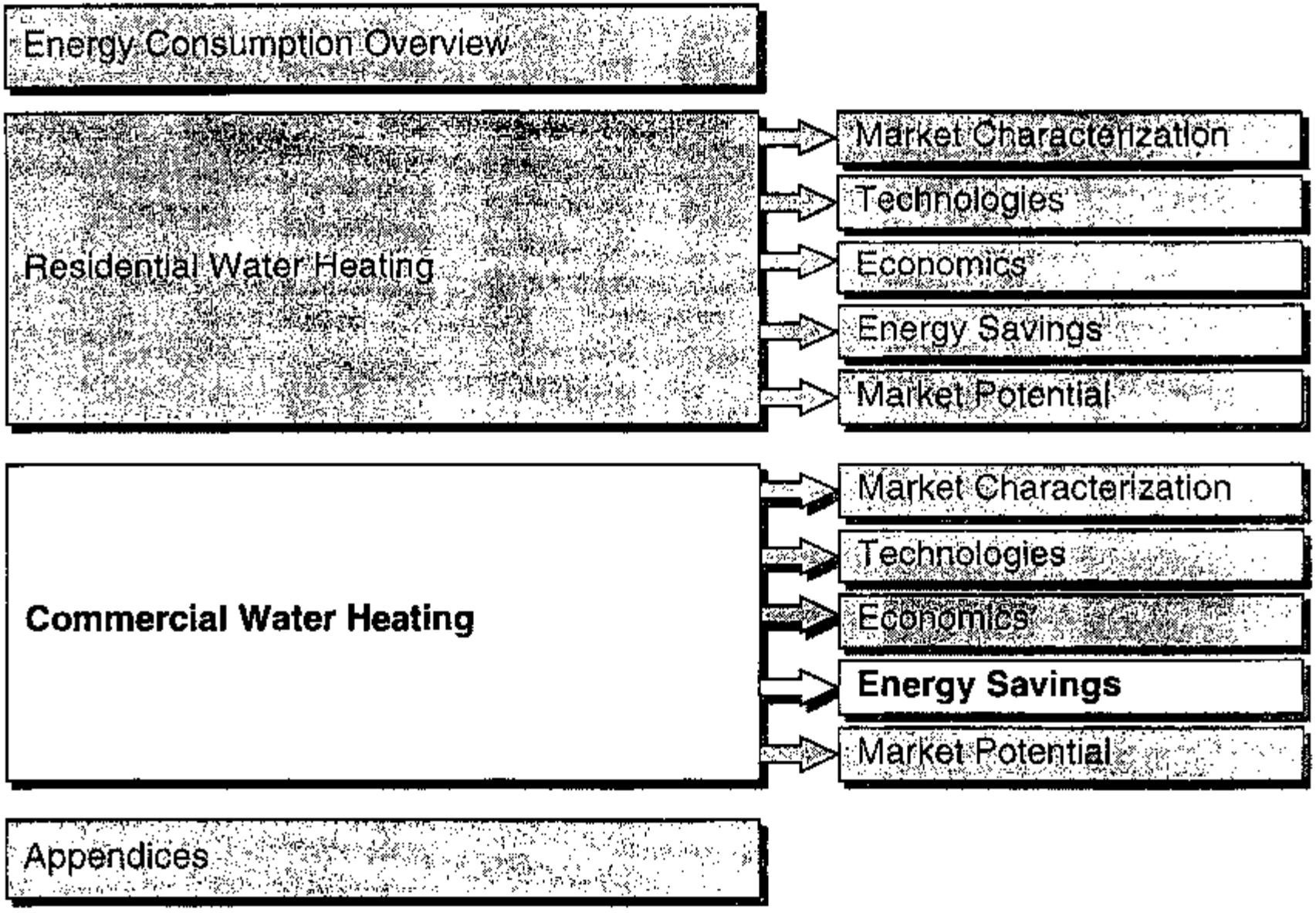
1. Commercial marginal rates of $0.07/kWh, $5.30/MMBtu, without incentives (assumes natural gas service is available at the site, and in the vicinity of the water heater). See appendix D for calculations and additional electric rates.
2. DEC Therma-Stor 120-60, 2 remote evaporators, 2 precharged line sets, 200 ft of insulation @ $3.75/ft, +30% markup, total installed cost: $6,700.
3. Not necessarily the product **replaced**. The product **displaced** is the product that would have been installed absent a joint industry/DOE program.
4. See Appendix A for discussion of DOE Climate Zones.
5. Gas Water Heater: 100 gallon, 199kBtuh, 182gph recovery (ASHRAE 90.1b); total installed cost: $2,900.
6. Electric Resistance Water Heater: 120 gallon, 45kW, 184gph recovery; total installed cost: $3,000.
7. Medium water draw is 250 gal/day and High water draw is 550 gal/day. Source: ASHRAE HVAC Applications, 1995.
8. Assumes year-round space-conditioning benefit in the kitchen.

Preliminary analysis has indicated that there are commercial applications for a point-of-use water heaters that reduce water-heating load requirements by savings from 40 to 60%[1].

- A 200-unit hotel was modeled having a circulating loop hot water distribution.
- Thermal losses were calculated assuming 70°F ambient air and a water tank temperature of 140°F.
- Piping runs ranged between 600 and 800 linear feet.

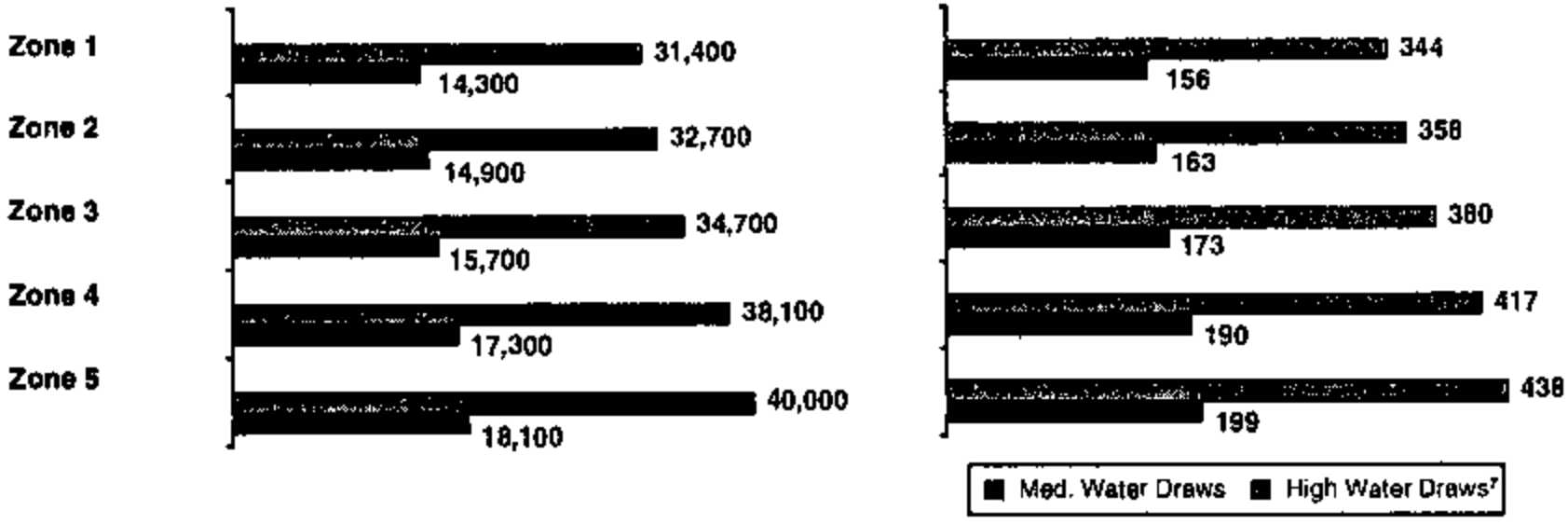
[1] See Appendix B.

Outline



Arthur D Little

Typical Unit[1] Energy Impacts
HPWH[2] Displacing[3] an Electric Resistance Water Heater[4,7]



1 A unit is defined as a single quick-service restaurant.

2 DEC Therma-Stor 120-60, with 2 remote evaporators, 2 precharged line sets, 200 ft of insulation.

3 Not necessarily the product **replaced**. The product **displaced** is the product that would have been installed absent a joint industry/DOE program.

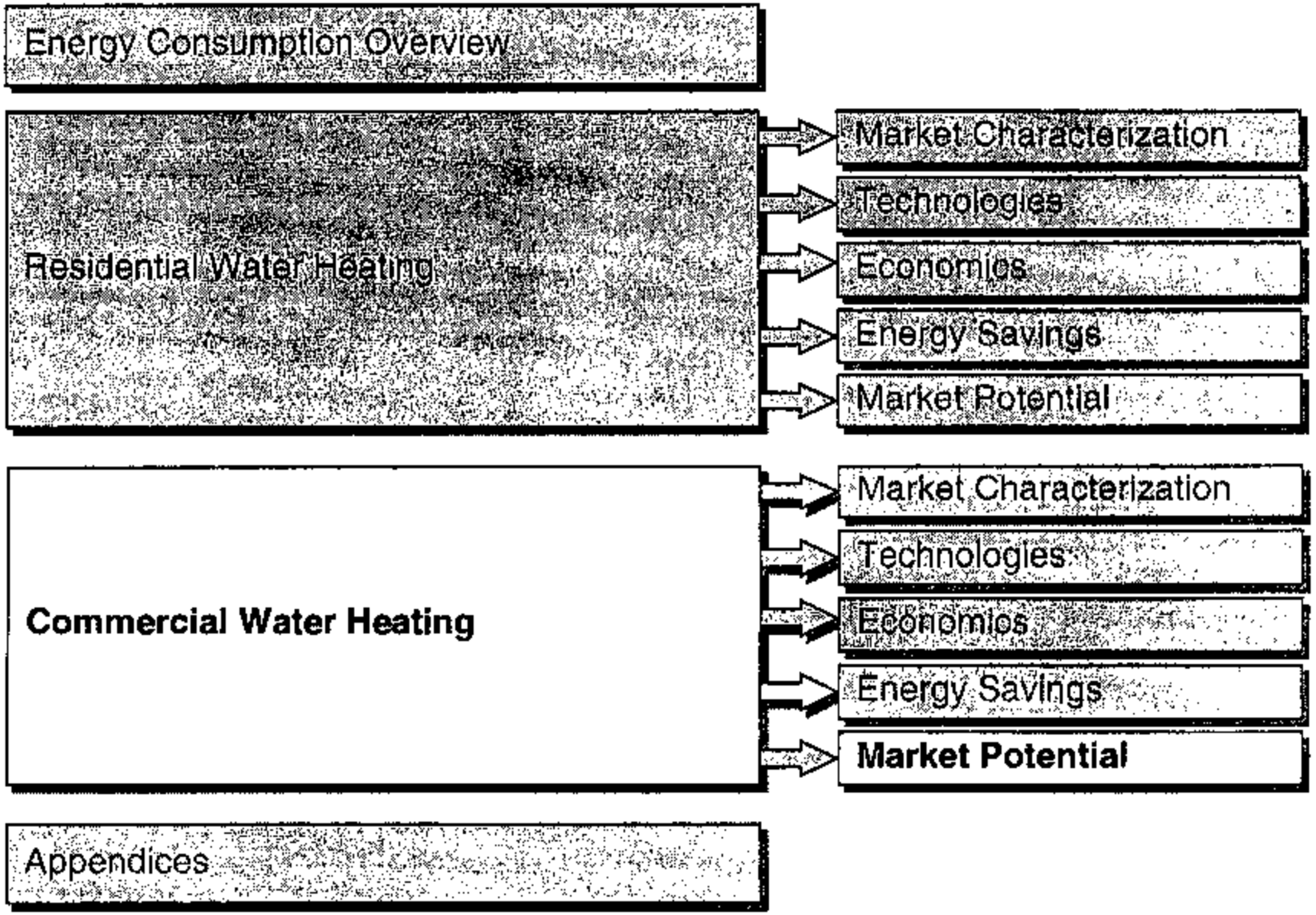
4 Electric Resistance Water Heater: 120 gallon, 45kW, 184gph recovery.

5 See Appendix A for discussion of DOE Climate zones.

6 Medium water draw is 250 gal/day and High water draw is 550 gal/day. Source: ASHRAE HVAC Applications, 1995.

7 Assumes year-round space-conditioning benefit in the kitchen.

Outline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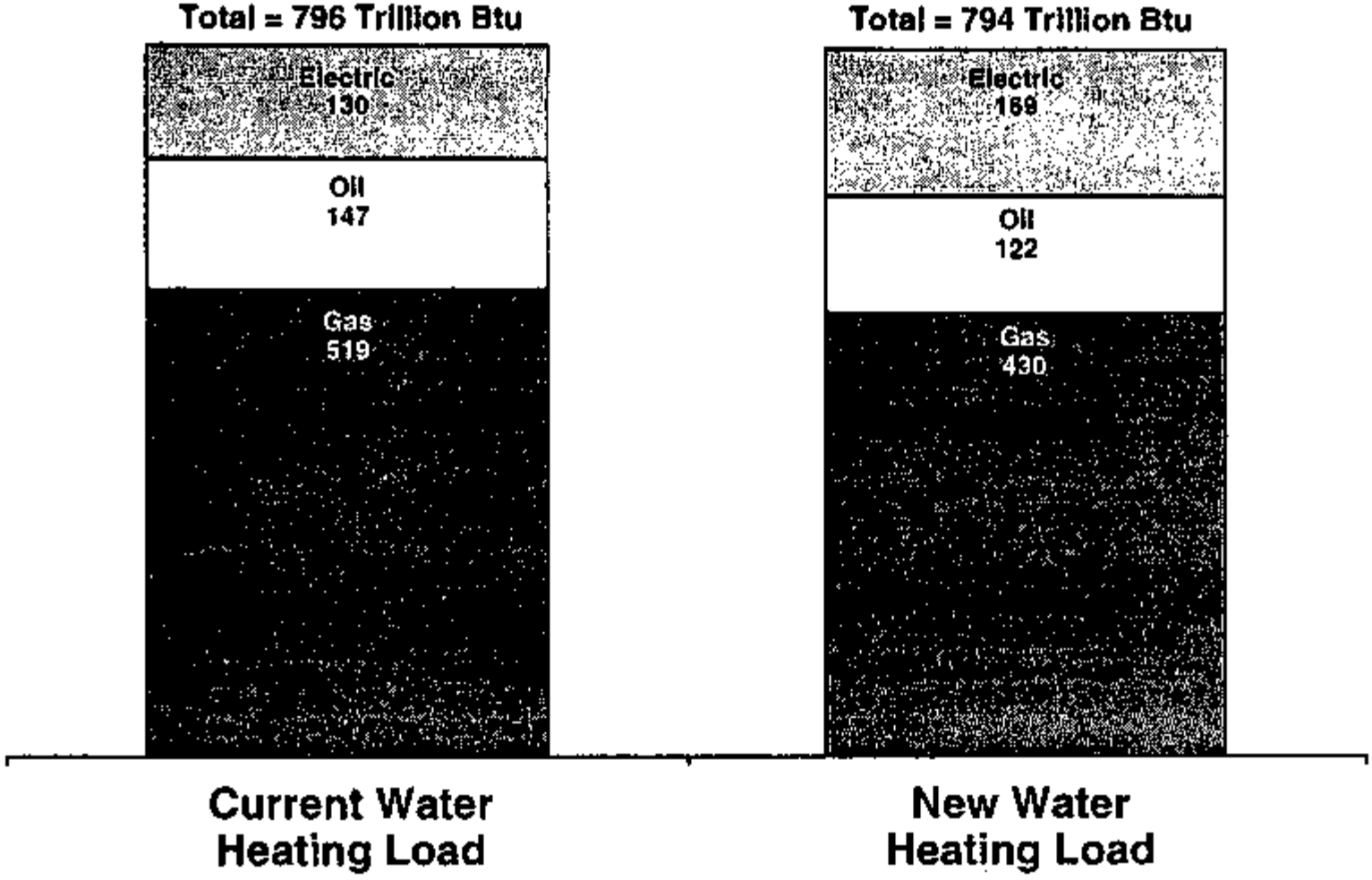
By targeting economical applications, particularly restaurants and hotels, the electric load will increase while providing national energy savings.



Increasing HPWH sales to 10,000/year with 5,000 units replacing a gas water heater in applications needing spot cooling (i.e., restaurant).

Program benefits have been estimated, assuming displacement of standard-efficiency electric resistance water heaters[1,4].

Benefit Type	Beneficiary	1997[2]–2002	1997[2]–2010	1997[2]–2030
Cumulative Site Energy Savings (Million kWh)	Industry	1,870	9,620	33,000
Cumulative Primary Energy Savings (Quads)	Nation	0.02	0.11	0.36
Cumulative Carbon Emissions Reductions (MMT CE[3])	Nation	0.33	1.6	5.6
Cumulative Operating Cost Savings (Millions $)	End-Users	115	589	2,022

1 Benefits may vary, depending on the actual mix of products displaced. See Appendix D for detailed calculations. Assumes no unit shipments and no inventory of high-efficiency products at the start of the program.

2 Assumes 1997 program start.

3 Million metric tons carbon equivalent.

4 See Appendix A for annual benefits.