



the Energy to Lead

How Natural Gas Can Help Pennsylvania Meet Its Energy Needs

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Topics

- > Energy conversion
- > Direct gas use benefits
- > Conclusions

Why Full Fuel Cycle Analysis is Important

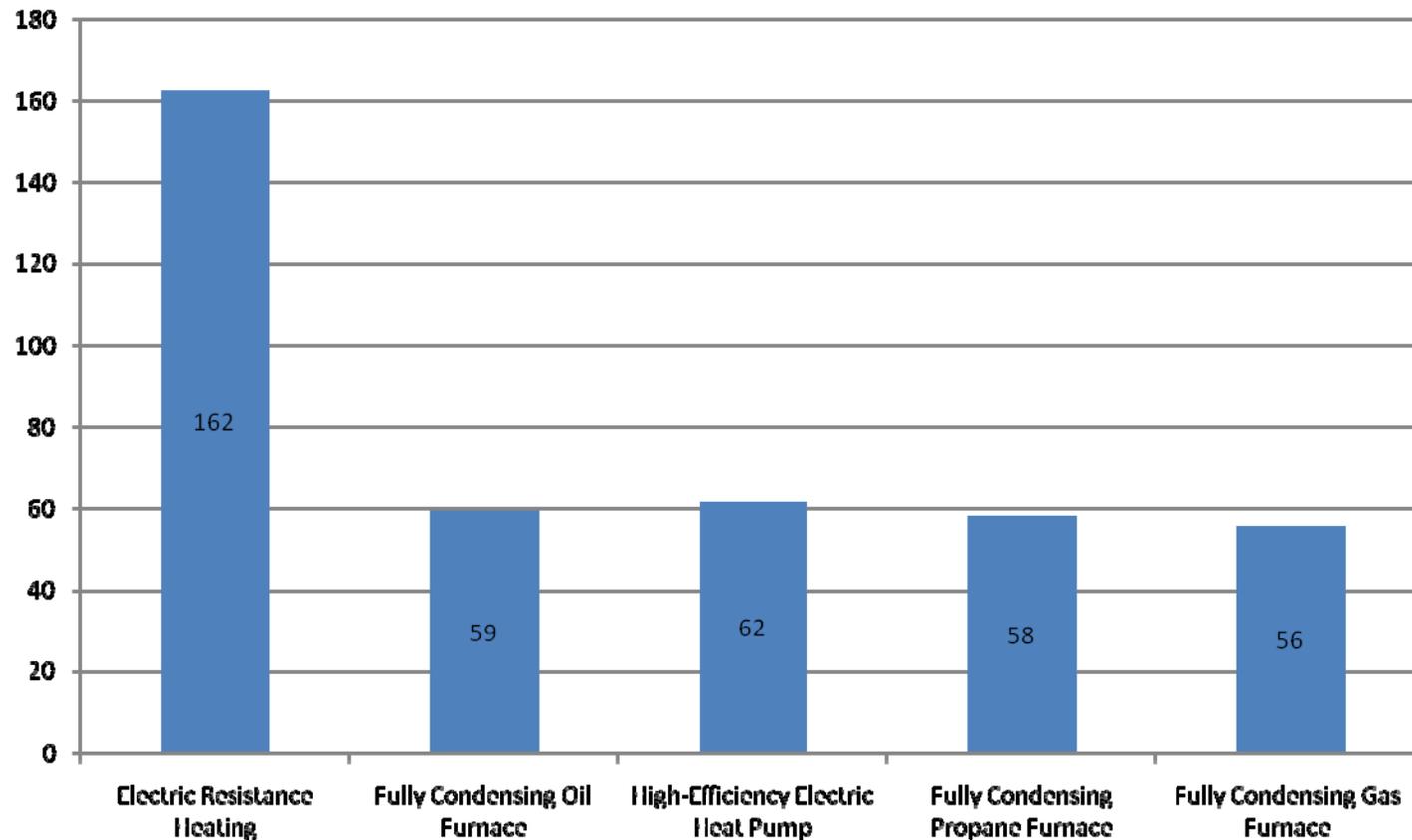
- > For every Btu of energy of coal in the mine, only 0.27–0.39 Btu of that energy gets delivered to the end-use customer through the electric grid.**
- > For every Btu of natural gas in the well, only 0.28–0.51 Btu of that energy gets delivered to the end-use customer through the electric grid.**
- > For every Btu of natural gas in the well, 0.91 Btu is delivered to the end-use customer through the gas lines.**

Pennsylvania Space Heating Statistics -- Bureau of Census Data

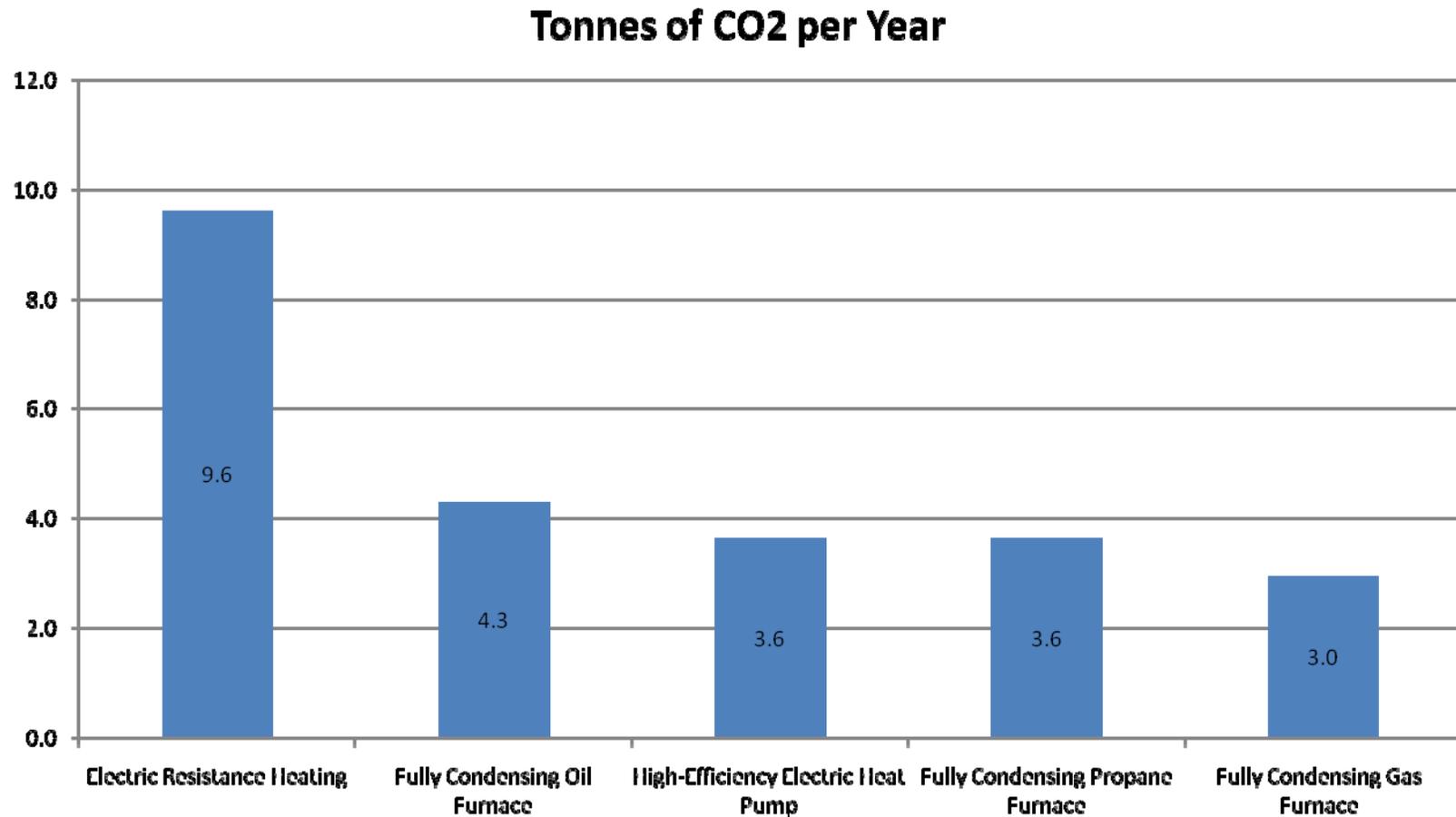
- > 4,840,000 occupied dwelling units
- > 2,490,000 natural-gas-heated homes
- > *861,000 electrically heated residences*
- > 1,110,000 oil-heated homes
- > 183,000 LP-heated homes
- > 100,000 wood-heated homes

Full Fuel Cycle Analysis – Space Heating Primary Energy Use

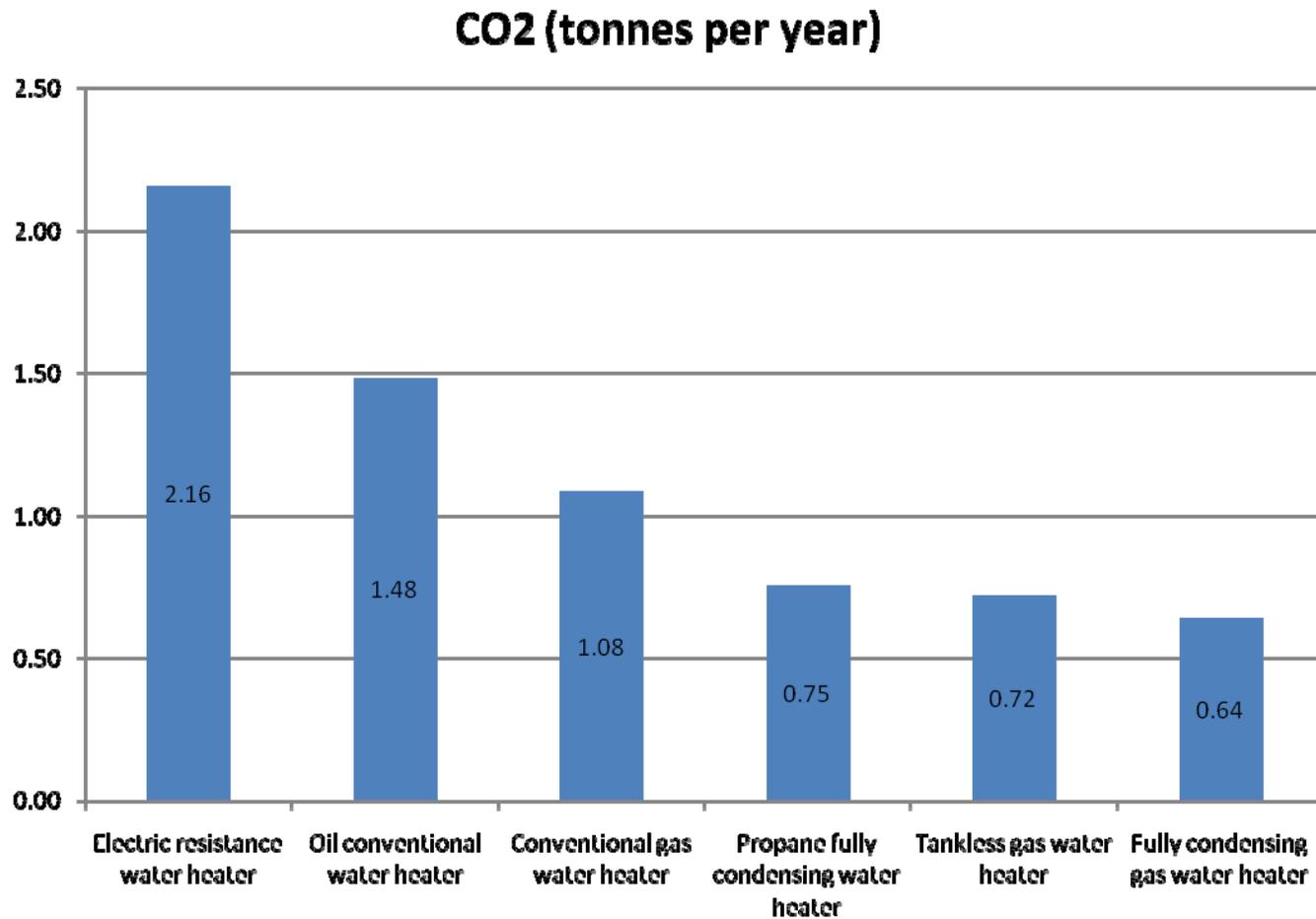
Full-Fuel Cycle Primary Energy Used (MMBtu)



Full Fuel Cycle CO₂ Impact – Space Heating



Full Fuel Cycle CO₂ Impact – Water Heating



Market Potential: Direct Gas Use in Place of Electric Space Heating

- > 861,000 electrically heated homes
- > Assume best EHP's (264% efficient) in place
- > About 5,300 kWhrs per year per home
 - Load much higher in electric-resistance-heated homes (14,000 kWhrs)
- > 100% displacement can save 4.6 million MW hrs

Market Potential: Direct Gas Use in Place of Electric Water Heating

- > At least 1,250,000 electric water heaters
- > Assume 100% electric water heating site efficiency
- > About 3,160 kWhrs per year per home
- > 100% displacement can save 3.9 million MW hrs

Combined Market Potential

- > Space heating and water heating direct gas use displacement electricity savings: 8.5 Million MWhrs
- > Total PA residential electricity use: 51.8 Million MWhrs
- > Potential savings: 16.5% of residential electricity use

Tankless Condensing Water Heaters



**Navien Condensing
Water Heater 98%
Thermal Efficiency**



**Bosch Condensing
Water Heater .92 EF**



**Noritz Condensing
Water Heater .92 EF**



**Eternal Hybrid Water Heater
98% Thermal Efficiency**

Issues

- > Won't this increase natural gas use?
 - Yes, but offset by displacement of reduced need to build new generation facilities, which will be mostly natural gas for the near term
 - This can be offset or minimized by aggressive natural gas efficiency programs for natural gas houses
- > What about the cost of gas hookup?
 - Needs to be taken into account in a Total Resource Cost analysis

Conclusions

- > We urge using a full fuel cycle view of energy efficiency opportunities, including direct gas use