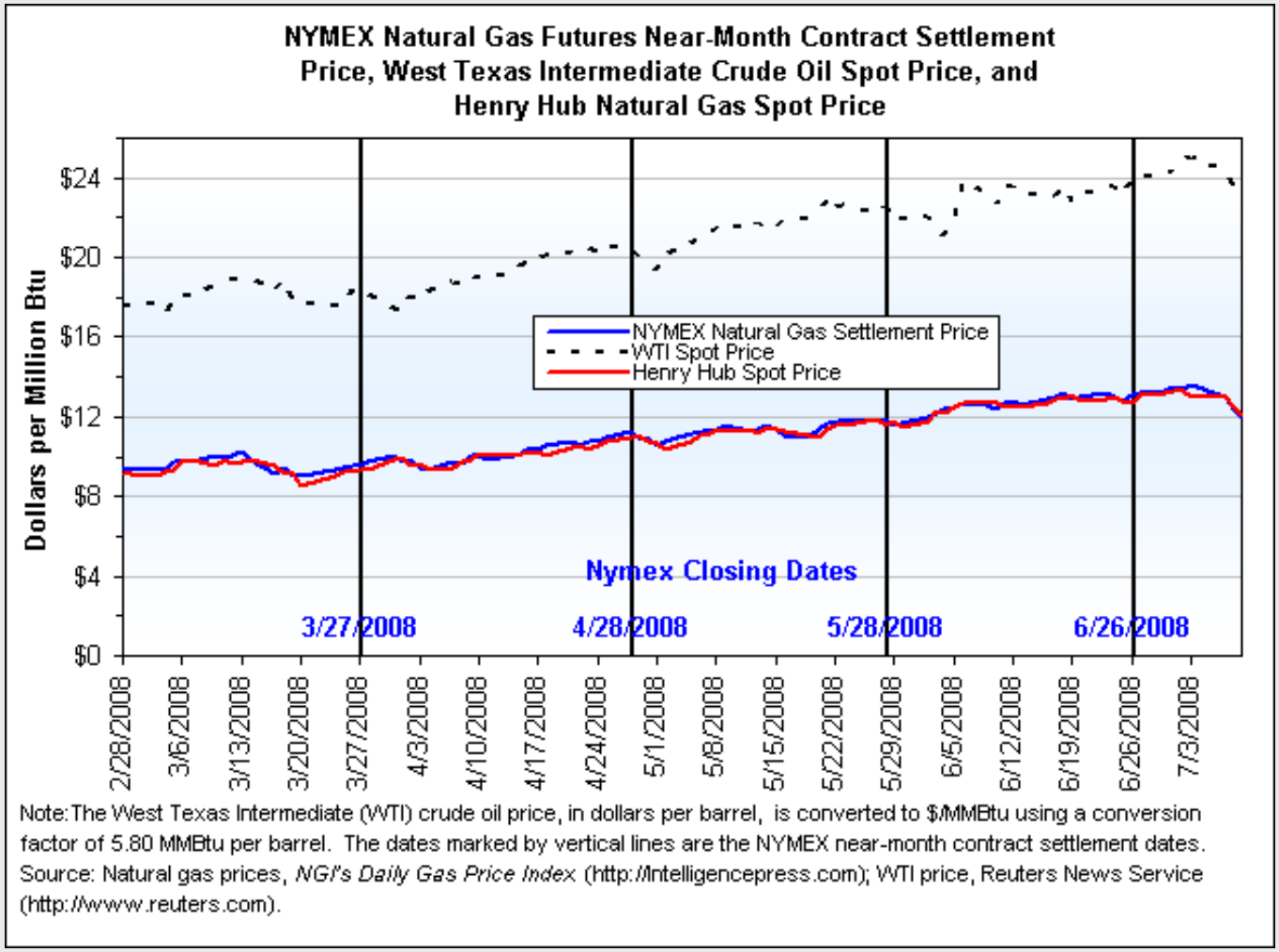
The Need for Natural Gas Energy Efficiency R&D

Ron Edelstein
Gas Technology Institute
NARUC Gas Committee
Portland, Oregon
July 2008

Issues

- Increasing need for energy efficiency in light of energy prices and climate change initiatives
- Benefits of direct gas use
- What new end-use energy efficiency technologies will become available over the next 5 years?
- Where should we draw the boundary on energy efficiency considerations?
- What can be done at Federal and State levels to encourage energy efficiency?
- What incentives are available to encourage utilities to promote and implement energy efficiency measures?

Natural Gas Settlement Prices



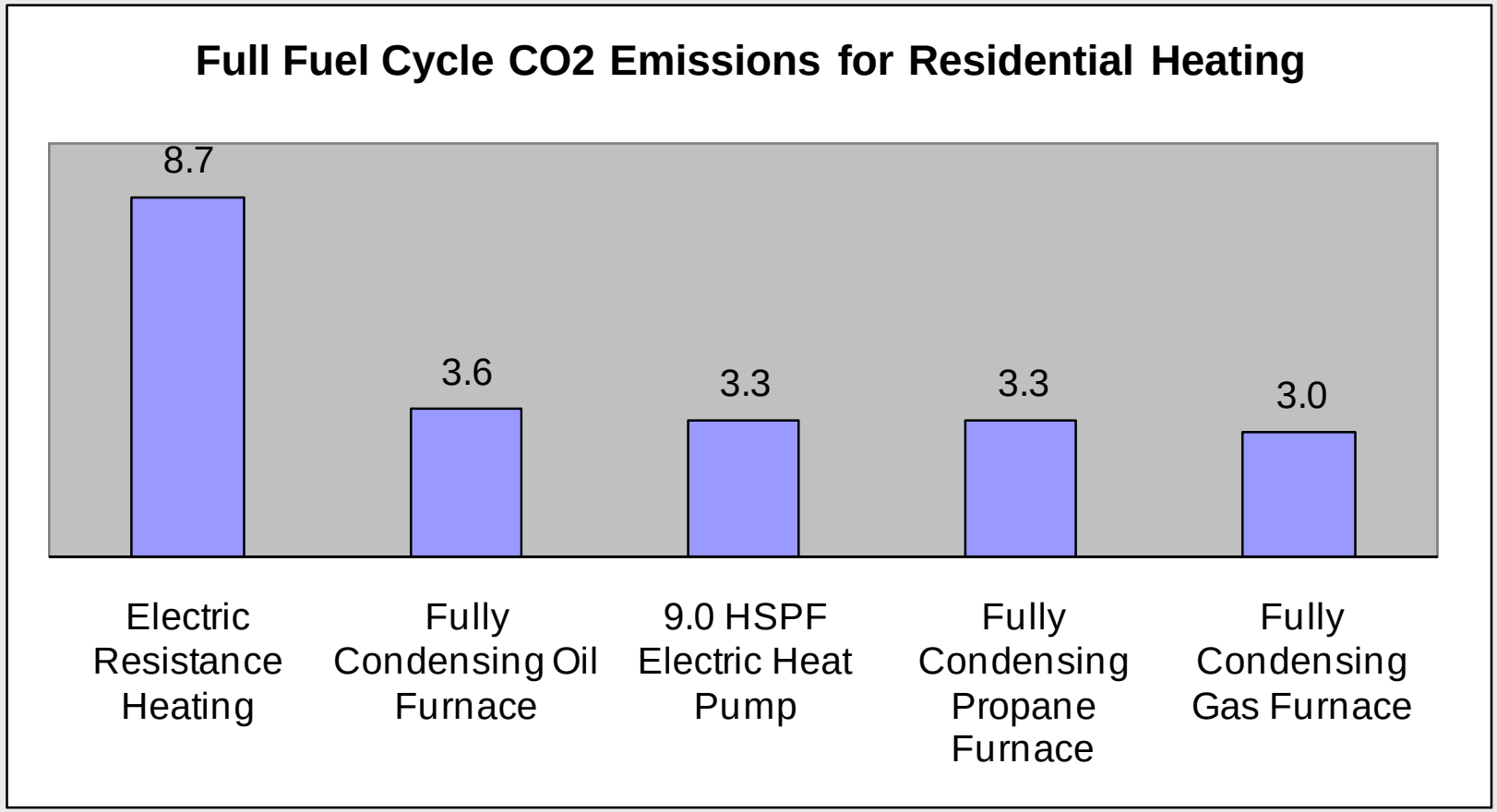
Note: The West Texas Intermediate (WTI) crude oil price, in dollars per barrel, is converted to $/MMBtu using a conversion factor of 5.80 MMBtu per barrel. The dates marked by vertical lines are the NYMEX near-month contract settlement dates.
Source: Natural gas prices, *NGI's Daily Gas Price Index* (http://Intelligencepress.com); WTI price, Reuters News Service (http://www.reuters.com).

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.***

gti

Full Fuel Cycle CO_2 Emissions



Note: Based on BACT, and heating output of 40 MMBtu/yr

Opportunity

- Optimizing how the U.S. uses energy has the potential to reduce CO_2 emissions by 430 – 645 million metric tons per year
- Energy efficiency gains, using full fuel cycle analysis, are about 4.3 quads per year

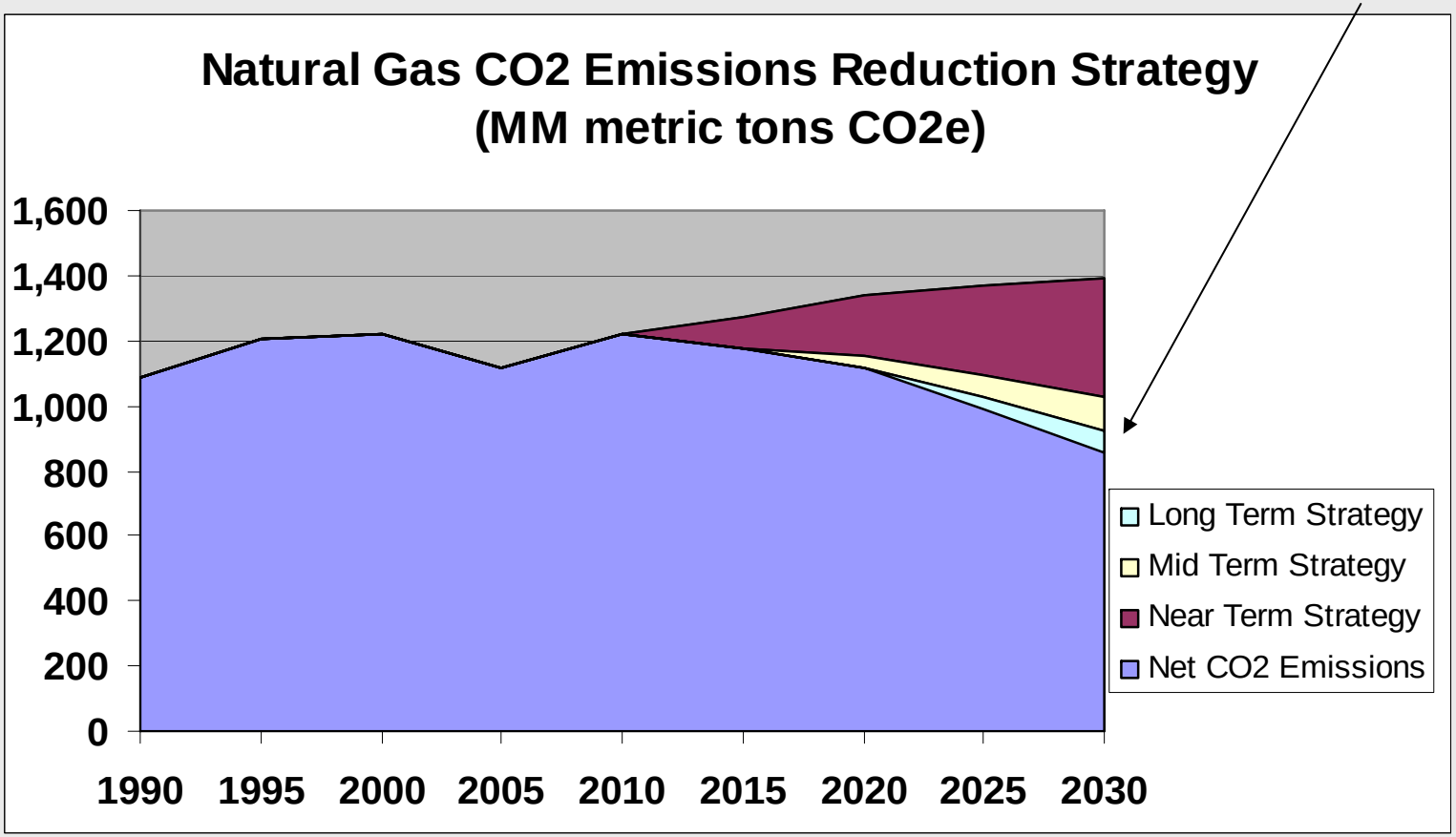
Strategy

- In the near term, aggressive deployment of high-efficiency natural gas equipment in the nation's homes, offices, and industries can achieve substantial CO_2 savings
- In the midterm, additional GHG savings by reducing methane leakage from the nation's natural gas production, transmission, and distribution systems
- In the long term, renewables-based gas can be fed into the pipelines to create a sustainable, zero-carbon option

gti

Three-Phase Strategy

21% reduction in CO2 emissions below 1990 levels



Public v. Private Goods R&D

- Pure public goods R&D : Non-rival, non-excludable, No benefits appropriable by private entities
- Pure private goods R&D: All benefits appropriable by private entities
- Energy efficiency R&D benefits lie mostly in the public goods sector
- Therefore, the Federal, State, or ratepayers should pay for the R&D

gti

Emerging Residential Gas EE Technologies

NovelAire ComfortDry™ 400

Water/Space Heater Combo

Gas Heat Pump with Standby Generator

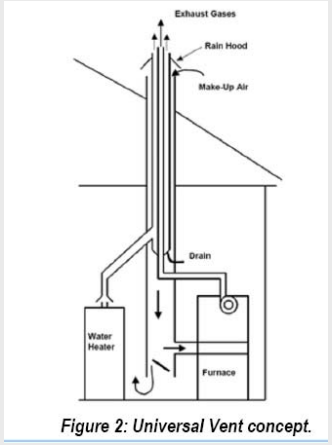
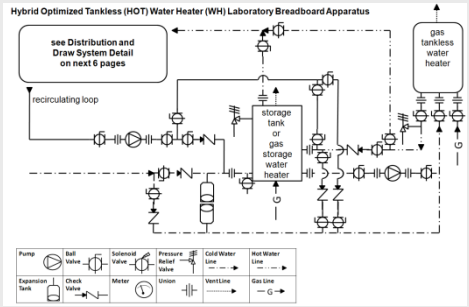


Figure 2: Universal Vent concept.

Universal Vent

A. O Smith Vertex Condensing Water Heater

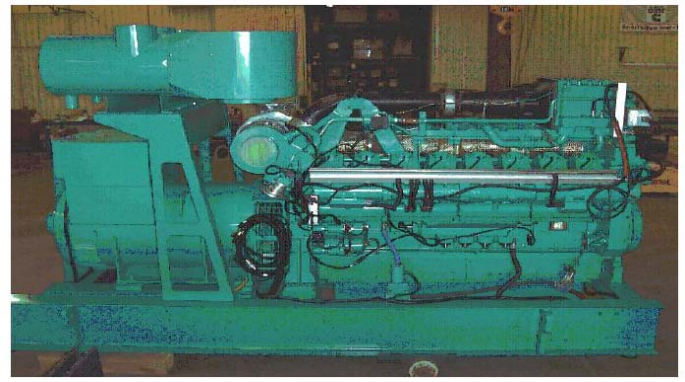


Hybrid Optimized Tankless Water Heater

Emerging Commercial Gas EE Technologies

Avantec Combi-Oven

Gas Fryer



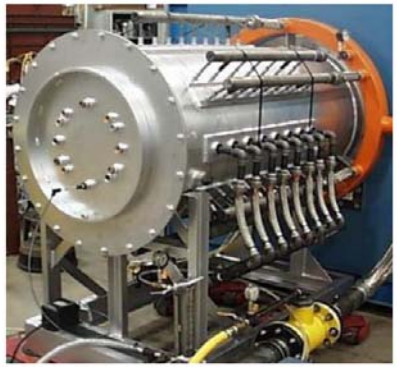
Distributed Generation using Thermochemical Recuperation

Emerging Industrial Gas EE Technologies

RASERT Radiant Tube Technology

Super Boiler

Transport Membrane Condenser



Direct Flame Impingement

Next Generation Melter

Potential Roles in Funding EE R&D

- Federal government (DOE model) should fund longer-term, high-risk, high-payoff R&D
- State governments (CEC model) should fund mid-term R&D
- Ratepayers should fund near-term R&D and market transformation
- Private sector (manufacturers, utilities) should fund proprietary R&D that will offer them competitive advantages, where benefits are rival and appropriable

gti

Incentives for Utilities

- Utilities need to be made whole for their support of energy efficiency R&D, deployment, and implementation
- Ratepayer funding of appropriate R&D
- Decoupling or other mechanism to separate O&M expense recovery and ROE from volumes

Conclusions

- Strong R&D need for energy efficiency that will not be supported by the private sector due to the public goods nature of energy efficiency
- Utilities can and want to be part of the energy efficiency process
- Direct tie between energy efficiency increases and greenhouse gas reductions
- Don’t forget about the advantages of direct gas use!

gti