2215

Direct Use of Natural Gas Policy Option

Arkansas' Investor-Owned Natural Gas Utilities

for

Arkansas Governor's Commission on Global Warming

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Why is direct use of natural gas policy option important to members of GCGW?

- GCGW shall conduct an in-depth examination and evaluation of issues related to global warming and the potential impact of global warming on the state, its citizens, its natural resources, and its economy
- GCGW shall set forth:
  - A global warming pollutant reduction goal
  - A comprehensive strategic plan for implementation of the global warming pollutant reduction goal
- <u>Direct use of natural gas is one of the best policy options available, if barriers to its implementation are identified and addressed</u>

What is direct use of natural gas?

- Using natural gas to fuel appliances for space heating, water heating, cooking and drying instead of using electric resistance heating appliances for these purposes.
- Using natural gas delivers energy to consumers at 90% energy efficiency compared with only 27% energy efficiency of electricity when natural gas or other fossil fuels are used to generate electricity.
- Using one unit of energy from natural gas to fuel appliances for space heating, water heating, cooking and drying saves three units of energy from fossil fuels used to generate electricity to power electric resistance heating appliances for these purposes.

Delivered Energy Efficiency

refers to the energy efficiency from the point of extraction to the consumer's meter

	Extract	Process	Transport	Convert	Distribute	Delivered
Natural Gas	96.8%	97.6%	97.3%	-	98.4%	90.5%
Coal-Based Electricity	99.4%	90.0%	97.5%	33.4%	92.0%	26.8%
Oil-Based Electricity	96.8%	90.2%	98.4%	32.5%	92.0%	25.7%
Natural Gas-Based Electricity	96.8%	97.6%	98.4%	31.8%	92.0%	26.9%
Fossil Fuel-Based Electricity	-	-	-	33.1%	-	26.7%

Water heater example

site energy efficiency vs. real energy efficiency …

- Site energy efficiency of:
  - Gas water heater = 80% (assuming no standby losses)
  - Electric water heater = 98% (assuming no standby losses)

- Real energy efficiency of:
  - Gas water heater = 80% X 90% = 72%
  - Electric water heater = 98% X 27% = 26%

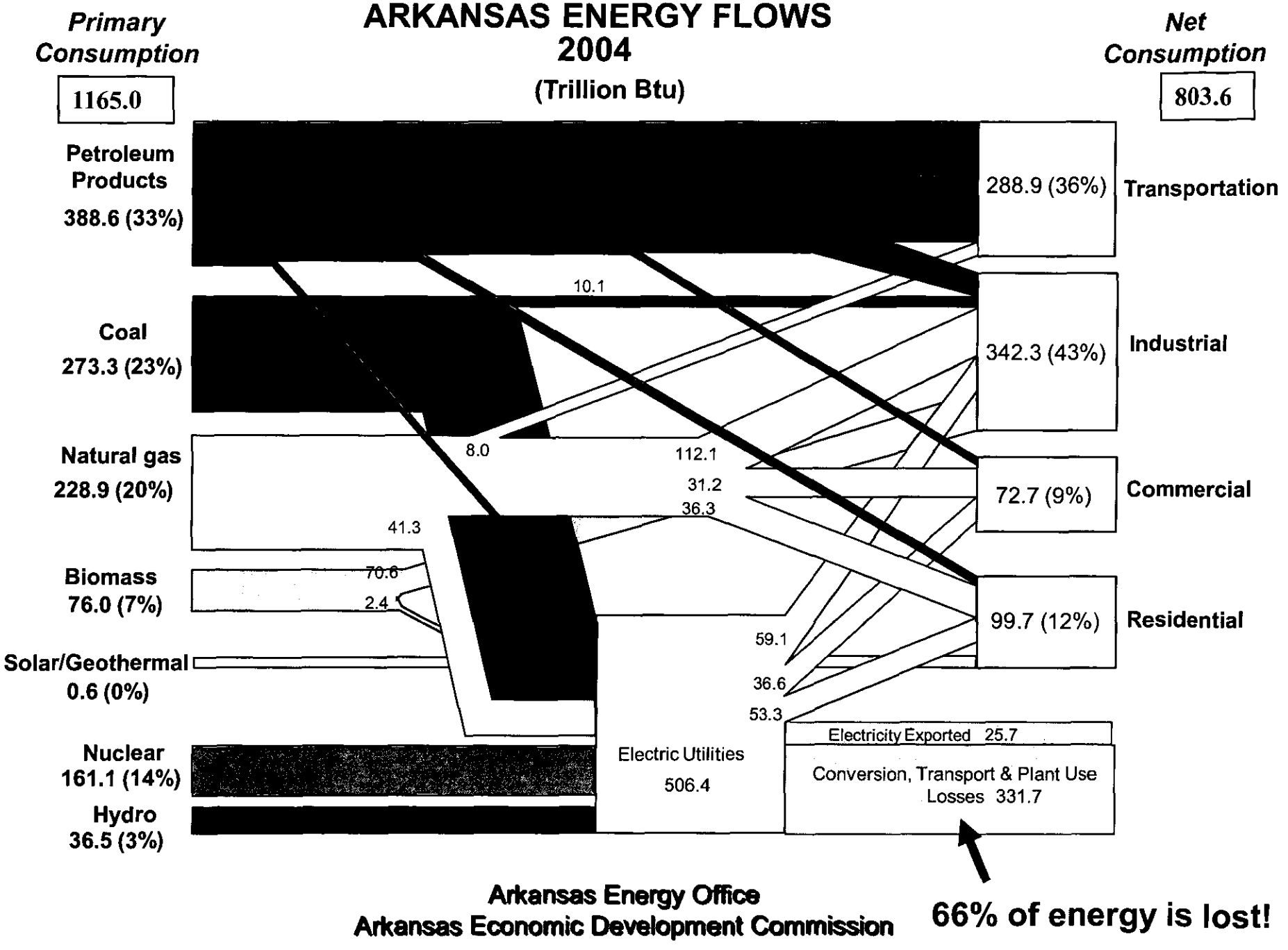
Space heater example

site energy efficiency vs. real energy efficiency …

- Site energy efficiency of:
  - Gas furnace = 80%
  - Air source heat pump = 250% (assuming operation in warm temperatures and not in defrost cycle)
  - Electric resistance heat = 100%

- Real energy efficiency of:
  - Gas furnace = 80% X 90% = 72%
  - Air source heat pump = 250% X 27% = 68%
  - Electric resistance heat = 100% X 27% = 27%

ARKANSAS ENERGY FLOWS
2004
(Trillion Btu)



Arkansas Energy Office
Arkansas Economic Development Commission

66% of energy is lost!

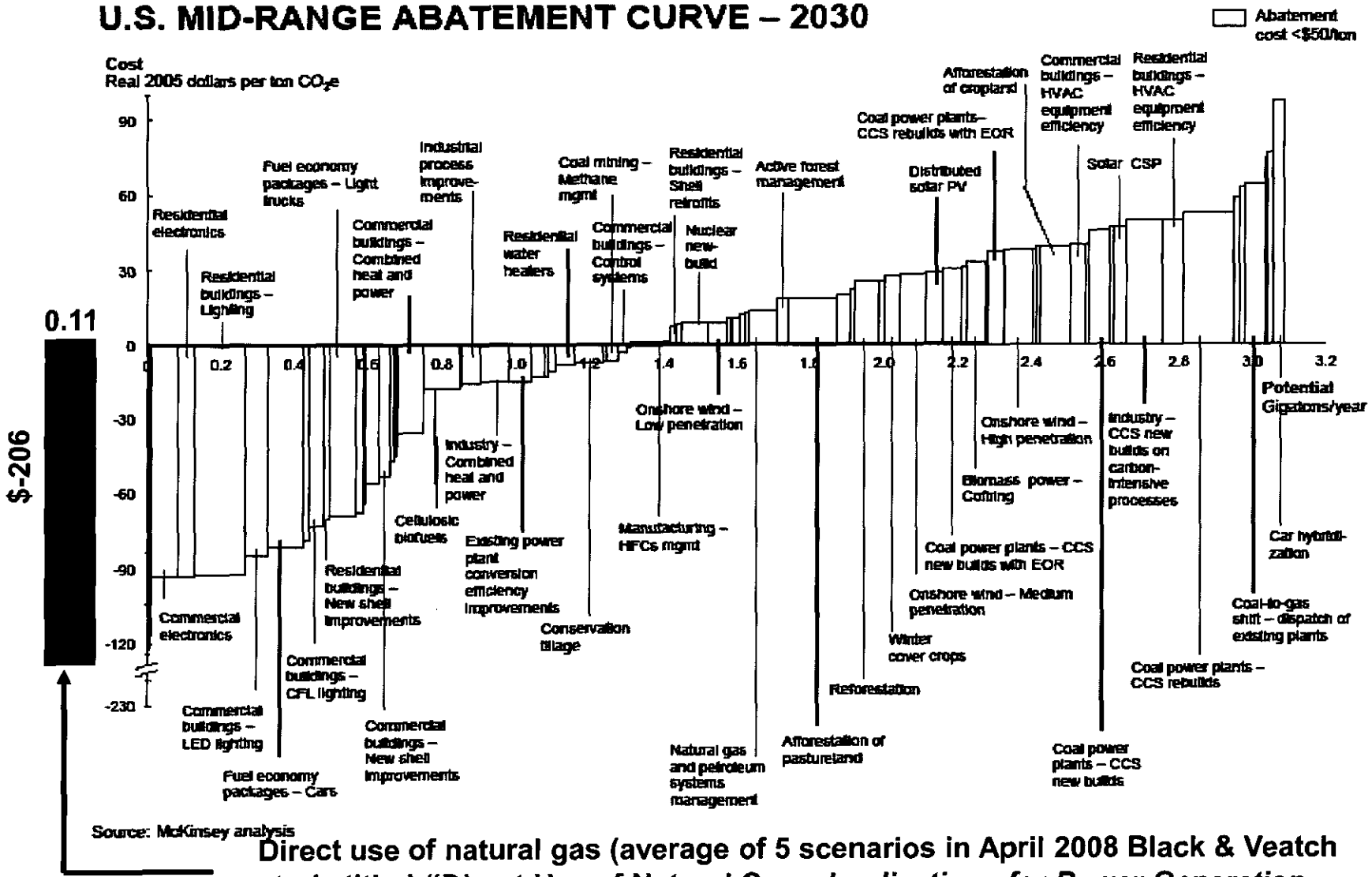
What are the costs and benefits of direct use of natural gas ?

- Costs and benefits for Arkansas will be quantified by CCS for the GCGW once a goal for direct use of natural gas is established.
- April 2008 study by Black & Veatch (B&V) found that if 7% of total electric load for residential and commercial applications is shifted by 2030 from electricity to natural gas, the United States will:
  - Save 1.25 – 2.00 quadrillion Btu in 2030
  - Avoid building 63 – 80 GW of new electric generation capacity at an avoided cost (savings) of $49 billion to $122 billion
  - Reduce CO2e by 60 – 200 million tons in 2030
  - Achieve the above benefits at a savings of $59 - $297 per ton of CO2e
- The B&V study analyzes five scenarios which have an average life cycle net marginal savings of $206 per ton of CO2e and an expected reduction of 108 million tons of CO2e in 2030.

This Exhibit 11 is from page 20 of McKinsey & Company's December 2007 study titled *"Reducing U.S. Greenhouse Gas Emissions: How Much at What Cost?"*)

Exhibit 11

U.S. MID-RANGE ABATEMENT CURVE – 2030



Source: McKinsey analysis

Direct use of natural gas (average of 5 scenarios in April 2008 Black & Veatch study titled *"Direct Use of Natural Gas – Implications for Power Generation, Energy Efficiency, and Carbon Emissions"*)

Will direct use of natural gas provide benefits to consumers if natural gas prices are high in the future?

Yes. Black & Veatch analyzed five scenarios with varying assumptions for natural gas prices, levels of natural gas supply, technology for energy efficient buildings and appliances and levels of restriction on carbon emissions. In all five scenarios, there are energy cost reductions for consumers and reductions in CO_2e emissions as a result of direct use of natural gas.

Estimated Impact of Direct Use of Natural Gas in 2030

	Energy Consumption	Energy Cost	Carbon Emissions	2005 $
	Quadrillion Btu (1)	2005 $ Billions (1)	Million Tons CO_2e (1)	Per Ton CO_2e
Scenario 1: Baseline Case	(2.0)	($13.2)	(224.1)	($59)
Scenario 2a: Gas Supply Lower, Gas Prices Higher, High Technology and High CO2 Restrictions	(1.2)	($18.1)	(63.7)	($284)
Scenario 2b: Gas Supply Lower, Gas Prices Higher, 2006 Technology and High CO2 Restrictions	(1.9)	($28.6)	(96.3)	($297)
Scenario 3a: Gas Supply Higher, Gas Prices Lower, High Technology and Low CO2 Restrictions	(1.2)	($12.3)	(63.7)	($193)
Scenario 3b: Gas Supply Higher, Gas Prices Lower, 2006 Technology and Low Co2 Restrictions	(1.9)	($18.8)	(96.3)	($195)
Average of Five Scenarios	(1.6)	(18.2)	(108.8)	(205.7)

(1) Source of data is from pages 45 - 46 of the Black & Veatch April 2008 study titled ***Direct Use of Natural Gas - Implications for Power Generation, Energy Efficiency, and Carbon Emissions***.

What are the barriers to acceptance?

- Electric and natural gas investor-owned utility ratemaking currently encourages investment in power plants, transmission lines and distribution lines and discourages investment in DSM
- Lack of knowledge among the general public, building industry and other professionals concerning real energy efficiency and the life cycle costs and benefits of direct use of natural gas

What is a reasonable goal for direct use of natural gas?

- **Shift 50% of future electric resistance heating in new residential and commercial buildings to natural gas appliances for space heating, water heating, cooking and drying wherever natural gas is economically available.**

What implementation mechanisms make the most sense?

- Building codes can be modified to encourage the direct use of natural gas similar to what has been done in California (RCI-1 and RCI-4)
- Utility DSM programs can be developed and offered by electric and natural gas utilities to provide incentives for home owners and builders to install natural gas appliances for space heating, water heating, cooking and drying instead of electric resistance heating appliances for these purposes (RCI-2)
- Educate consumers, building industry and other professional on real energy efficiency and the life cycle net marginal costs (savings) and benefits of direct use of natural gas (RCI-5)

Summary

- There are no "silver bullets" … a portfolio of low risk and proven solutions is needed … direct use of natural gas is one of the best policy options available to cost effectively reduce CO2e emissions.
- Regulatory barriers must be removed to receive the full benefits of this cost effective policy option.
- A goal to discourage resistance heating appliances in new buildings and to encourage direct use of natural gas should be a priority of the GCGW. Direct use of natural gas should be a priority policy option for analysis.
- The gas utilities are available to help the GCGW.