

U.S. Energy Subsidies: Effects on Energy Markets and Carbon Dioxide Emissions

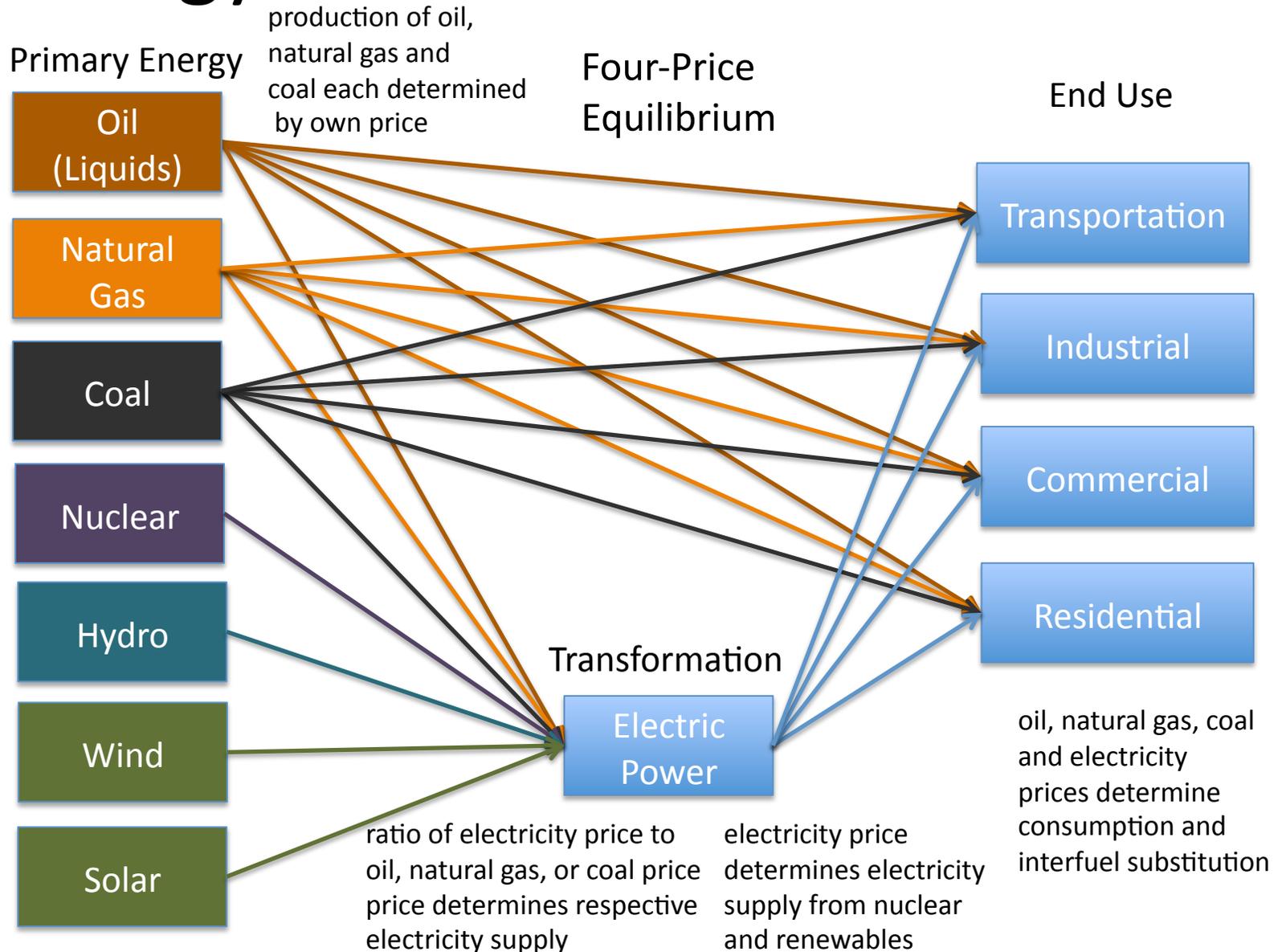
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U.S. Energy Subsidies and CO₂ Emissions

- From 2005-09, United States spent \$96.3 billion on about 60 energy subsidies
 - Some encouraged the production or consumption of conventional fuels
 - Some encouraged the production or consumption of renewable fuels
 - Some encouraged energy conservation
- All affected CO₂ emissions to some extent
- Evaluate CO₂ emissions with simulation model

Energy Market Simulation Model



Interaction with World Energy Markets

- World oil market with limited detail outside United States
- Natural gas market with imports and exports
- Coal market with imports and exports
- Electricity market with net imports

Subsidies that Most Reduced CO₂ Emissions

- Low cost residential weatherization
- Energy efficiency block grant program
- USDA rural energy for America program
- DOE state energy program
- Special tax rate for nuclear decommissioning reserve funds
- Credit for energy efficiency improvements to existing homes
- Production tax credit, investment credit and grants for renewable energy
- Credit for energy efficient appliances
- Exclusion for utility-sponsored conservation measures
- Biodiesel tax credits
- Deduction for certain energy-efficient commercial building property
- Energy efficient appliance rebate program
- USDA electric programs

Other Subsidies that Reduced CO₂ Emissions

- Credit for investment in clean coal facilities
- Five-year modified accelerated cost recovery for solar, wind, biomass and ocean thermal electric power generation
- Credit for the construction of new energy-efficient homes
- USDA high energy cost grants
- Credit for holding clean energy bonds
- Credit for residential purchase and installation of solar and fuel cells
- USDA biorefinery assistance loan guarantees
- DOE residential buildings program
- DOE loan guarantees for energy efficiency improvements
- National accounts acceleration in support of the commercial buildings initiative
- Federal interest rate support for electricity generation, transmission and distribution
- USDA renewable energy program
- USDA repowering assistance payments
- Deferral of gain from disposition of credits for transmission property to implement FERC restructuring policy
- Renewable Energy production incentive

Subsidies that Most Increased CO₂ Emissions

- Alternative fuel production credit
- Alcohol fuels excise tax and credit
- USDA corn payments attributable to ethanol
- Expensing of exploration and development costs
- LIHEAP heating and cooling assistance
- Excess of percentage over cost depletion
- Capital gains treatment of royalties in coal
- Exclusion of special benefits for disabled coal miners
- EIEA stimulus: special rules for refund of the coal excise tax
- 84-month amortization of pollution control equipment
- Temporary expensing of equipment used in the refining of liquid fuels

Other Subsidies that Increased CO₂ Emissions

- Enhanced oil recovery credit
- Partial expensing for advanced mine safety equipment
- Black liquor
- Natural gas distribution pipelines treated as 15-year property
- Exception for passive loss limitation for working interests in oil and gas properties
- Amortize all geological and geophysical expenditures over two years
- Alternative fuel excise tax credit
- Pass through of low sulfur diesel to cooperative owners
- Expensing of capital costs with respect to complying with EPA sulfur regulations

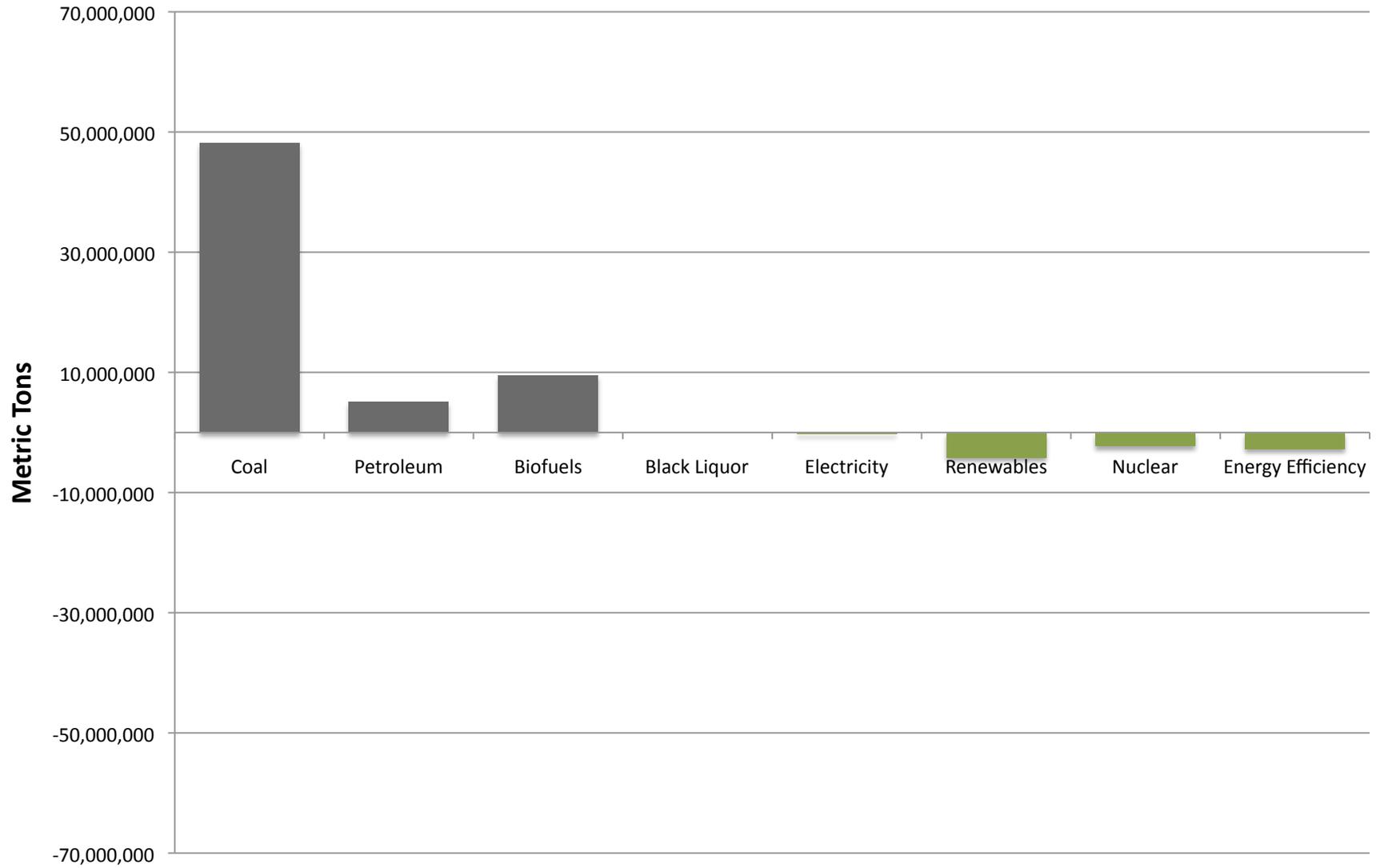
Three Types of Subsidies

- Energy production subsidy modeled as a supply increase
- Energy consumption subsidy modeled as a demand increase
- Energy efficiency subsidy modeled as creating an annuity paid back as energy savings
 - Assume 50 percent of expenditure has no effect
 - Use 18 percent interest rate

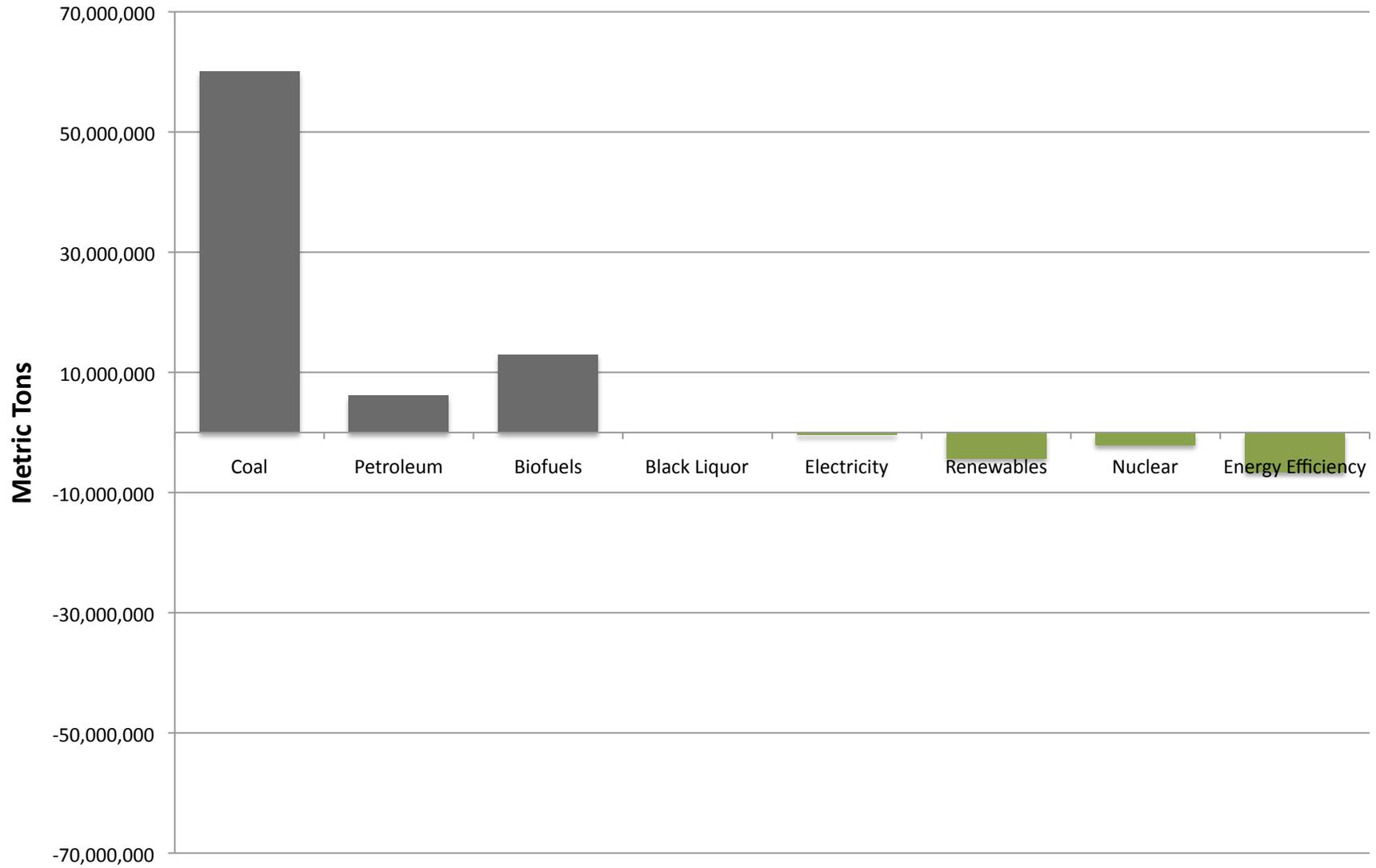
Assessing CO₂ Emissions

- Model calibrated for each year 2005-2009 with subsidies in place
- Counterfactual for each subsidy: market equilibrium had the subsidy never occurred
 - Long run elasticities
- ΔCO_2 emissions determined by coefficients

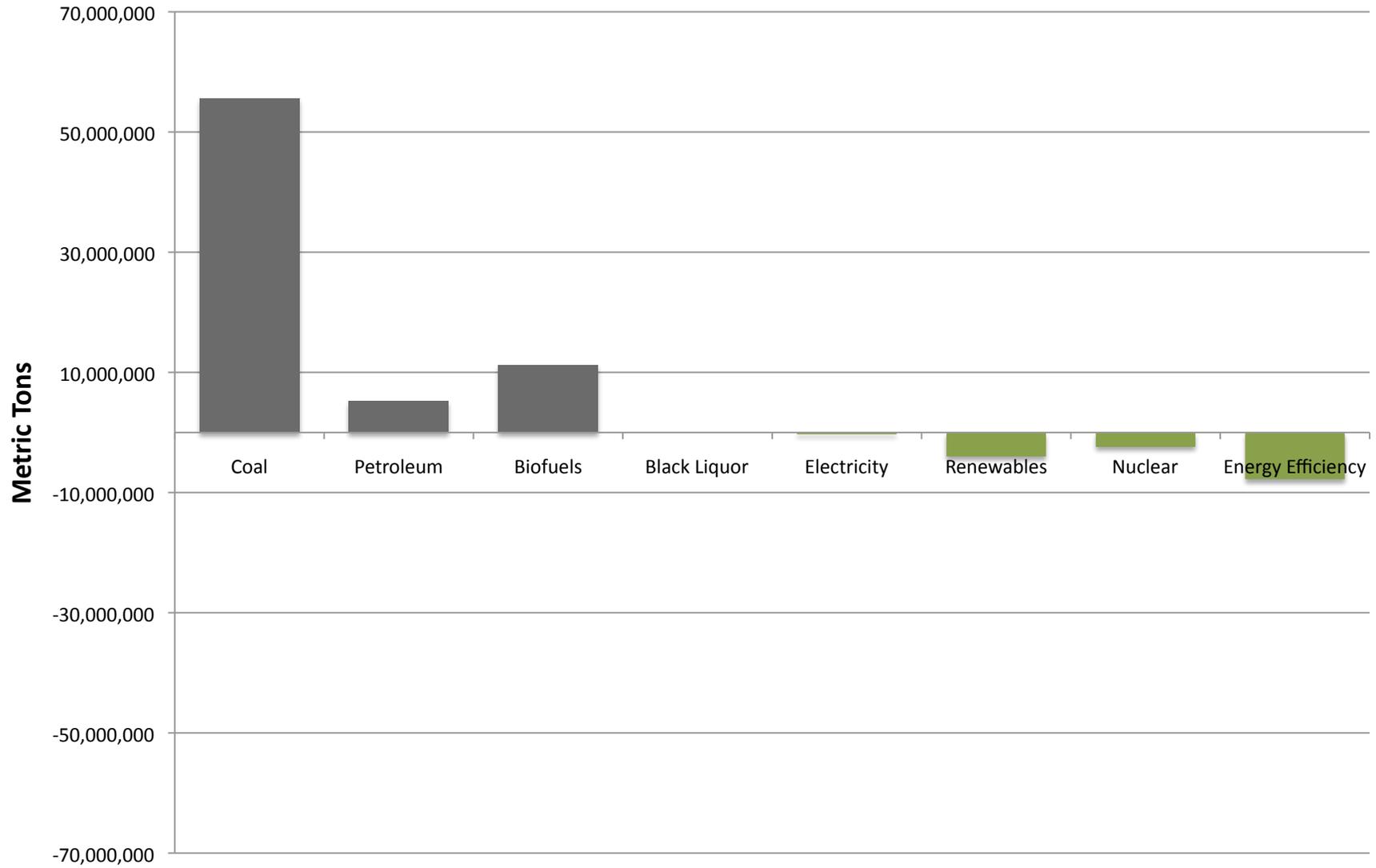
Impact on CO₂ Emissions, 2005



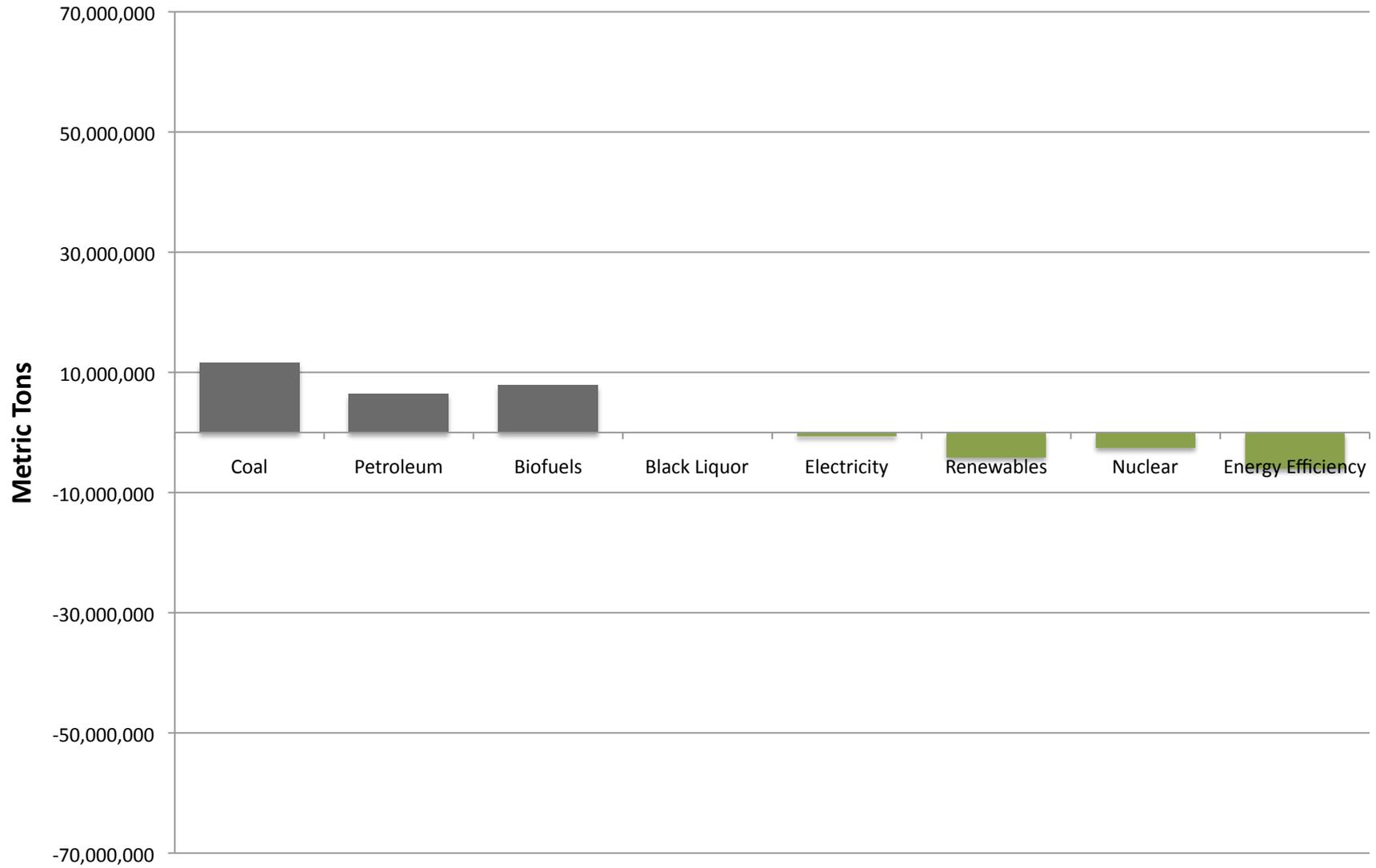
Impact on CO₂ Emissions, 2006



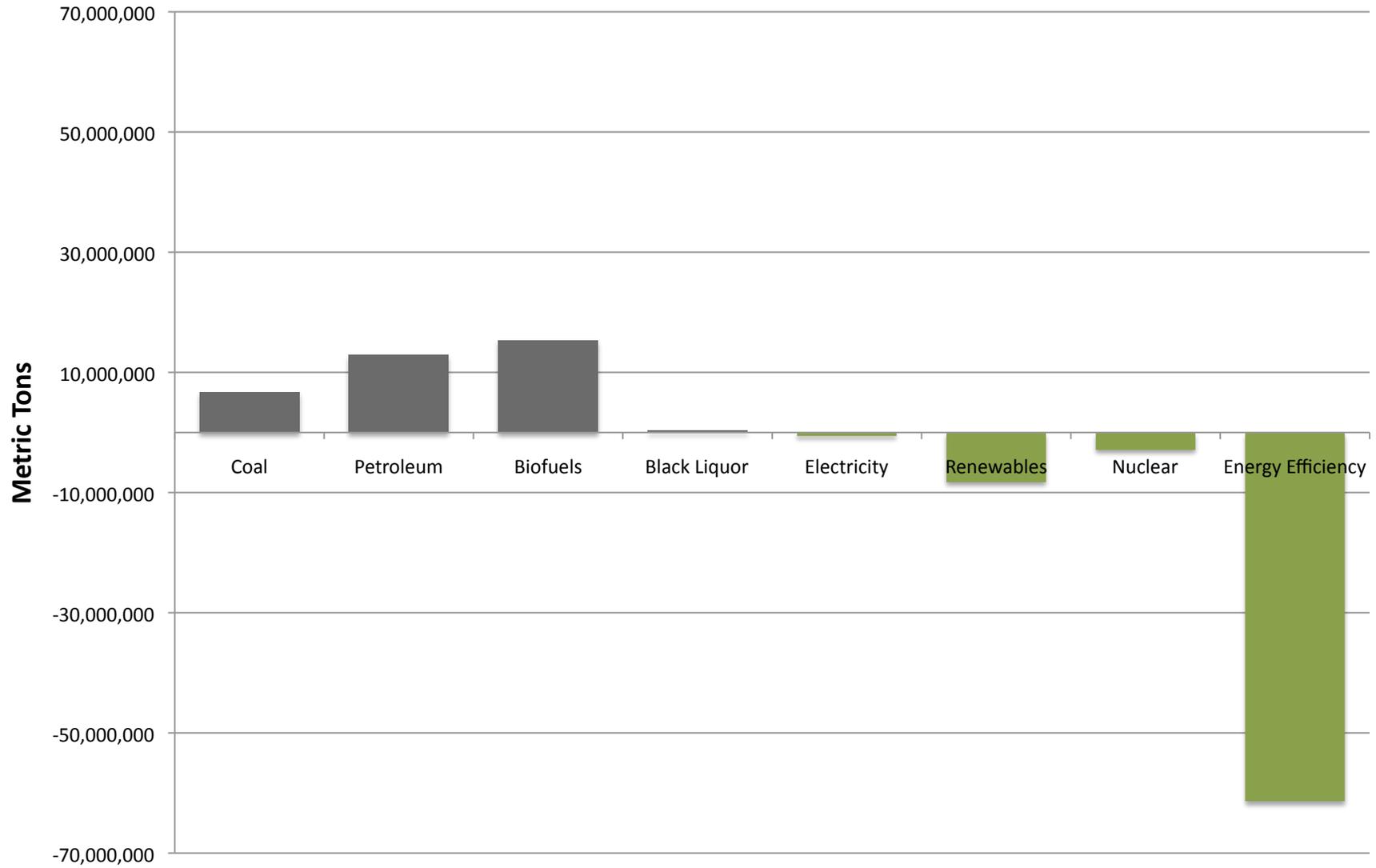
Impact on CO₂ Emissions, 2007



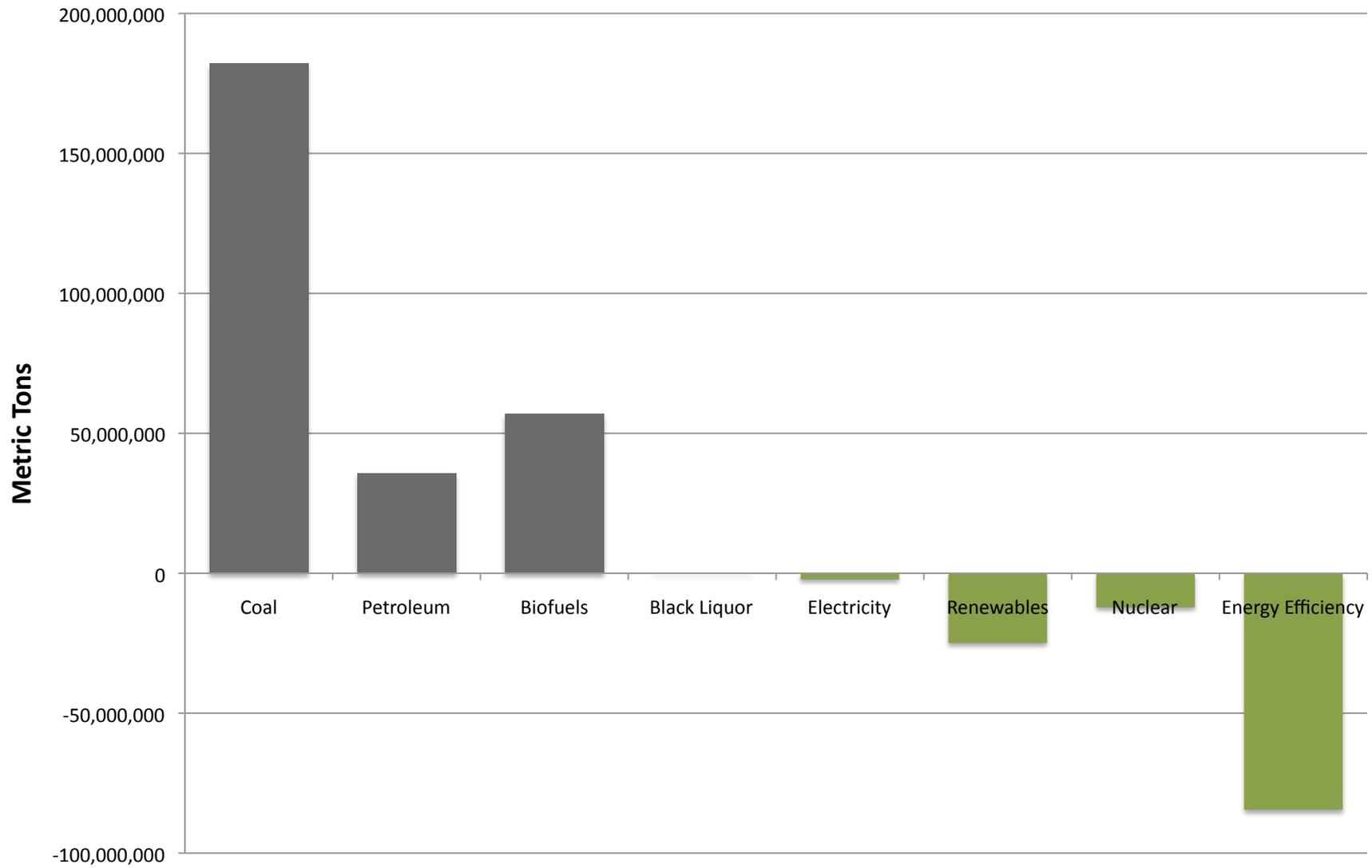
Impact on CO₂ Emissions, 2008



Impact on CO₂ Emissions, 2009



Total Impact on CO₂ Emissions, 2005-2009



Biofuel Subsidies Increase CO₂ Emissions

- Result of ethanol subsidy
- Biodiesel subsidy reduces CO₂ emissions
- Two effects for both fuels:
 - Substitution of biofuel for conventional fuel
 - Increased consumption of blended fuel
- For ethanol, increased consumption of blended fuel dominates
- For biodiesel, substitution effect dominates

Expenditures on Subsidy Programs

Billions of 2009 \$

	2005	2006	2007	2008	2009	Total 2005-09
CO ₂ Reducing	3.4	4.2	4.4	5.4	18.5	35.9
CO ₂ Increasing	9.1	12.4	11.7	11.3	15.4	59.8
Total	12.4	16.6	16.1	16.7	33.8	95.7

Change in CO₂ Emissions

Millions of Metric Tons

	2005	2006	2007	2008	2009	Total 2005-09
CO ₂ Reducing	-9.5	-13.4	-14.8	-14.7	-75.1	-127.4
CO ₂ Increasing	62.6	79.1	72.4	27.3	37.2	278.6
Net Effect	53.1	65.7	57.6	12.6	-37.8	151.2

Change in CO₂ Emissions

Percent of U.S. Total CO₂ Emissions

	2005	2006	2007	2008	2009	Total 2005-09
CO ₂ Reducing	-0.2	-0.2	-0.2	-0.3	-1.4	-0.4
CO ₂ Increasing	1.0	1.3	1.2	0.5	0.7	1.0
Net Effect	0.8	1.1	1.0	0.2	-0.7	0.5

(Waxman-Markey set an emissions reduction target
3.0-4.75 below the 2005 emissions level by 2012-13)

Spending per Change in CO₂ Emissions

2009 \$1 per metric ton increased

	2005	2006	2007	2008	2009	Total 2005-09
CO ₂ Reducing	-356	-314	-296	-371	-246	-282
CO ₂ Increasing	145	156	162	413	413	215
Net Effect	234	252	280	1,325	-893	633

Overall Results

- From 2005 to 2009, shift from subsidies that increased CO₂ emissions to those reducing CO₂ emissions
- Obama stimulus package in 2009 an important part of shift
- Subsidies for fossil energy contributed the most to increased CO₂ emissions
- Biofuel subsidies also increase CO₂ emissions
- Energy efficiency programs had particularly strong effects in reducing CO₂ emissions

Policy Implications

- Obama stimulus package near an end
 - Efficiency programs will continue to pay dividends
- Eliminating fossil energy subsidies a fiscally responsible way to reduce CO₂ emissions
 - Portrayed as tax increase
- Eliminating U.S. fossil energy subsidies may spur similar actions elsewhere in the world