
The Costs of Controlling U.S. Carbon Emissions

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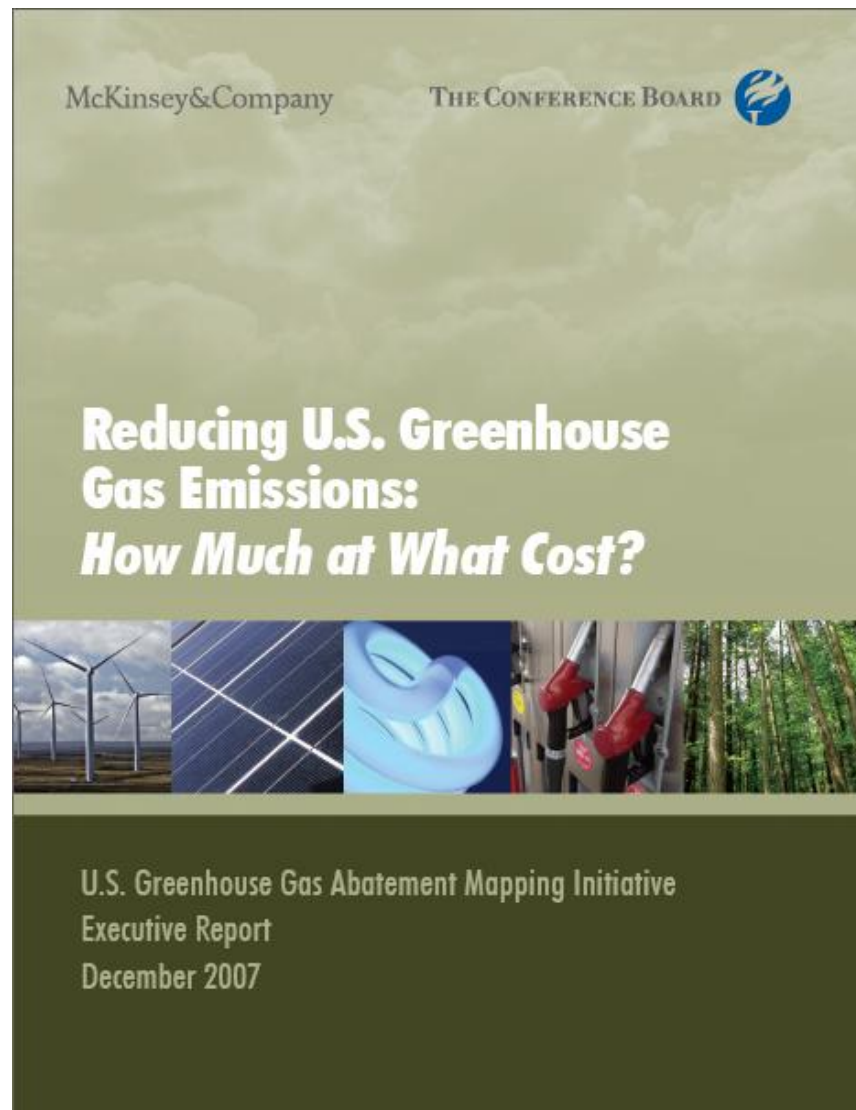


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Plan

- Review McKinsey study findings and caveats
 - what the study is and what it is not
- Compare to other cost studies
- Place within broader debate on energy efficiency

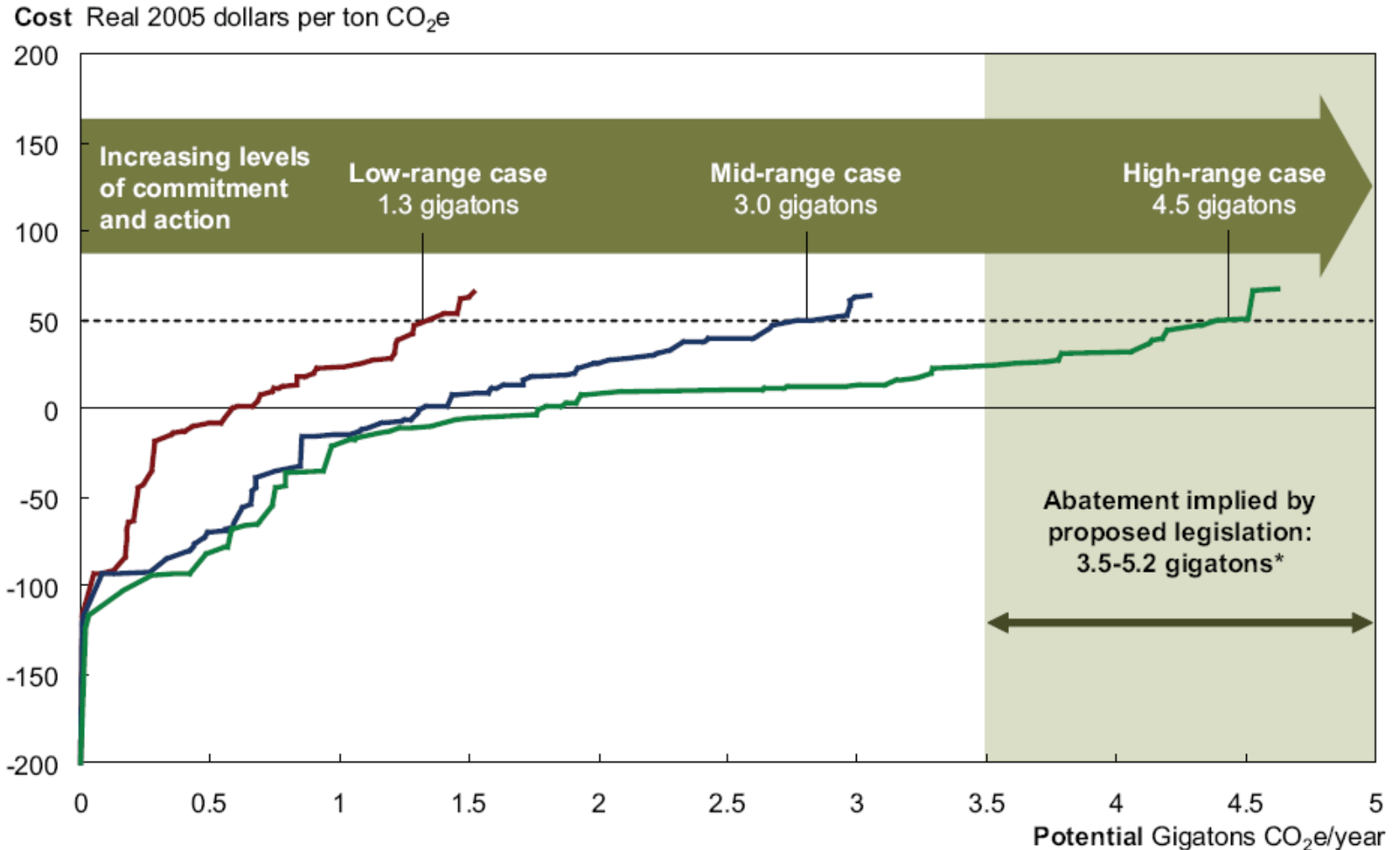
McKinsey study



McKinsey study: How much at what cost?

- How much?
 - 3.0-4.5 gigatons U.S. CO₂e reductions by 2030 in mid-to-high range case
 - 31-46% reduction from 2030 baseline of 9.7 gigatons
- What cost?
 - marginal cost: \$50 per ton CO₂e
 - total cost: roughly zero

U.S. GREENHOUSE GAS ABATEMENT POTENTIALS – 2030



* Based on bills introduced in Congress that address climate change and/or GHG emissions on an economy-wide basis and have quantifiable targets; targets calculated off the 2030 U.S. GHG emissions of 9.7 gigatons CO₂e/year (reference case)

Source: McKinsey analysis

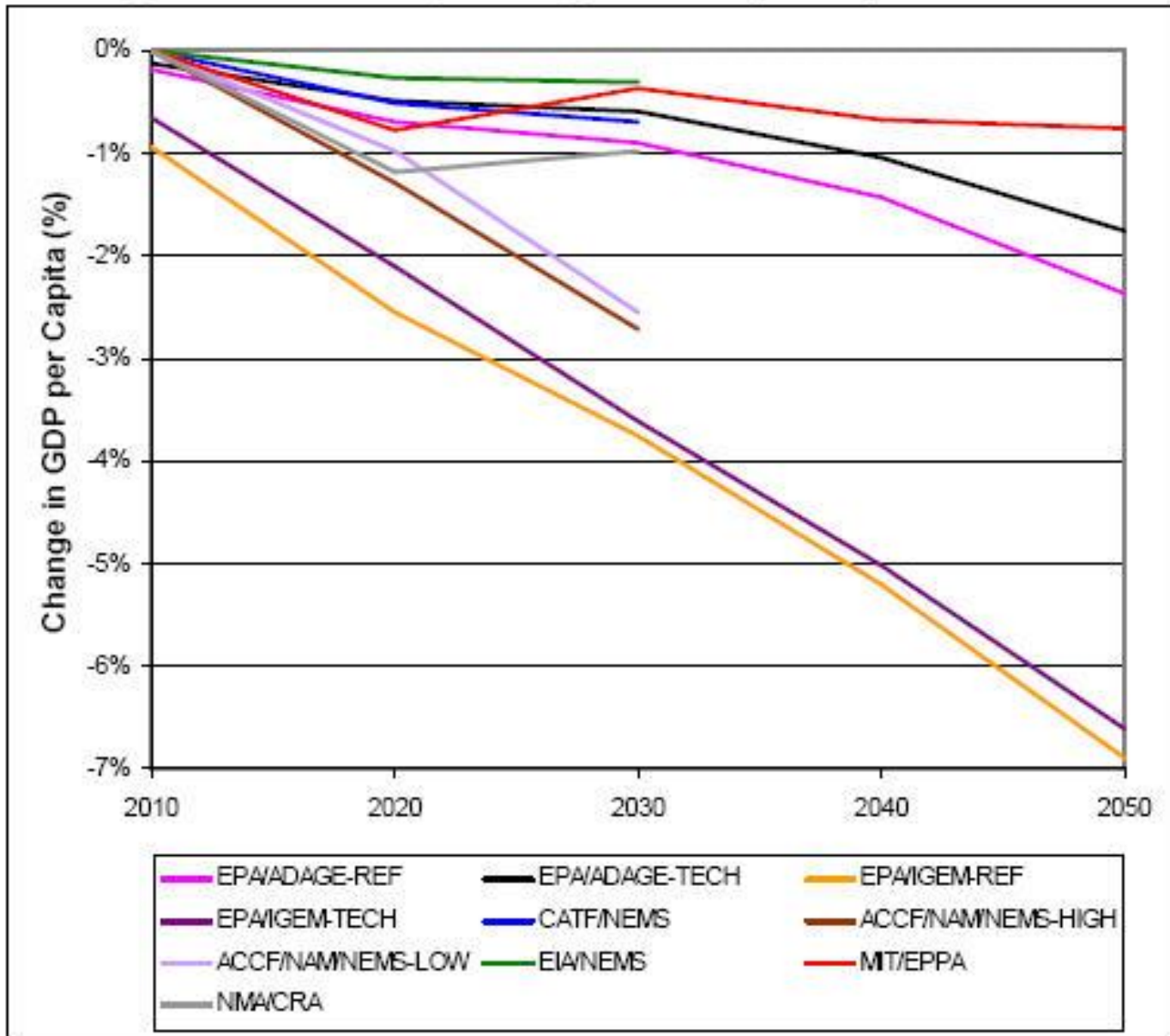
EIA analysis of S.2191

- Focus on “no international offsets” scenario in 2030
 - 3.9 gigatons U.S. CO₂e reductions (38% reduction from base)
 - marginal cost: \$85 per ton CO₂e under other core assumptions
 - total cost: -0.4% of consumption (about \$60 billion/yr)
- Baseline already includes 2007 Energy bill
 - 1.7% annual improvement in energy efficiency of economy
 - increased auto fuel economy increases (35 mpg)
 - renewable fuel expansion (36 billion gallons)
 - appliance standards (lighting; 45 other new standards)
- Policy scenario assumes
 - 50% cut in incremental cost of efficient appliances (~rebates)
 - residential building codes tightened 30% in 2015; 50% in 2025

Other analyses

- EPA analysis of S.2191 (as of 2030)
 - marginal cost: \$61-\$83 per ton CO₂e (but assumes international offsets, so comparable cost is higher)
 - 3.1-4.3 gigatons (34-45%) reduction in CO₂e in 2030
 - total cost: 0.9%-3.8% of GDP (\$238-983 billion/yr)
- MIT (Paltsev et al 2007) analysis (as of 2030)
 - middle reduction scenario (roughly, stabilize emissions at 50% below 1990 by 2050)
 - 5.3 gigatons CO₂e reduction in 2030 (53% from baseline)
 - marginal cost: \$74 per ton CO₂e
 - total cost: 1% of welfare (\$239 billion/yr)

Figure 6. Percentage Change in GDP per Capita Under S. 2191



Congressional Research Service summary of estimates of the Lieberman-Warner Bill's % impacts on GDP per capita

McKinsey study: Understanding cases

- “Moving from the reference case to the low range case or from mid-range to high-range cases is like turning a dial to a higher setting; **it increases the intensity of presumed commitment**, which leads to greater penetration for each abatement option.” p 17
- But study does not identify the specific policies representing this increased commitment
- Conclusion: McKinsey study is not a policy analysis

McKinsey study: General caveats

- “We made no assumptions about specific policy approaches that might be taken — e.g., a carbon cap or tax, mandates, or incentives — nor responses in consumer demand that might result.” p xii
- Analysis “did not attempt to estimate the... policy-dependent structural and transaction costs...beyond direct capital, operating, and maintenance cost...and did not attempt to estimate welfare cost or regulatory/compliance costs.” p 3
- “Some 25 percent of the options require additional investment and/or continued maturation with cost reductions to meet their full potential.” p25
- Profile reflects optimal sequencing of options
 - e.g., if energy efficiency is added after wind-power generation the GHG-saving value of energy-efficiency is diminished

McKinsey study on energy efficiency

- “Unlocking the negative cost options would require overcoming persistent barriers to market efficiency...” p xii
- “Compared to other potential capital projects energy efficiency projects are frequently not pursued because of their lower expected rate of return and the capital constraints of companies.” p 53
 - e.g., study employs 7% discount rate, much lower than typical corporate hurdle rates
- “Finally, they tend to be widely distributed, requiring disproportionate human resources and management attention to capture them.” p 53
- These costs are not represented in the study

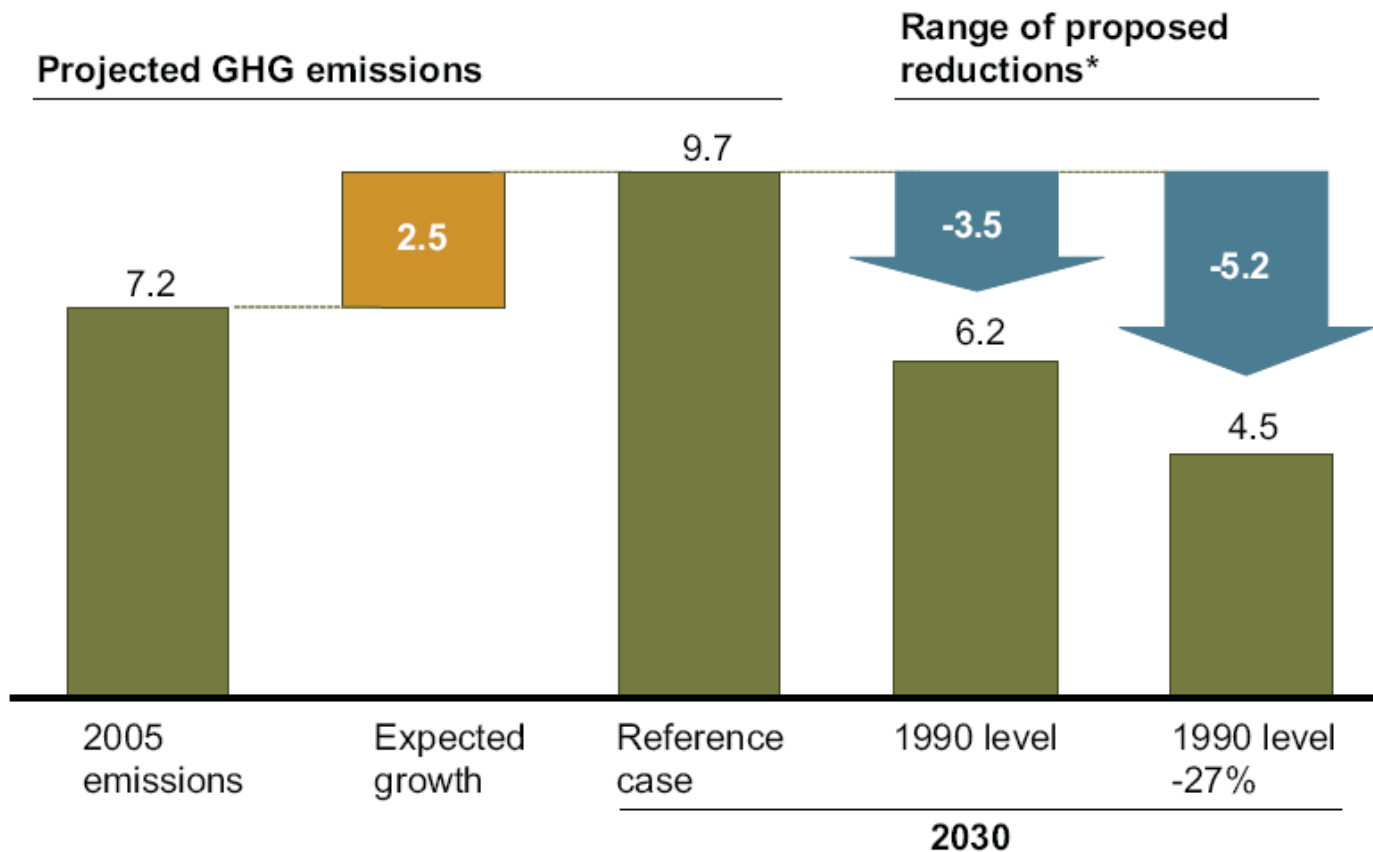
Concluding remarks

- Points of agreement
 - “Achieving these reductions at the lowest cost to the economy...will require strong, coordinated, economy-wide action that begins in the near future.”
 - marginal cost of substantial reductions is positive and significant
 - GDP continues to grow under GHG constraints, and total cost of reductions is likely to be a small percent of GDP
 - energy efficiency represents an important, relatively low-cost option for GHG mitigation
- Points of contention
 - total cost of substantial reductions is positive/significant (not zero)
 - it requires an integrated economy-wide model, and analysis of specific policies in concrete cases, to assess the overall costs of GHG mitigation (not simply identification of technical potential)
- Climate policy costs are highly uncertain, raising the value of measures that contain costs and allowance prices

Extra slides

THE CHALLENGE OF RISING U.S. EMISSIONS

Gigatons CO₂e



* Based on bills introduced in Congress that address climate change and/or GHG emissions on an economy-wide basis and have quantifiable targets

Source: U.S. EIA Annual Energy Outlook (2007) "Reference case," U.S. EPA; Pew Center On Global Climate Change; McKinsey analysis

DRIVERS OF GHG ABATEMENT POTENTIAL – 2030

x Abatement potential below \$50/ton, gigatons

	2005	Low-range case	Mid-range case	High-range case
Coal with CCS Gigawatts	<ul style="list-style-type: none"> Rebuilds – 0 New builds – 0 	9 13	32 23	50 33
Nuclear Gigawatts	<ul style="list-style-type: none"> Nuclear - 100 	113	129	153
Renewables Gigawatts	<ul style="list-style-type: none"> Wind – 10 Solar CSP } <1 Solar PV } 	70 10 28	116 30 50	164 80 148
Biofuels Billion gallons	<ul style="list-style-type: none"> Starch - 4 Cellulosic - 0 	12 5	16 14	16 51
Light-duty vehicles	<ul style="list-style-type: none"> Cars* – 28 mpg Light trucks* – 22 mpg Alternatives** – 3% 	34 mpg 27 mpg 14%	47 mpg 34 mpg 60%	53 mpg 38 mpg 71%
Buildings energy efficiency***	<ul style="list-style-type: none"> Efficient lighting: 8% Efficient homes: N/A 	15% 25 million	70% 37 million	75% 49 million

1.3 **3.0** **4.5**

* Average for new vehicle sales; average across gasoline internal combustion, diesel, hybrid electric and plug-in hybrid electric vehicles; includes opportunities above \$50 per ton
 ** Alternatives to conventional gasoline propulsion: diesel, hybrid electric and plug-in electric hybrid vehicles; share of new sales
 *** Lighting: CFLs and LEDs, share of new residential sales. Homes: incremental total built (or rebuilt) to Energy Star efficiency or higher

Source: US EIA; McKinsey analysis

Alternative notions of the energy efficiency gap

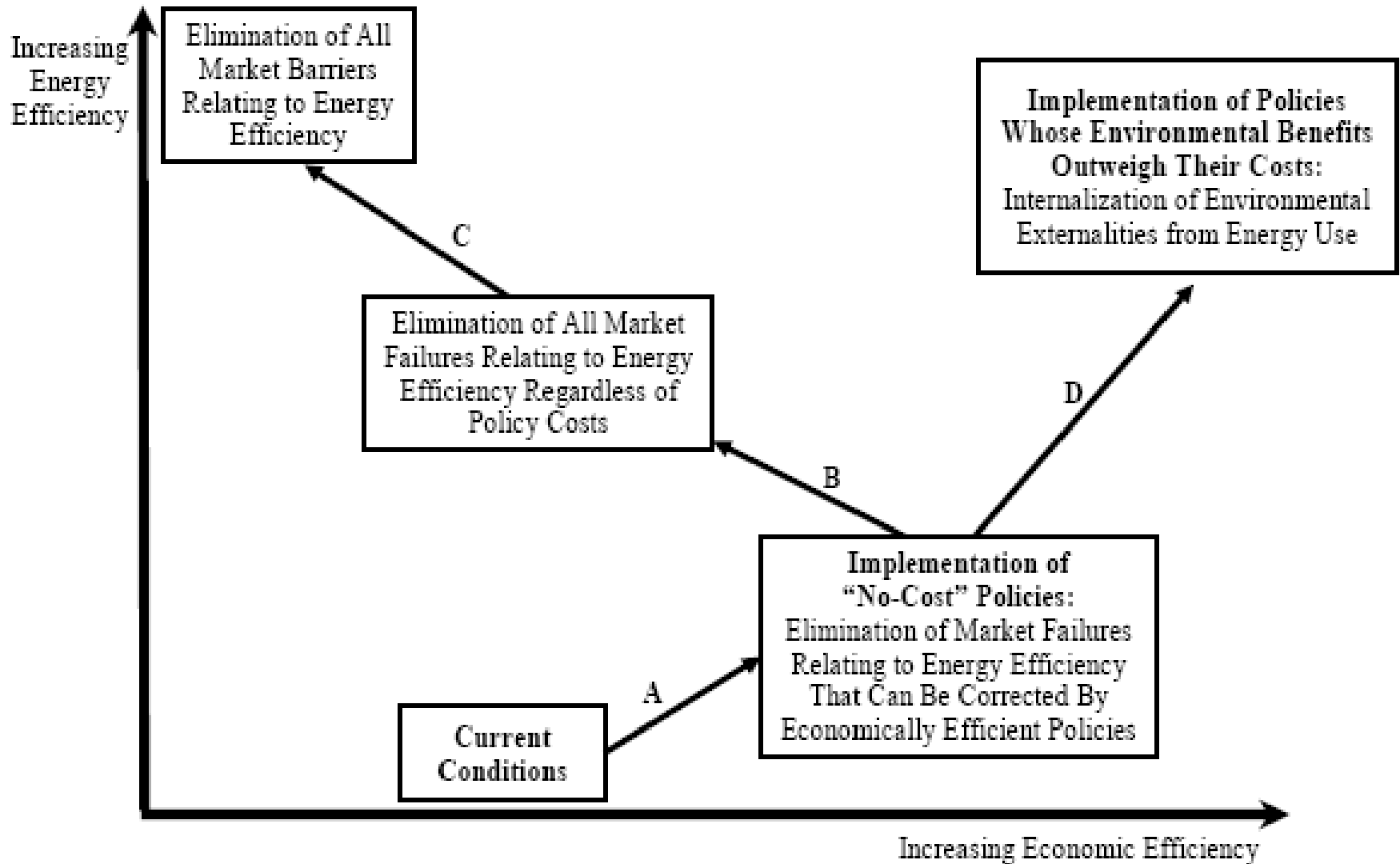


Figure from Stavins, Jaffe, Schatzki (2007)