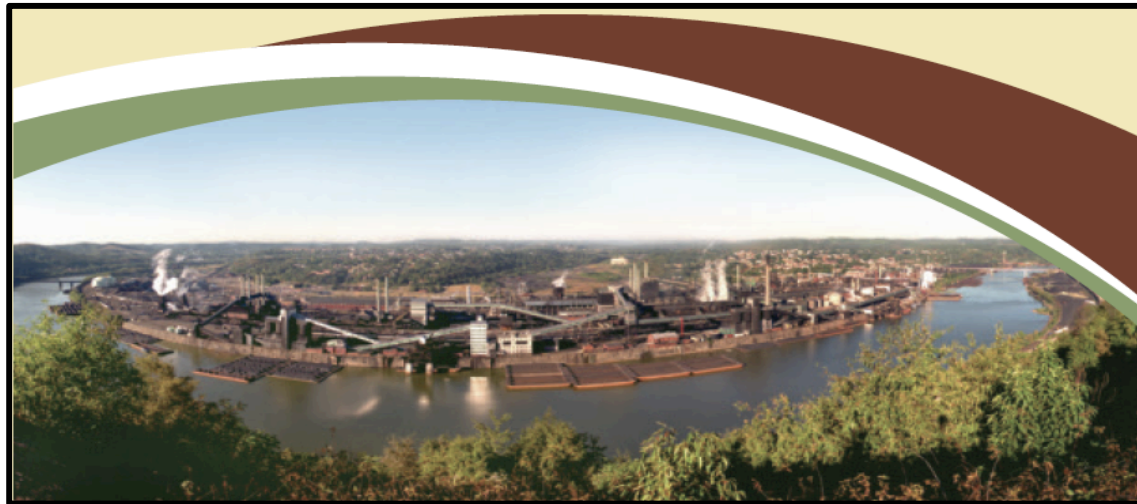




Climate Policy and Energy-Intensive Manufacturing: Impacts & Options



Cap-and-trade, competitiveness, and international trade
The implications of the latest data and legislative developments

Washington, DC

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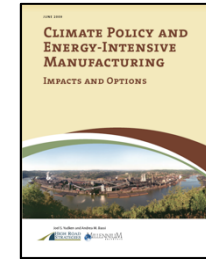


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Climate Policy and EI Manufacturing Study



- What are climate policy impacts on energy-intensive manufacturing industries
 - Iron & steel, primary & secondary aluminum, paper & paperboard, petrochemicals, chlorine-alkalies manufacturing

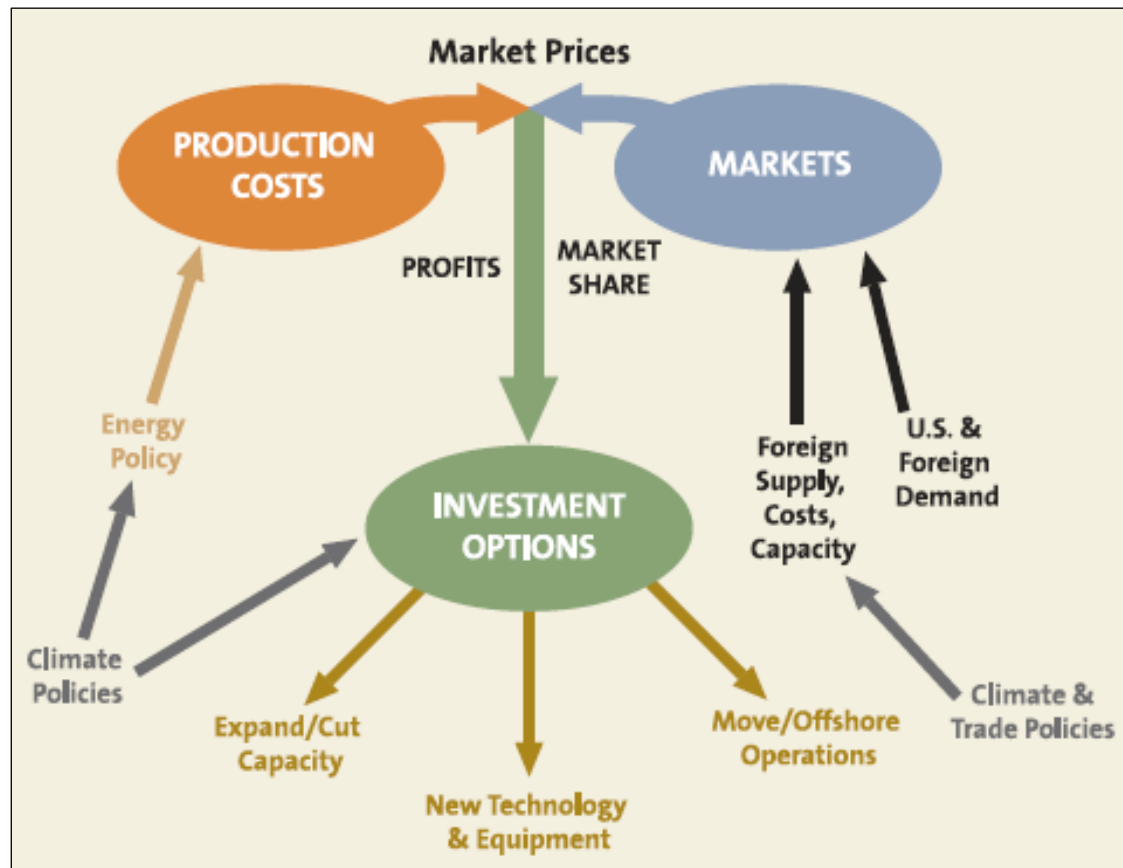
- What are the best policies to maintain manufacturing competitiveness and retain jobs, while cutting emissions?
 - To mitigate cost impacts and level the playing field in international trade
 - Enable and encourage industry investments in new technology



Summary of Findings

- Modest to high impacts on production costs, operating surplus (profits), market shares from higher energy prices:
 - Contingent on energy mix, cost-pass along assumptions, market conditions
- Pressure on industries to take actions to reduce costs and prevent profits from decreasing to undesired levels
- Technology options available, but timing critical
- Allowance allocation policy would buy time for industry adjustment
- Other policies may be needed to encourage long-term investment in advanced energy-saving technologies

Study Framework



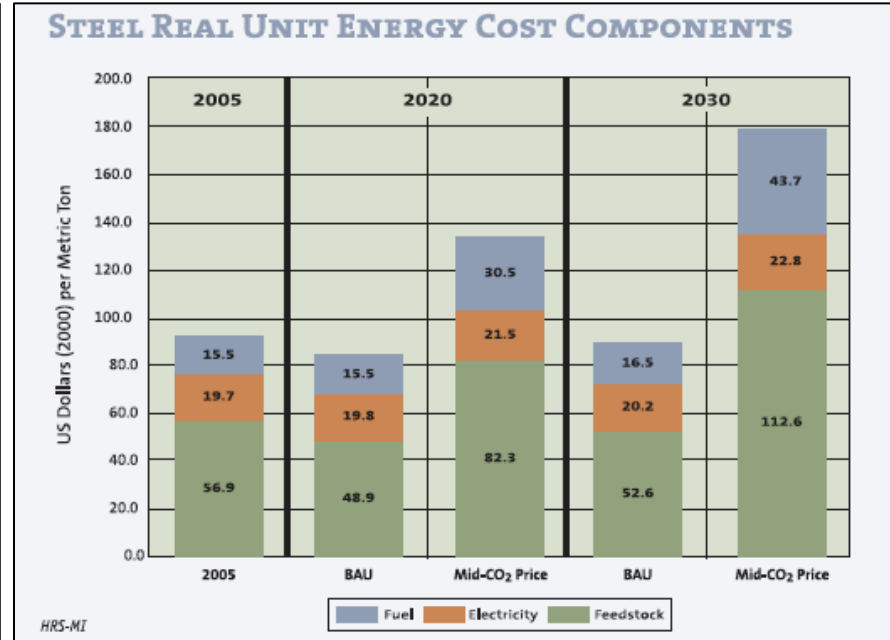
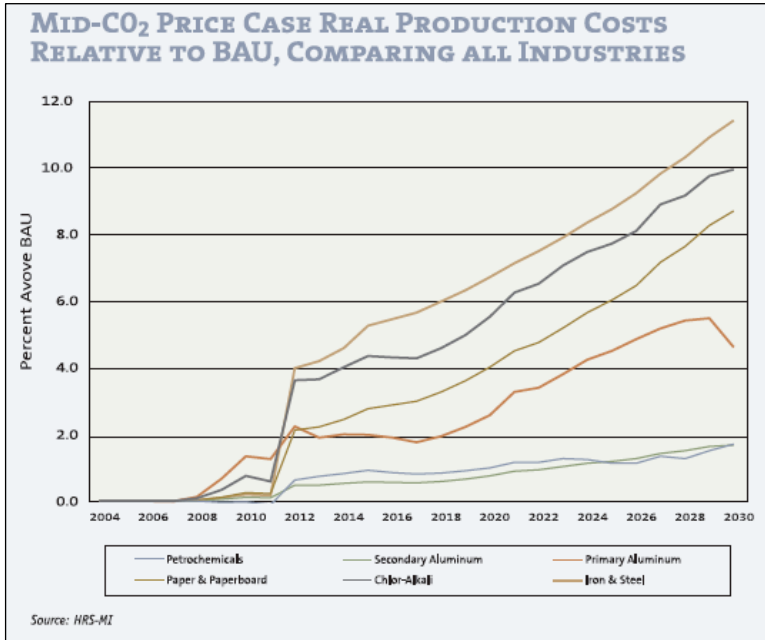
- **Business As Usual (BAU) Case**
- **Mid-CO2 Price Case**
Based on Lieberman-Warner Climate Security Act (S. 2191)
Emissions allowance price: 2020-2030, \$30-\$61/mt CO₂-equivalent
- **EIA NEMS Fossil-Energy Price Scenarios**



Data Sources

- **DoE's Industrial Technologies Program (ITP) and Manufacturing Energy Consumption Survey (MECS)**
- **Census Bureau's Annual Survey of Manufacturers (ASM)**
- **The United States International Trade Commission (USITC) database**
- **Industrial trade association databases**
- **The U.S. Geological Survey (USGS)**
- **Global Insight (GI)**

Production Cost Impacts



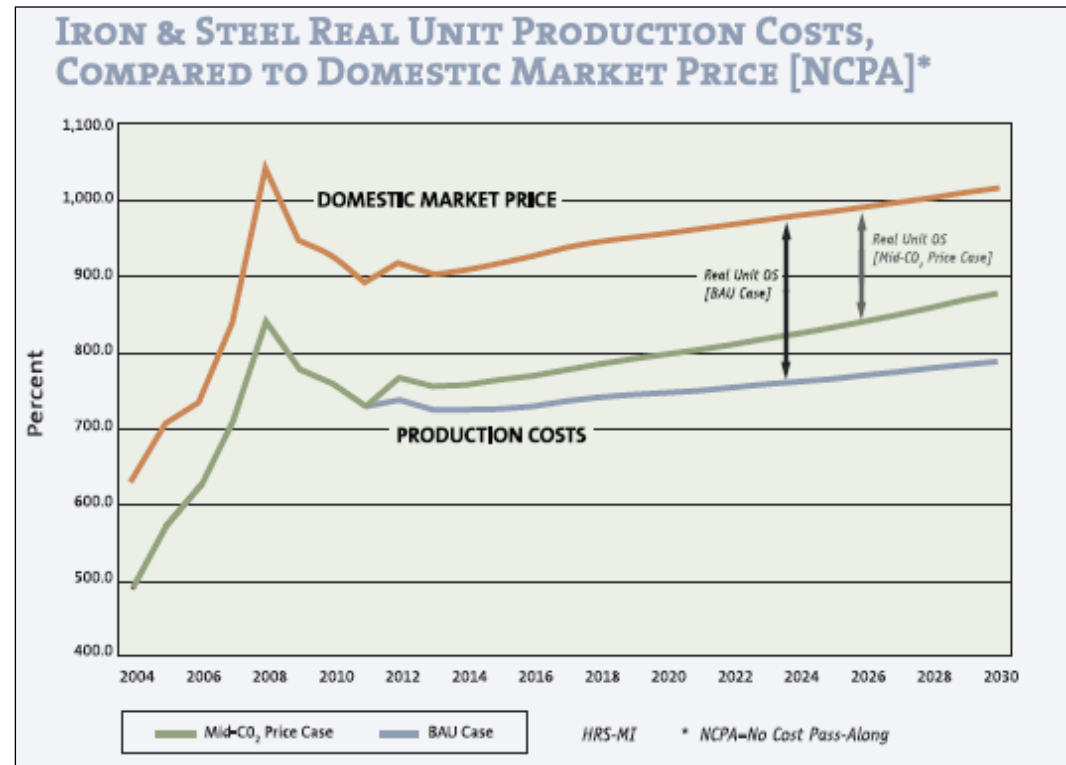
- Iron & steel—6.7% above BAU, 2020; 11.4%, 2030
- Chlor-Alkali—5.5%, 2020; 9.0%, 2030
- Paper and paperboard—4.0%, 2020; 8.7%, 2030
- Primary aluminum—2.8% (4.6% inc. anode/alumina); 2020; 4.6% (8.7%), 2030

Operating Surplus Defined

- **Operating Surplus:**
Domestic Market Price
Minus Unit Production Cost

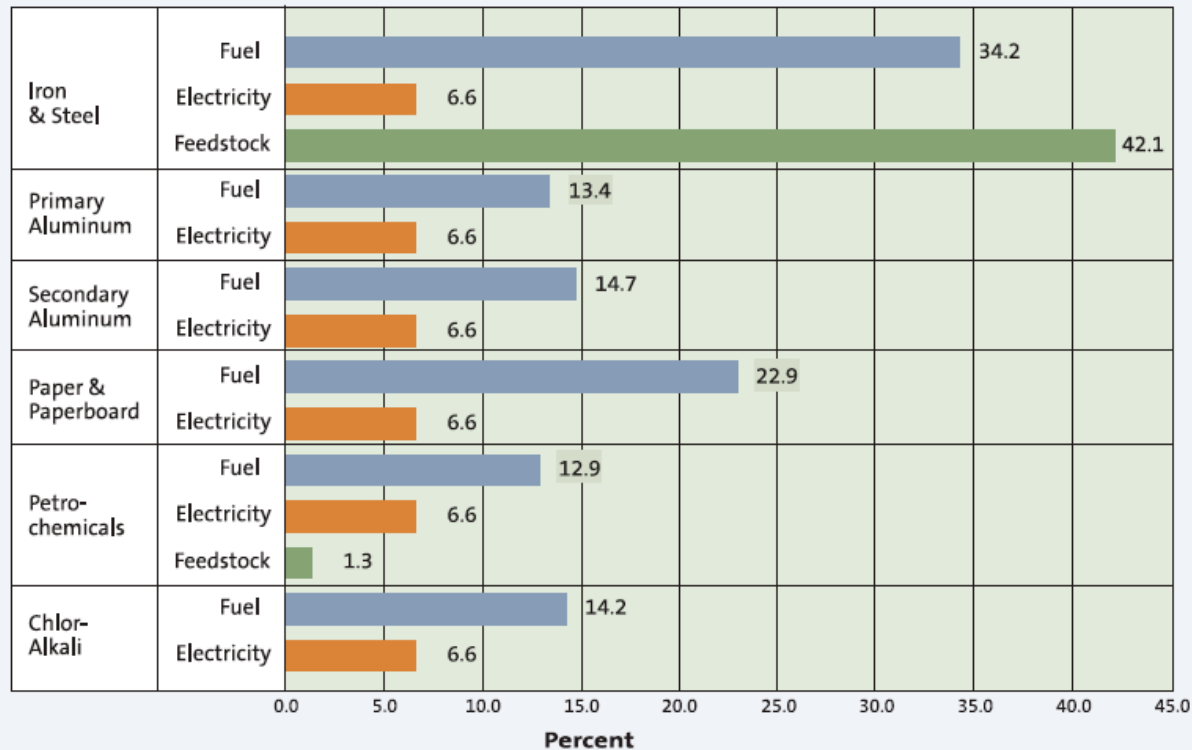
- Sales, General and Administrative costs
- Depreciation, interest on capital
- Other fixed costs
- Profits, taxes
- Reduced OS means lower profits

- **Operating Margin:**
Ratio of total OS and total revenues



Energy Efficiency Gains Needed

ENERGY EFFICIENCY GAINS REQUIRED BY 2020 (CUMULATIVE) MID-CO₂ PRICE POLICY CASE [PERCENT OF BAU]



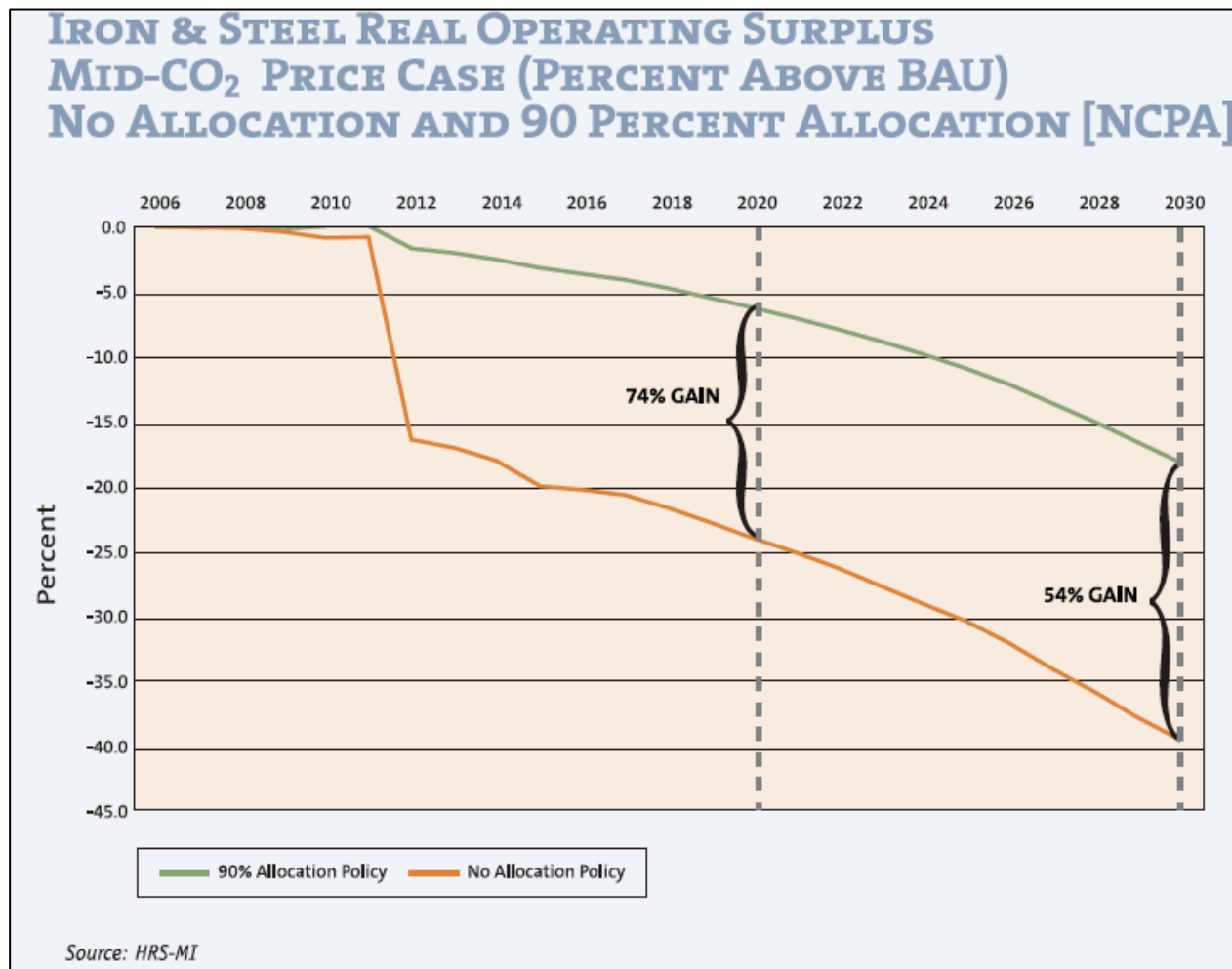
HRS-MI

Technology Investment Options

- “Low-hanging fruit”
 - Heat recovery, CHP, sensors and process controls, more efficient pumping, motor, compressed air systems, etc.
- Improved recycling (steel, aluminum, paper)
- Advanced and alternative process technologies:
 - Low-carbon iron-making technology (iron & steel)
 - Wetted drained cathode/inert anodes (aluminum)
 - Black-liquor gasification; efficient drying technology; biorefineries (paper)
 - Shift to membrane technology (chlor-alkali)
 - Advanced furnaces, CHP, biomass-based systems (petrochemicals)
- Barriers to Adoption:
 - Costs; timing (technical feasibility, vintage); lack of capital



90 Percent Allocation Policy





Key Conclusion

- Energy-intensive manufacturing industries may need additional measures:
 - To mitigate adverse cost impacts in the short-to-medium term
 - To encourage and facilitate the *transition* of energy-reliant companies (and their employees) to a low-carbon future, while maintaining their global competitiveness



Policy Implications

- **Cost Containment and Mitigation**
 - “Safety valve,” offsets, banking
 - Allowance allocations
 - E.g., output-based rebates
- **Technology Investment and Adoption**
 - R&D funding, tax incentives, loan funds, etc.
- **Border Adjustment & International Provisions**
- **Workforce and Community Transition**