Climate Policy and Energy-Intensive Manufacturing: Impacts & Options

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

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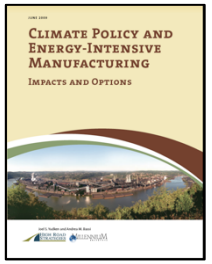
Climate Policy and EI Manufacturing Study

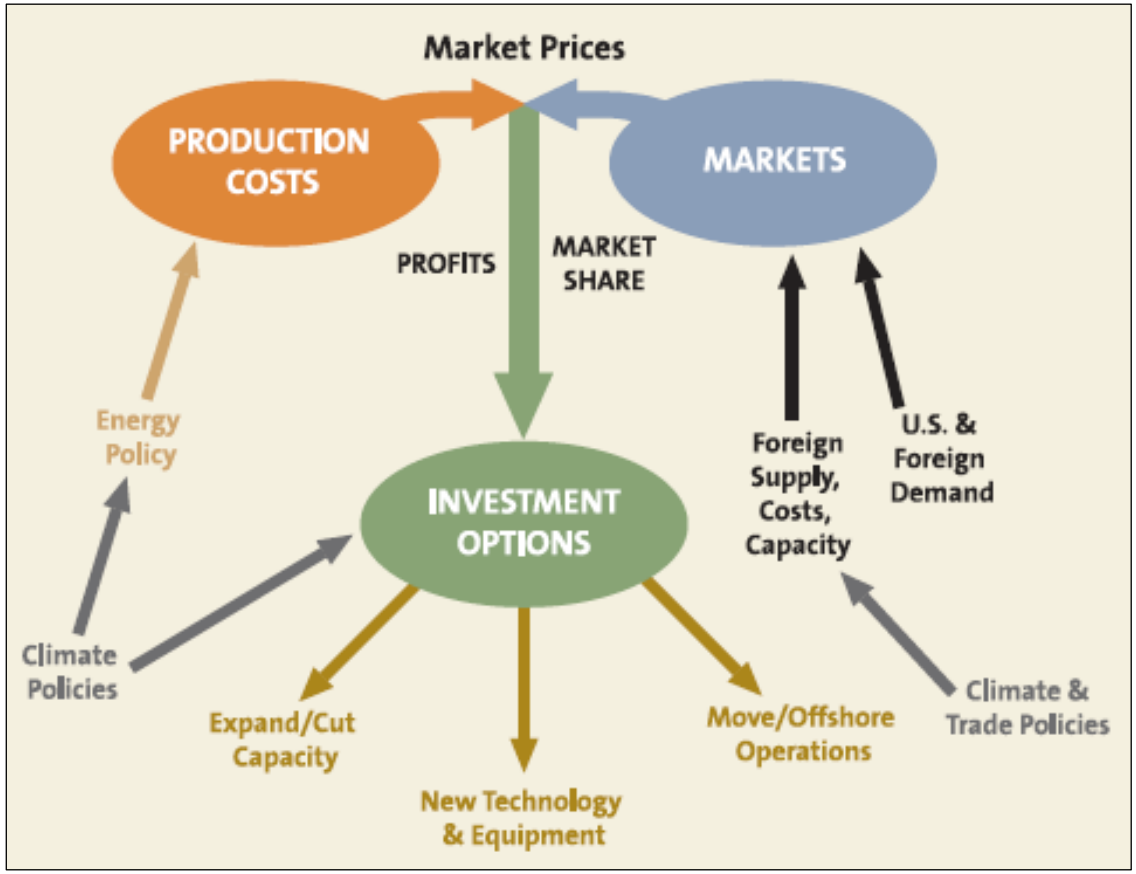


- What are climate policy impacts on energy-intensive manufacturing industries
  - Iron & steel, primary & secondary aluminum, paper & paperboard, petrochemicals, chorine-alkalies manufacturing
- What are the best policies to maintain manufacturing competitiveness and retain jobs, while cutting emissions?
  - 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**

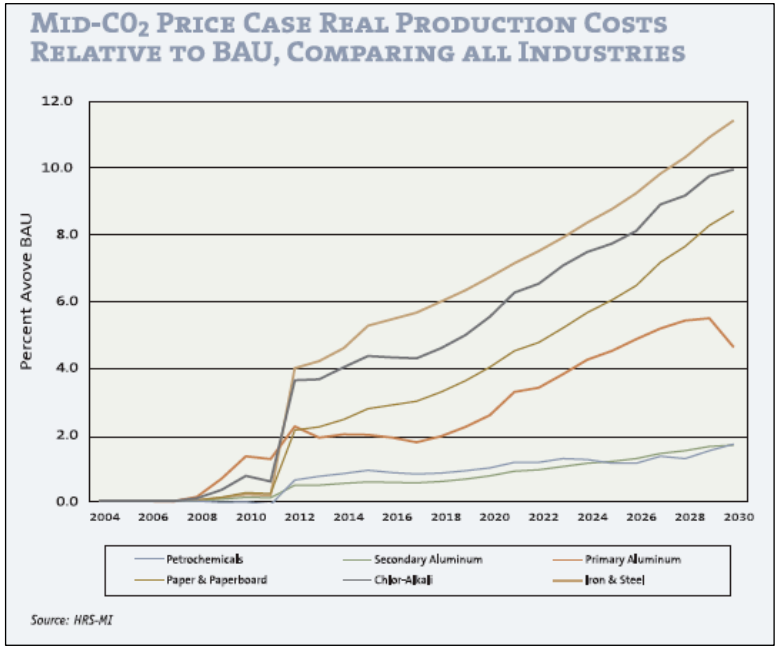
  Based on Lieberman-Warner Climate Security Act (S. 2191)

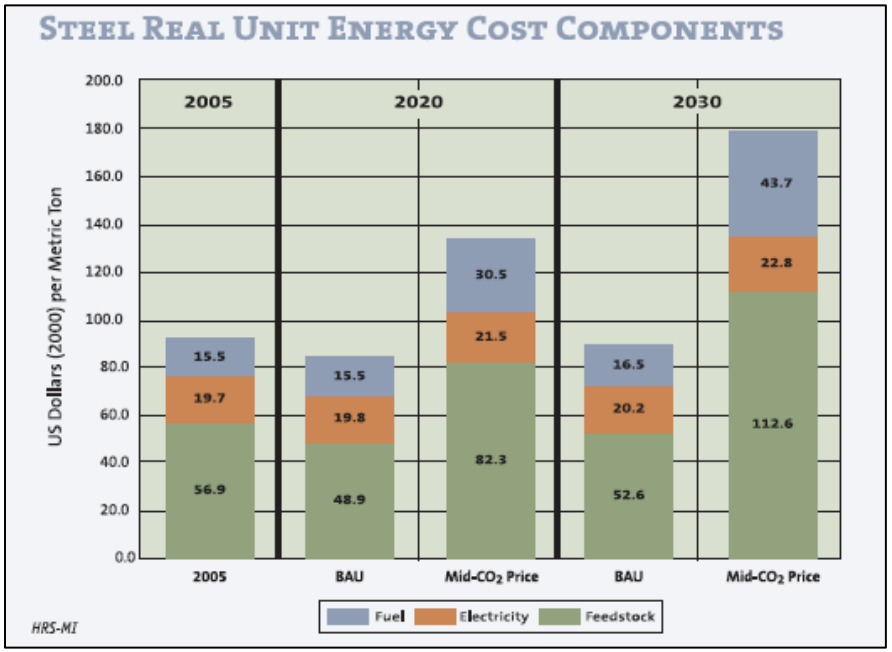
  Emissions allowance price: 2020-2030, $30-$61/mt CO_2-equivalent
- **EIA NEMS Fossil-Energy Price Scenarios**

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

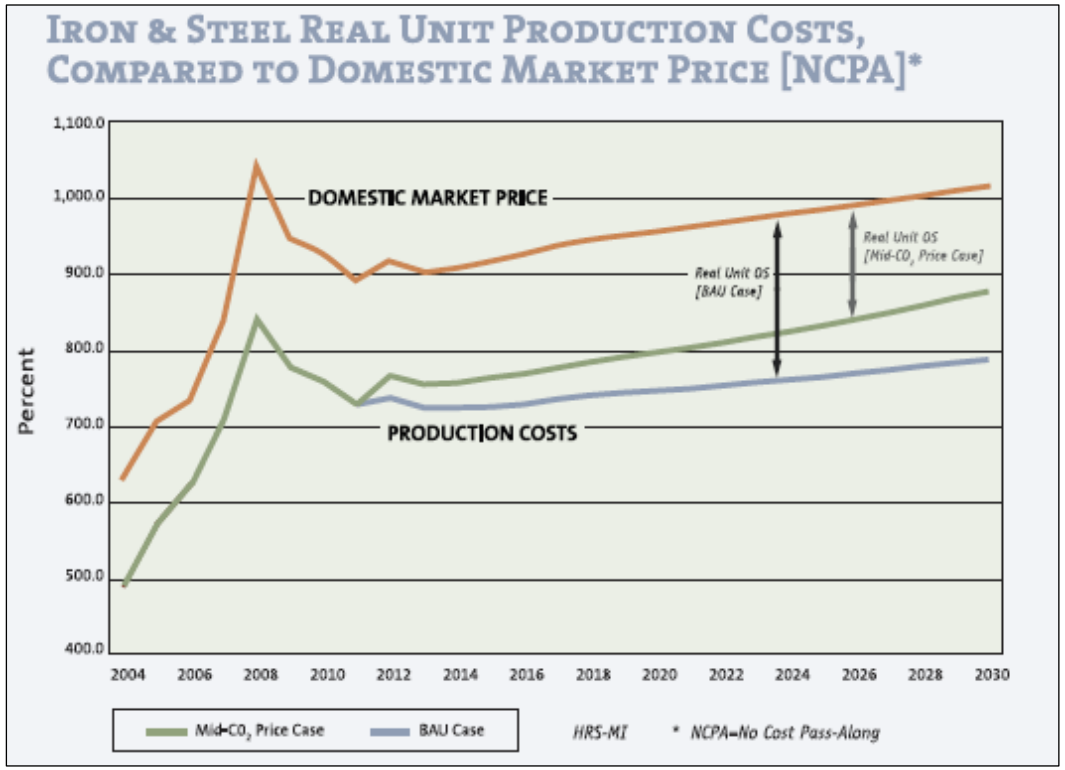




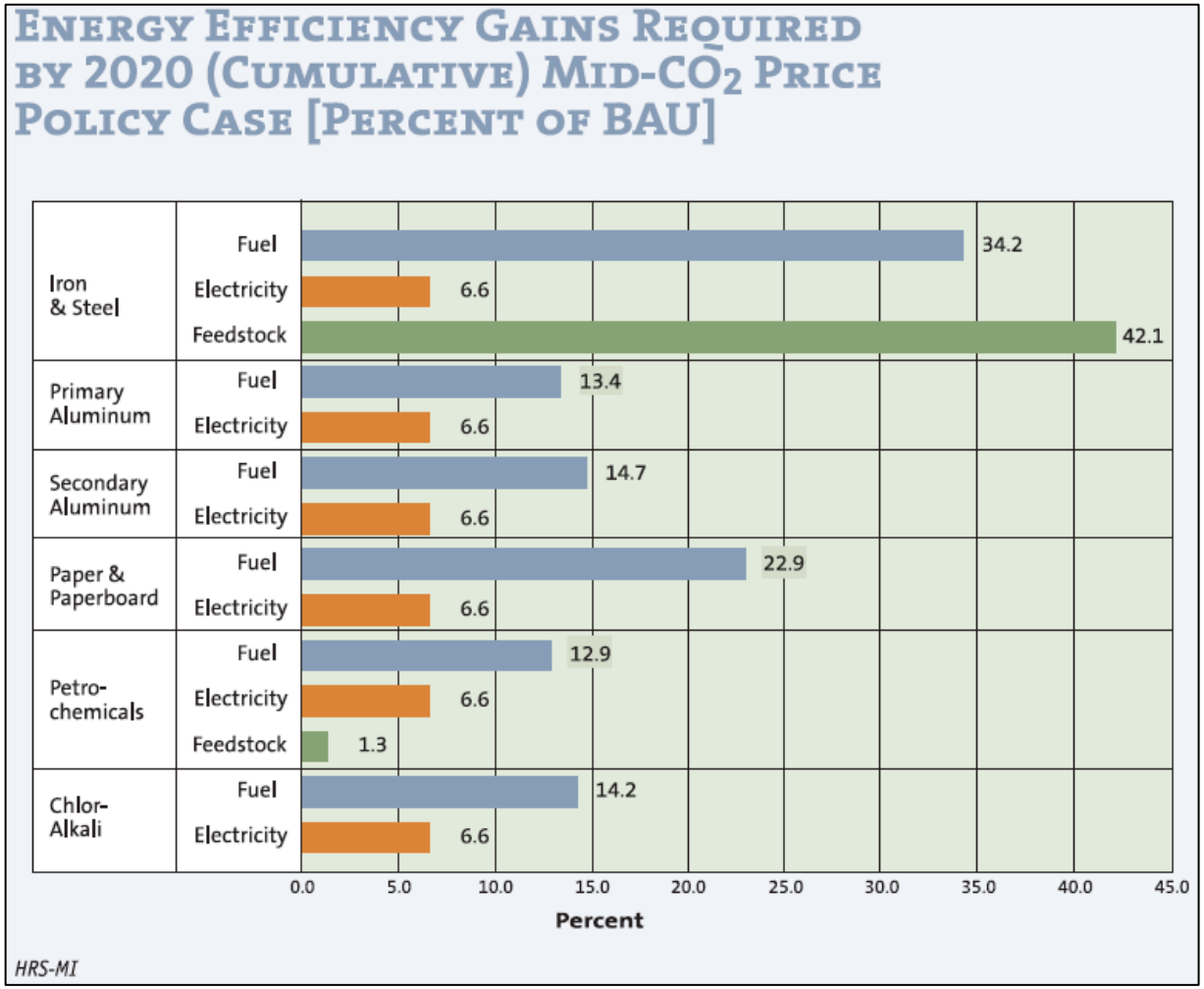
- Iron & steel—6.7% above BAU, 2020; 11.4%, 2030
- Chlor-Alkali—5.5%, 2020; 9.0%, 2030
- Paper and paperboard—4.0%, 2020; 8.7%, 2030
- Primary aluminum—2.8% (4.6% inc. anode/alumina); 2020; 4.6% (8.7%), 2030

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

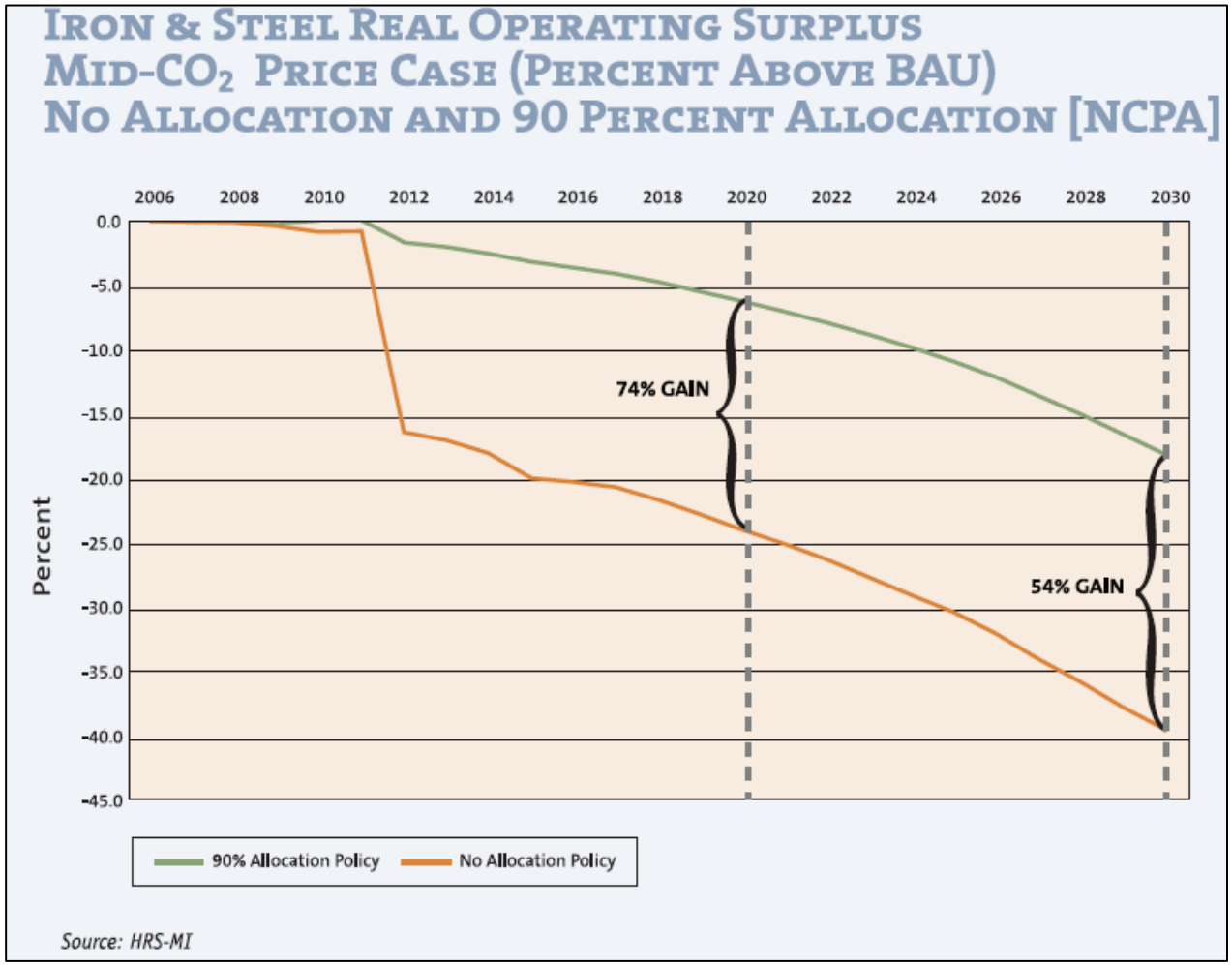


Technology Investment Options

- "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