Climate Change and U.S. Competitiveness

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HIGH ROAD STRATEGIES

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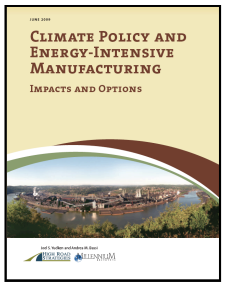
Climate-Manufacturing Challenge

- Crisis in U.S. manufacturing
  - Loss of capacity, jobs
  - Foreign competition, offshoring
- Energy-intensive industries especially affected
  - Consolidation, restructuring, import penetration, offshoring

Columbia Falls Aluminum Plant

- EI manufacturing and climate policy
  - EI industries cornerstone of manufacturing—beginning of supply chains for all other manufacturing
  - Sensitive to fossil-fuel energy prices, international competition
  - Carbon leakage if U.S. EI manufacturers move offshore

Climate Policy and EI Manufacturing Study



- What are climate policy impacts on the competitiveness of energy-intensive manufacturing industries
  - Iron & steel, primary & secondary aluminum, paper & paperboard, petrochemicals, chorine-alkalies manufacturing
- What policies are needed 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

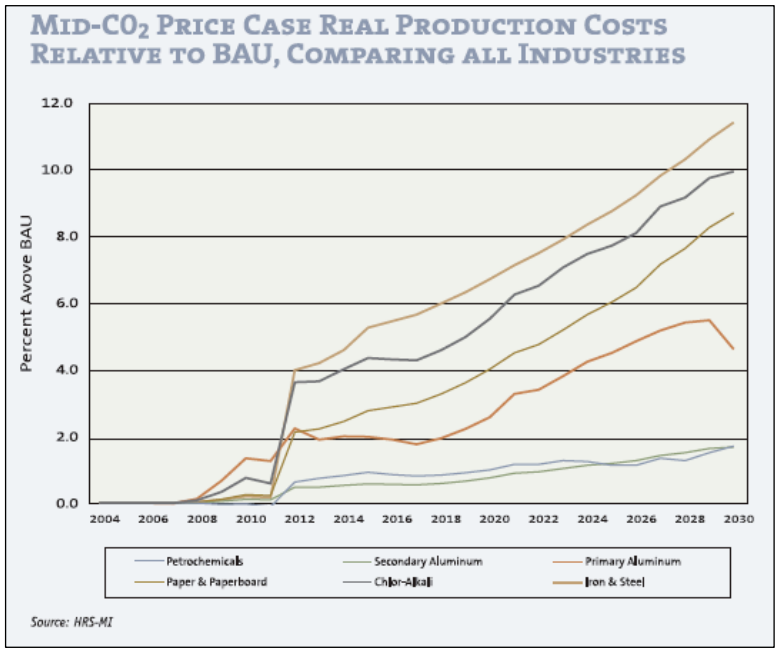
Summary of Findings

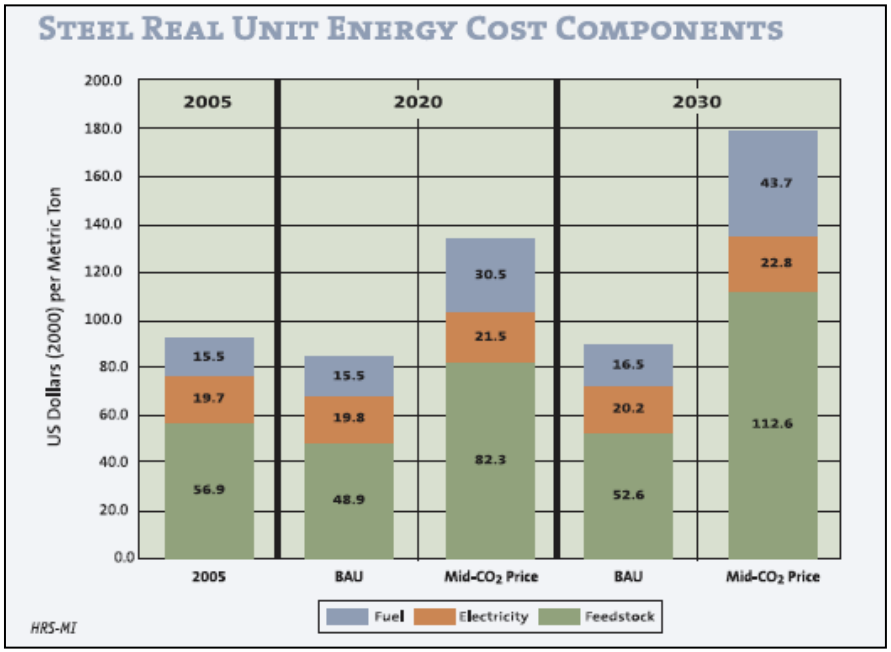
- Modest to high impacts on production costs, operating surplus (profits), market shares from higher energy prices:
  - Contingent on energy mix, cost-pass along assumptions, market conditions
- Pressure on industries to take actions to reduce costs and prevent profits from decreasing to undesired levels
- 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

Climate Policy Cases

- **Business As Usual (BAU) Case**
  - No GHG-emissions pricing policies
  - Based on AEO 2008 Reference Case
- **Mid-CO_2 Price Case**
  - Based on Lieberman-Warner Climate Security Act (S. 2191)
  - Emissions allowance price: 2020-2030, \$30-\$61/mt CO_2-equivalent
    - 30% emissions below 2005 by 2030; 70% below by 2050
- **EIA NEMS Fossil-Energy Price Scenarios**
  - Electricity, natural gas, metallurgical coal, coal coke, liquid petroleum gas, residual fuel oil, distillate fuel oil

Production Cost Impacts

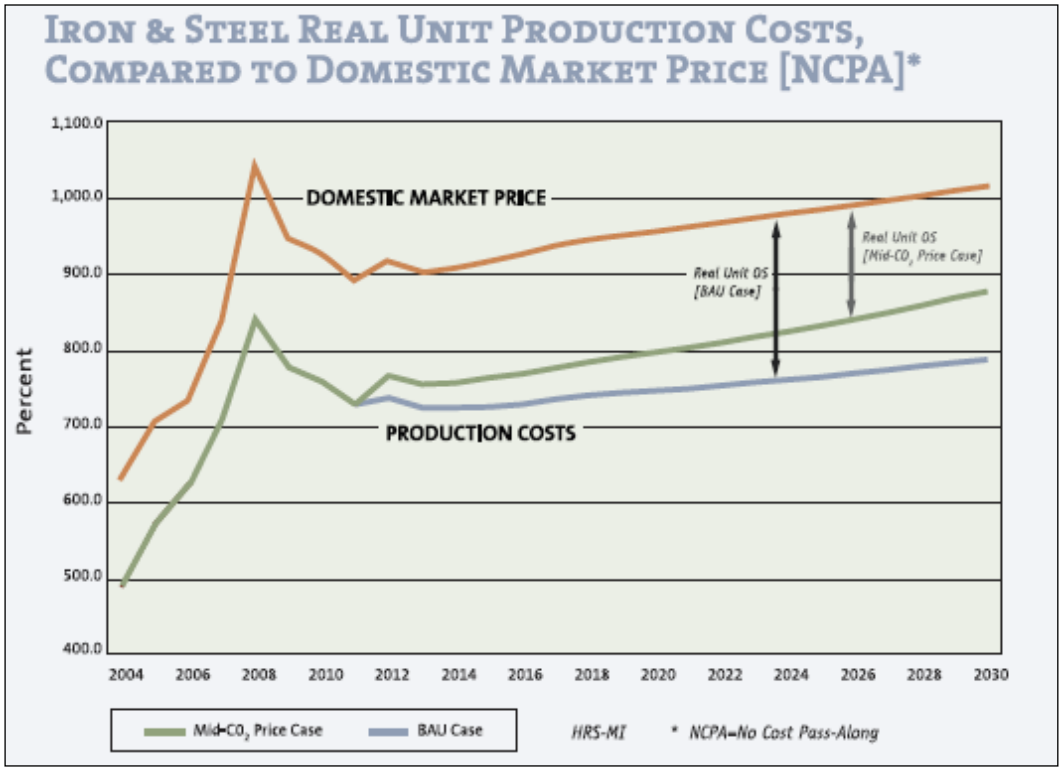




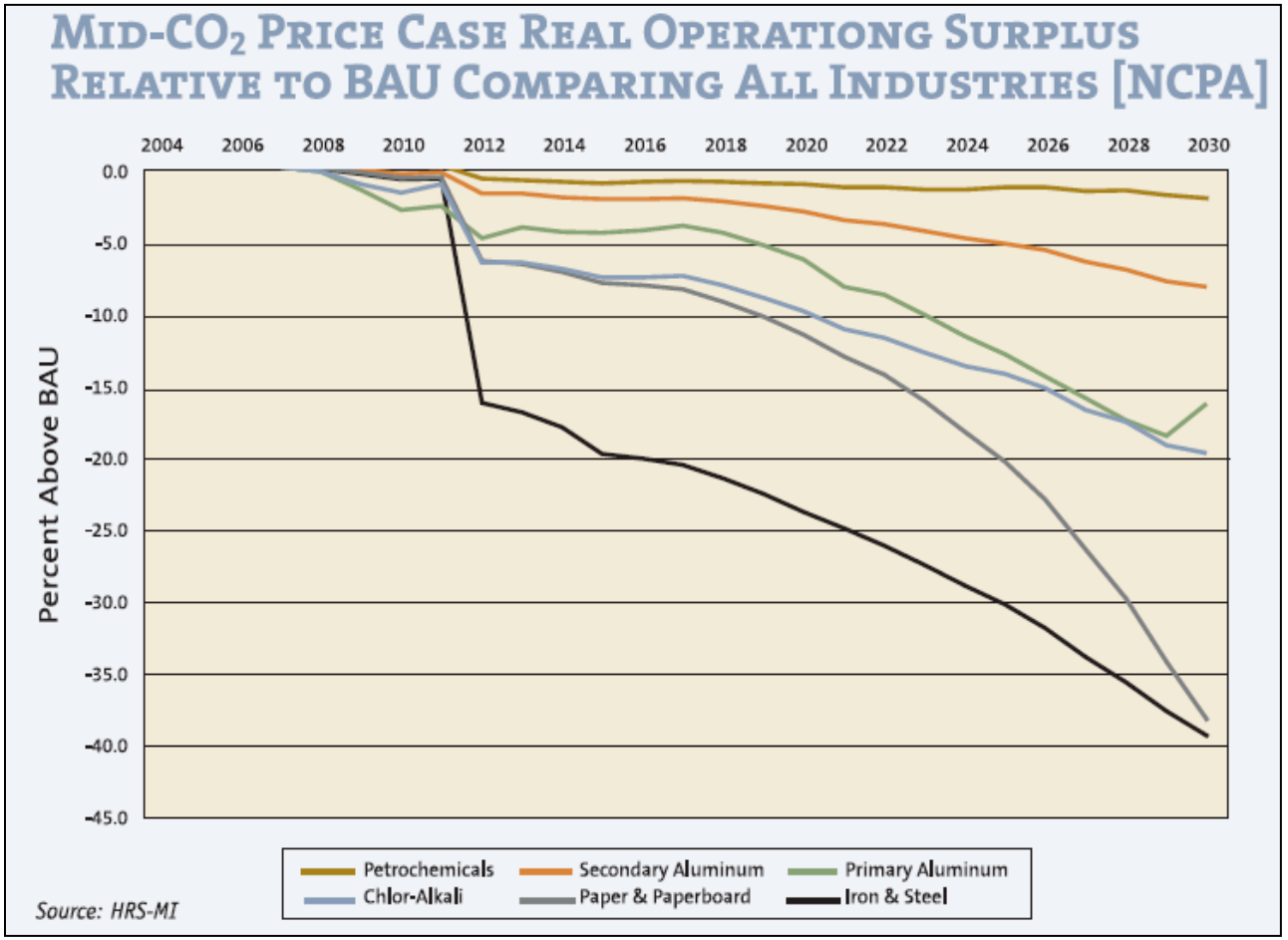
- Iron & steel—6.7% above BAU, 2020; 11.4%, 2030
- Chlor-Alkali—5.5%, 2020; 9.0%, 2030
- Paper and paperboard—4.0%, 2020; 8.7%, 2030
- Primary aluminum—2.8% (4.6% inc. anode/alumina); 2020; 4.6% (8.7%), 2030

Operating Surplus Defined

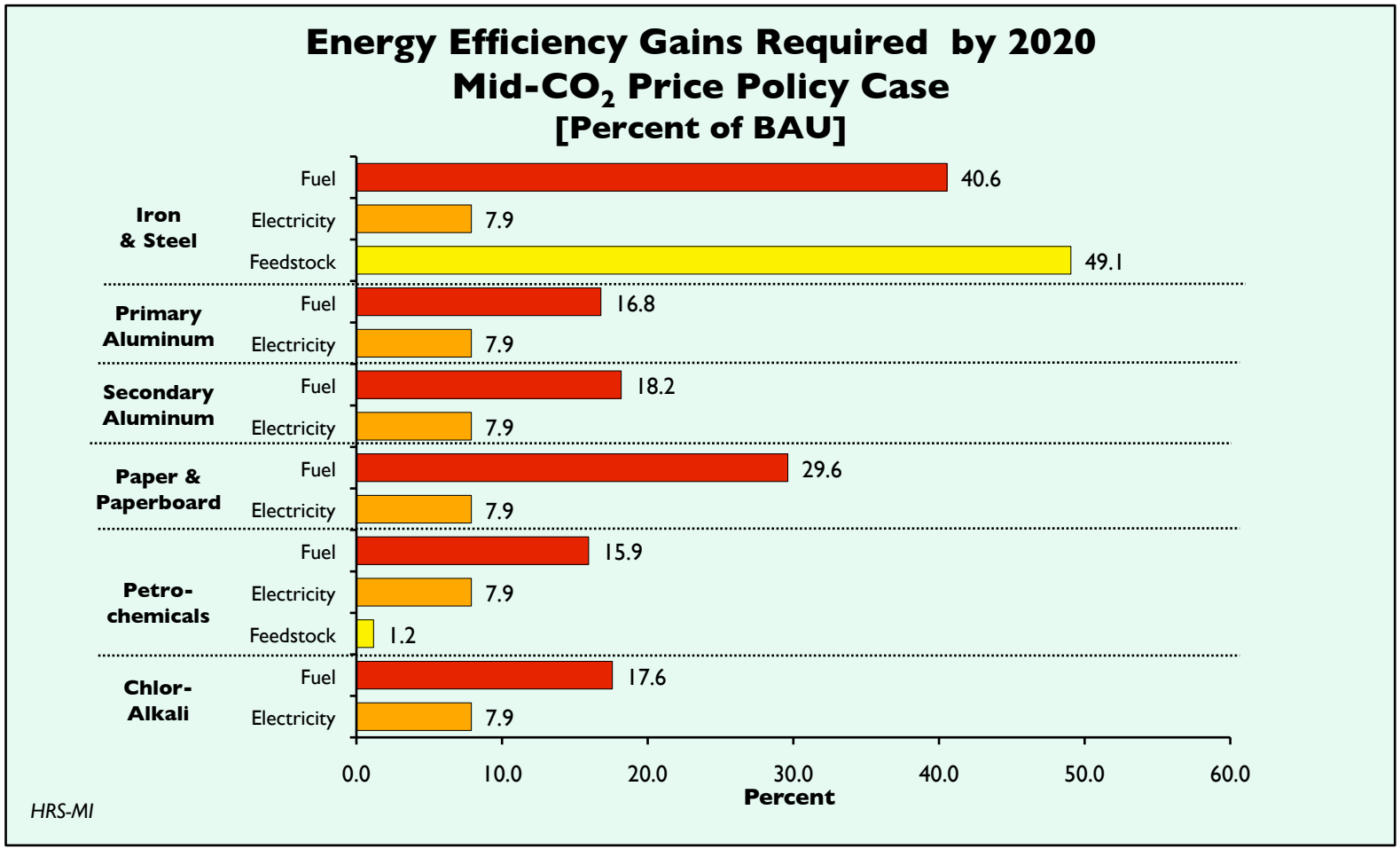
- **Operating Surplus:** Domestic Market Price Minus Unit Production Cost
  - Sales, General and Administrative costs
  - Depreciation, interest on capital
  - Other fixed costs
  - Profits, taxes
  - Reduced OS means lower profits
- **Operating Margin:** Ratio of total OS and total revenues



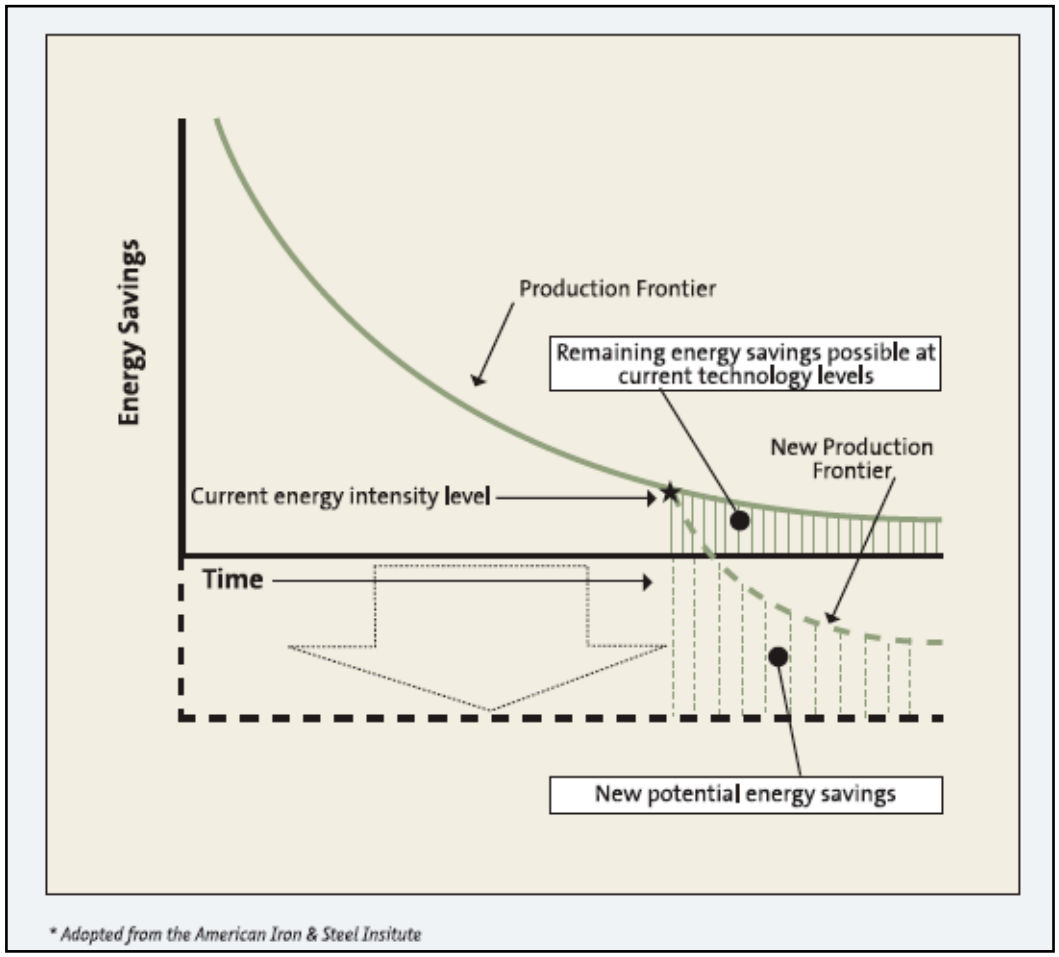
Operating Surplus Impacts



Energy Efficiency Gains Needed



Energy Savings Potential



Technology Investment Options

- "Low-hanging fruit"
  - Heat recovery, CHP, sensors and process controls, more efficient pumping, motor, compressed air systems, etc.

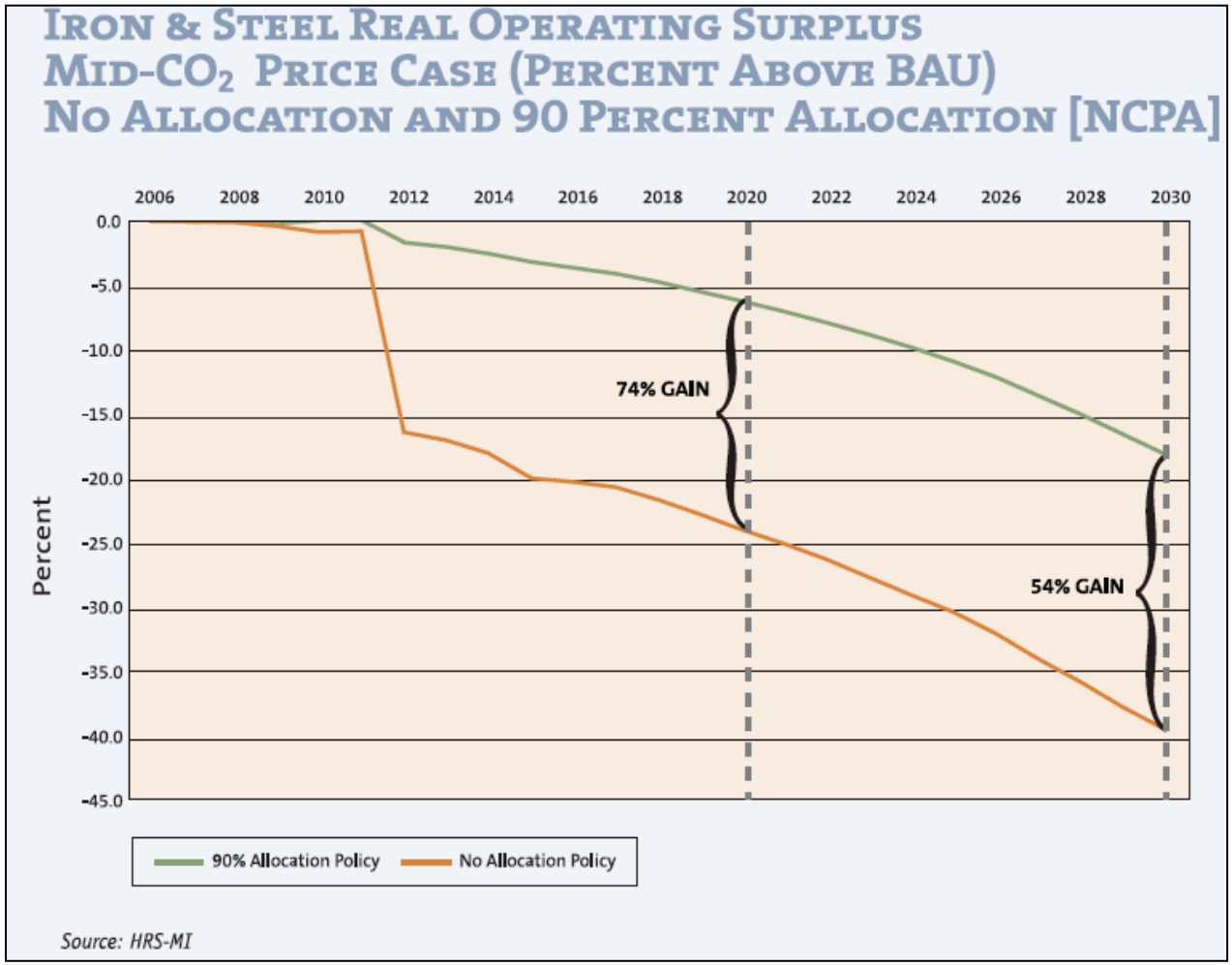
- Improved recycling (steel, aluminum, paper)
- Advanced and alternative process technologies:
  - Low-carbon iron-making technology (iron & steel)
  - Wetted drained cathode/inert anodes (aluminum)
  - Black-liquor gasification; efficient drying technology; biorefineries (paper)
  - Shift to membrane technology (chlor-alkali)
  - Advanced furnaces, CHP, biomass-based systems (petrochemicals)
- Barriers to Adoption:
  - Costs; timing (technical feasibility, vintage); lack of capital

Success Stories

- **ArcelorMittal (East Chicago, IN)**
  - Partnered with Recycled Energy Development, built onsite energy plant to capture waste heat and gases
    - Cut purchases of coal-fired power by ½ at BOF mill; reduced CO2 emissions by 1.3 million tons/yr; saved $100 million/year
    - Using waste heat recovery at 3 more steel facilities

- **Flambeau River Papers (Park Mill, WI)**
  - Built 1896, 300 employees in town of 3,000, paper mill shut down in 2006
    - High energy costs, foreign competition, aging equipment, outmoded processes
  - Reopened in 2 years with state and private support
    - 1st fossil fuel free, energy independent integrated pulp and paper mill in NA
    - Becoming first modern U.S.-based pulp mill biorefinery
    - Reemployed workers, 100 new jobs, reduced carbon impact

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**

Climate Policy Comparison

American Clean Energy & Security Act of 2009 (ACES; H.R. 2454)	Lieberman-Warner Climate Security Act of 2007 (S. 2191)
GHG cap-and-trade program • 17% reduction–2020; 58%–2030; 83%–2050 relative to 2005 • ACES Basic–allowance prices: $31.7–2020; $64.8–2030 (USD 2007)	GHG cap-and-trade program • 39% reduction–2030; 72%–2050 relative to 2006 • Allowance prices: $31.7–2020; $64.8–2030 (USD 2007)
Allowances to electricity, NG distributors; low-income consumers; **energy-intensive industries;** states; etc.	Auction allowances used for low-carbon technology programs; transition assistance; states; etc.
CCS demonstration, early deployment; building, appliance standards; other technology improvements	Low-emissions technologies—nuclear, coal, CCS; incentives for CCS, biogenic carbon sequestration; building, appliance standards
Domestic and international offsets; banking	Domestic and international offsets each capped at 15%;
BAU: AEO2009 • 2.4% long-term growth; short-term growth <AEO2008; reflects ARRA, current leg. & regs.	BAU: AEO2008 • 2.5% long-term growth; includes 2007 energy bill; current legislation, regulations

Policy Issues

- Cost Containment and Mitigation
  - "Safety valve," offsets, banking
  - Free allowances (output-based rebates)
- Border Adjustment & International Provisions
- Technology Investment and Adoption
  - RD&D for cutting-edge process technologies
  - Grants and tax incentives for installing new equipment
  - Accelerated capital stock recovery
  - Tech assistance, revolving loan funds to SMEs (Sen. Sherrod Brown's IMPACT bill)
- Workforce and Community Transition

Conversion to Low-Carbon Manufacturing

- **Make a national priority**
  - Presidential task force; interagency working groups; national labs
- **Climate legislation should include:**
  - Cost mitigation; level global market playing field; transition assistance to workers and communities
- **Investment and innovation policies:**
  - RD&D, financing, tax incentives, technical assistance to promote low-carbon generation, smart grid, green construction and transportation, and next generation production technologies
- **Benefits:**
  - Energy security, reduced GHG emissions, revitalized manufacturing, economic growth and job creation