Energy Pricing and Manufacturing Competitiveness in Malaysia

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Using Threshold 21 (T21)

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HIGH ROAD STRATEGIES

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Malaysia's Manufacturing & Energy Challenge

- **Malaysia is at a critical juncture.**
- **In 2010, Malaysia's GDP grew by 7.2 percent, its strongest pace in a decade, one of SE Asia's fastest growing economies.**
- **Malaysia in its third state of economic development**
  - A growing emphasis on services (49.3% GDP) (2010)
  - Broaden base of exports, move into new growth areas
  - Industrial sector remains key focus as well (41.6%)
    - Manufacturing, large oil and gas industry
- *Tenth Malaysia Plan*—**move to high-income status**
    - Shift to high value-added, knowledge intensive industry

Malaysia's Energy Subsidies

- **Large subsidies to energy and other commodities**
  - Petrol, diesel, natural gas, sugar, rice and flour.
  - Government spent RM73 billion on subsidies
  - Energy subsidies encouraged business growth in past
  - Electric power and manufacturers reliant on heavily subsidized natural gas; power producers NG prices 74% lower than market

Subsidized Natural Gas in Malaysia

Natural Gas Consumer	Subsidized Price (per MMBTU)	Unsubsidized Price (per MMBTU)
Electric Power Sector	RM10.70	RM41.16
Large Power Consumers	RM15.35	RM56.20
Gas Malaysia	RM11.05	RM42.35

Removal of Energy Subsidies

- **Removal of subsidies important *TMP* element**
- **Compelling economic and social reasons today for removing subsidies**
  - Subsidies contribute national debt and takes away resources for social and economic development programs.
  - 2008, fuel subsidies in Malaysia > RM50 billion, four times combined spending on national defense, education and health care.
  - Distorts true prices, ultimately hurts competitiveness
- **Removing subsidies would raise serious transitional issues and may spark political pushback**
  - Power producers and industrial users most affected,

Industrial Energy Efficiency Potential

- Greater energy-efficiency, especially in industrial sector, a key element in economic plan
- Driven by concerns over security of the nation's energy supply, depletion of indigenous energy resources and climate change, and need for mitigating the growing energy demand in the economy.
- High energy subsidies an important factor that hinders energy efficiency improvement efforts
- Link subsidy removal with increased incentives for IEE (APEC)

Manufacturing & Energy Studies

- **U.S. studies of** *analogous* **energy and manufacturing problem can provide insights for Malaysia situation**
  - HRS-MI *Climate Policy and Energy-Intensive Manufacturing* study, and follow-up cost mitigation studies
  - HRS Ohio energy-intensive manufacturing energy opportunities and IEE Roadmap
- **System Dynamics modeling approach could apply to Malaysia analysis**

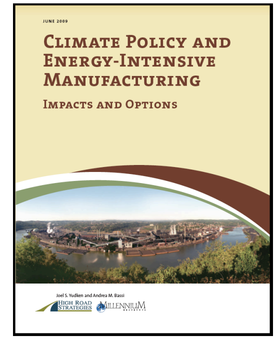
U.S. Energy-Manufacturing Challenge

- 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

- Motivation for EI manufacturing and climate policy study
  - 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

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

Energy Price Scenarios

($2000/MBtu and % above BAU)

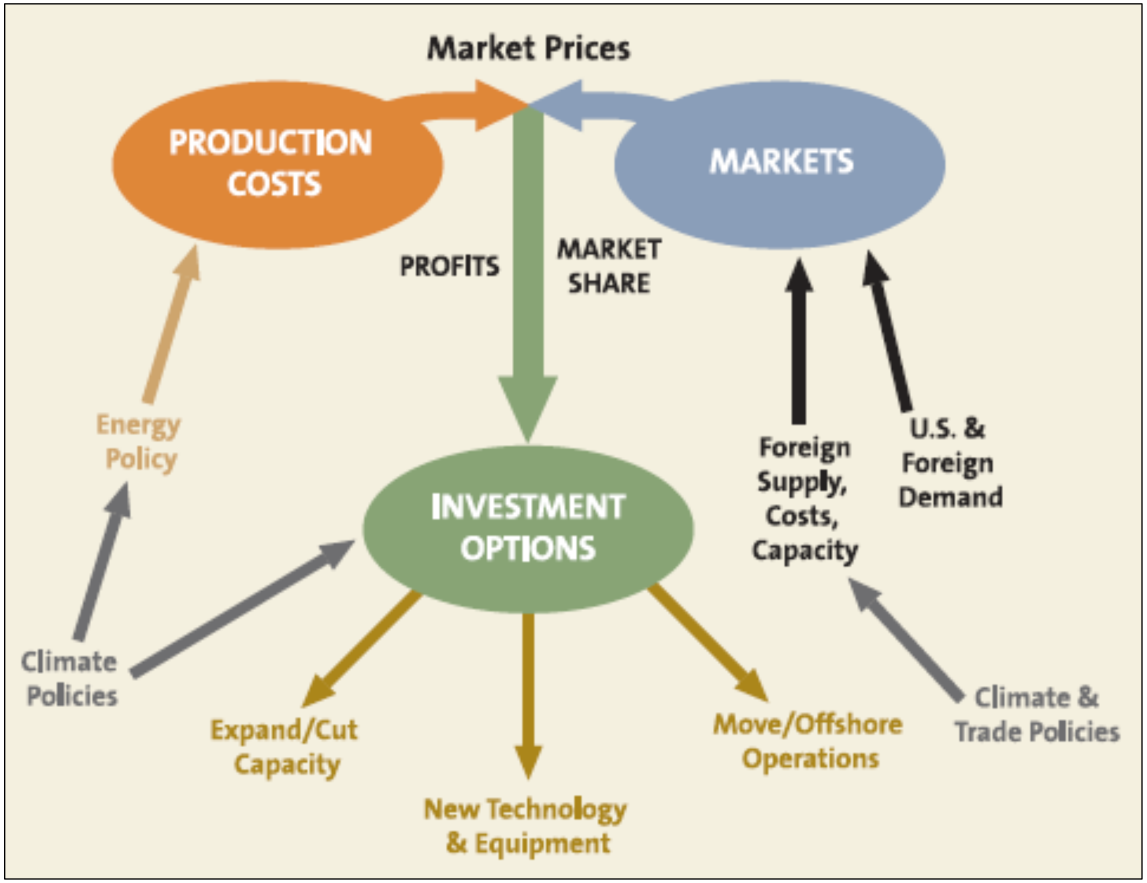
Energy Source	Real Energy Prices ($2000)		
	BAU	Mid-CO_2 Price	
	2006	2020	2030
Electricity	15.42	16.09	17.11
Percent above BAU	—	*8.6*	*13.1*
Natural Gas	6.57	6.51	8.69
Percent above BAU	—	*22.2*	*39.0*
Metallurgical Coal	3.04	6.01	8.65
Percent above BAU	—	*104.7*	*180.0*
Liquefied Petroleum Gas	16.91	14.48	15.25
Percent above BAU	—	*0.5*	*-0.1*
Coal Coke	9.11	18.02	25.94
Percent above BAU	—	*104.7*	*180.0*
Residual Fuel	7.77	9.01	11.81
Percent above BAU	—	*26.7*	*43.1*
Distillate Fuel	13.15	14.31	17.30
Percent above BAU	—	*14.1*	*24.0*

Source: EIA, NCEP, HRS-MI

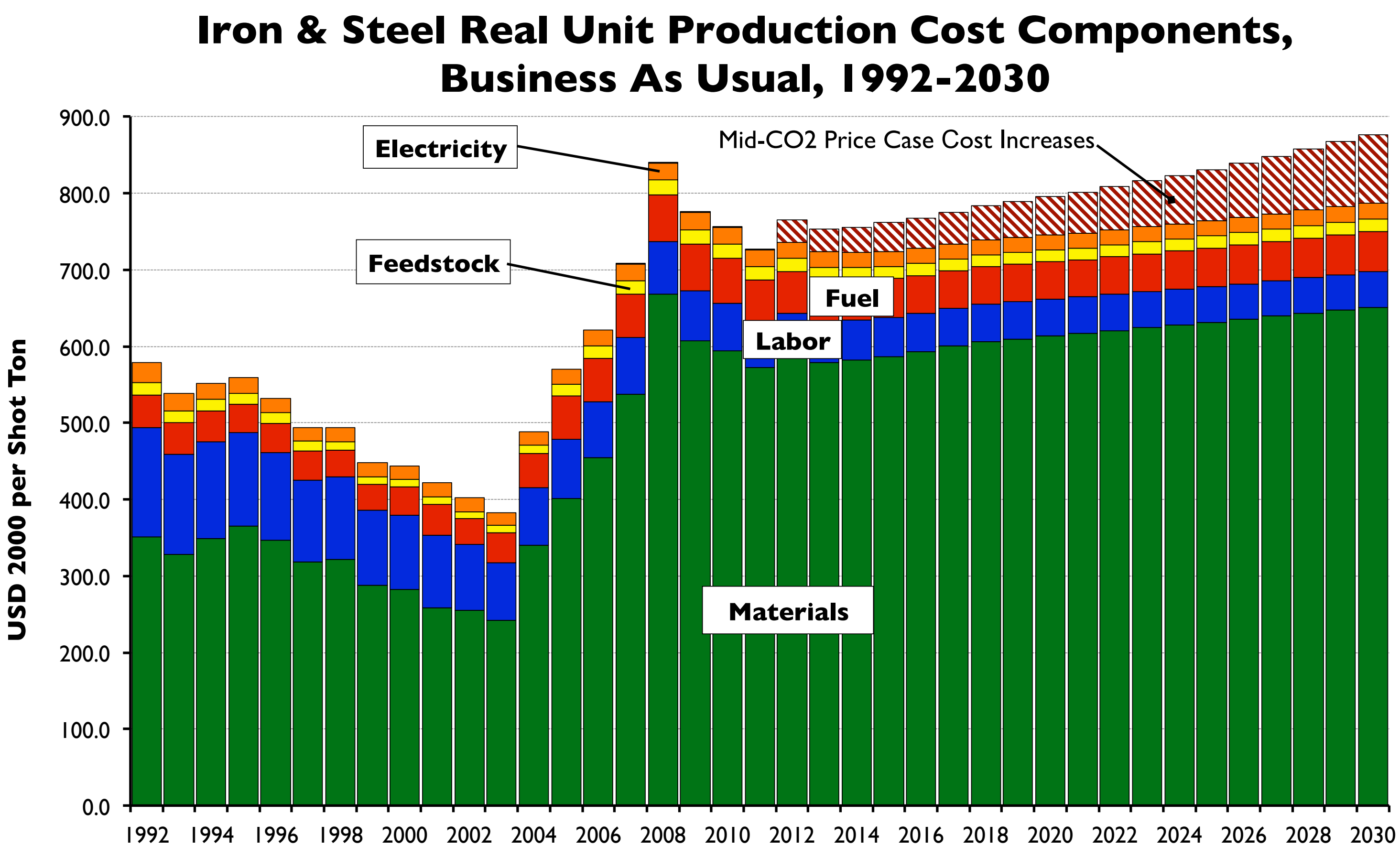
Methodology

- **Data collection**
  - ASM, MECS, USGS, USITC
  - AISI, Aluminum Association, AF&PA, ACC
- **System Dynamics modeling**
  - Computer-based SW platform: Vensim®
  - Integrated Industry-Climate Policy Model (II-CPM)
- **Group modeling sessions**
- **Characterize policy cases**
  - EIA/NEMS, GI
- **Model runs**
  - Cost pass-along scenarios (NCPA, CPA)
  - Sensitivity and alternative scenarios

Modeling Framework

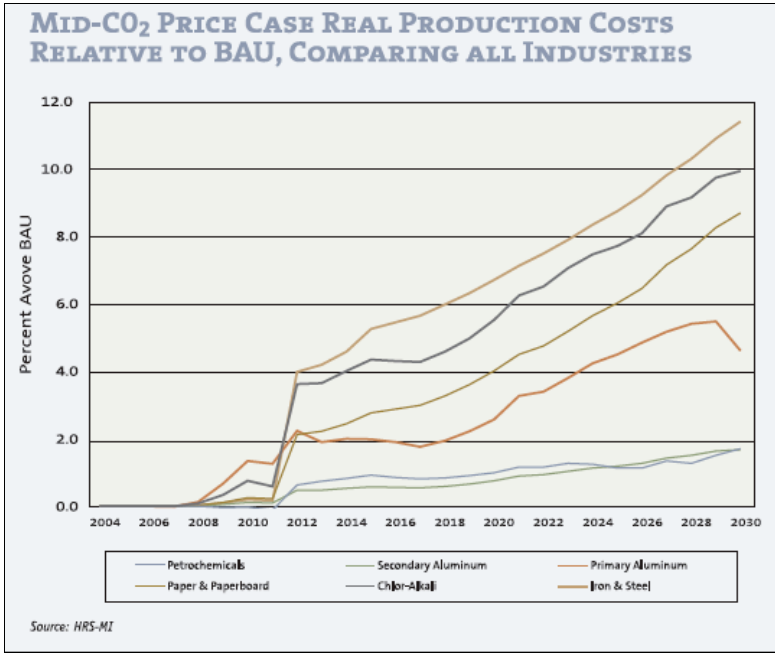


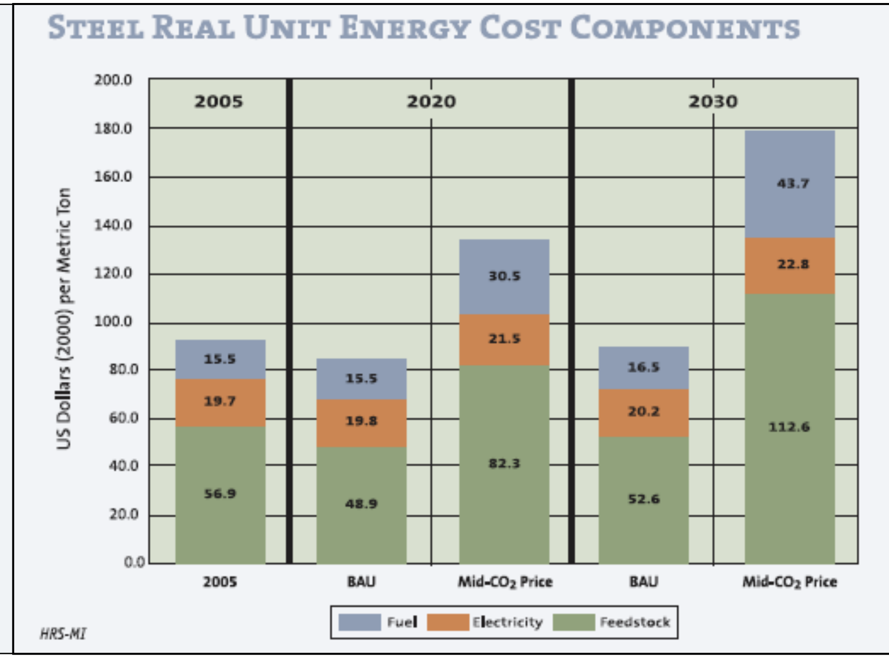
Production Cost Structure



Source: HRS-MI

Production Cost Impacts

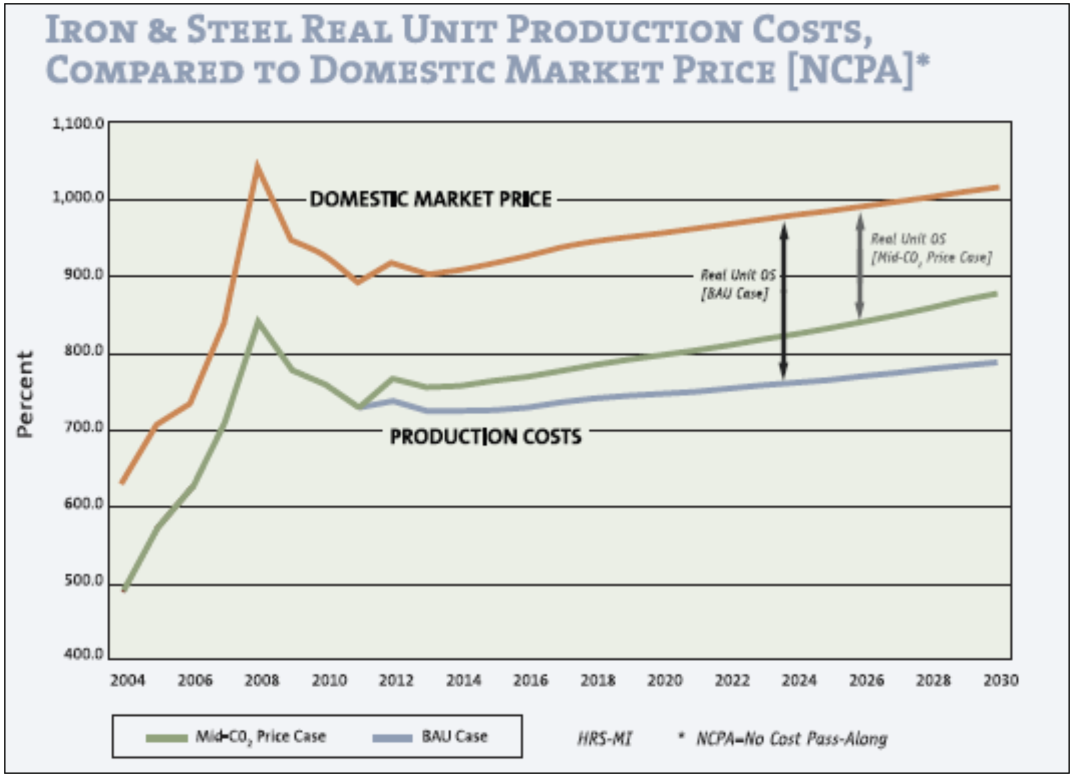




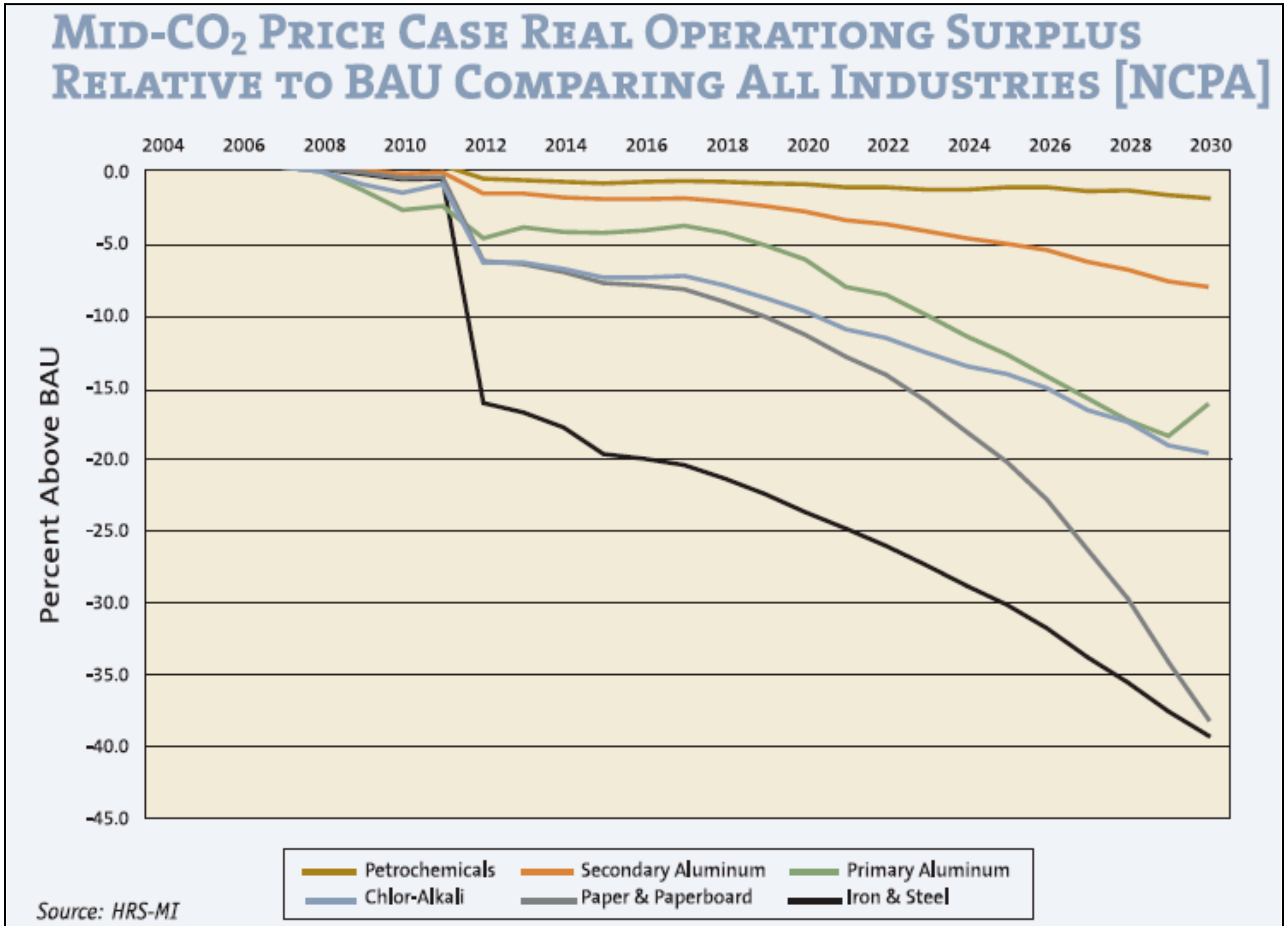
- Iron & steel—6.7% above BAU, 2020; 11.4%, 2030
- Chlor-Alkali—5.5%, 2020; 9.0%, 2030
- Paper and paperboard—4.0%, 2020; 8.7%, 2030
- Primary aluminum—2.8% (4.6% inc. anode/alumina); 2020; 4.6% (8.7%), 2030

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



Summary of Findings

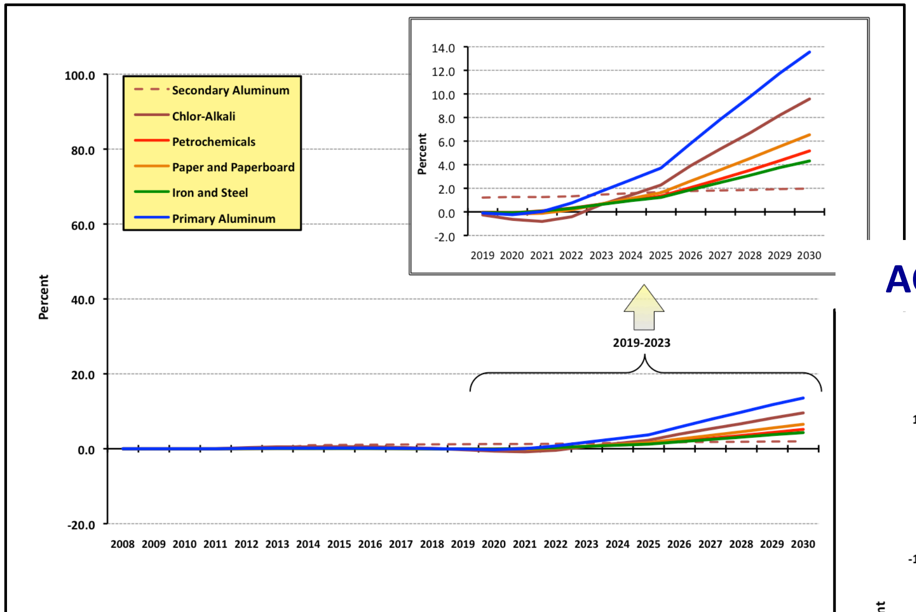
- Modest to high impacts on production costs, operating surplus (profits), market shares from higher energy prices:
  - Contingent on energy mix, cost-pass along assumptions, market conditions
- Pressure on industries to take actions to reduce costs and prevent profits from decreasing to undesired levels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

HRS-MI Cost Mitigation Studies

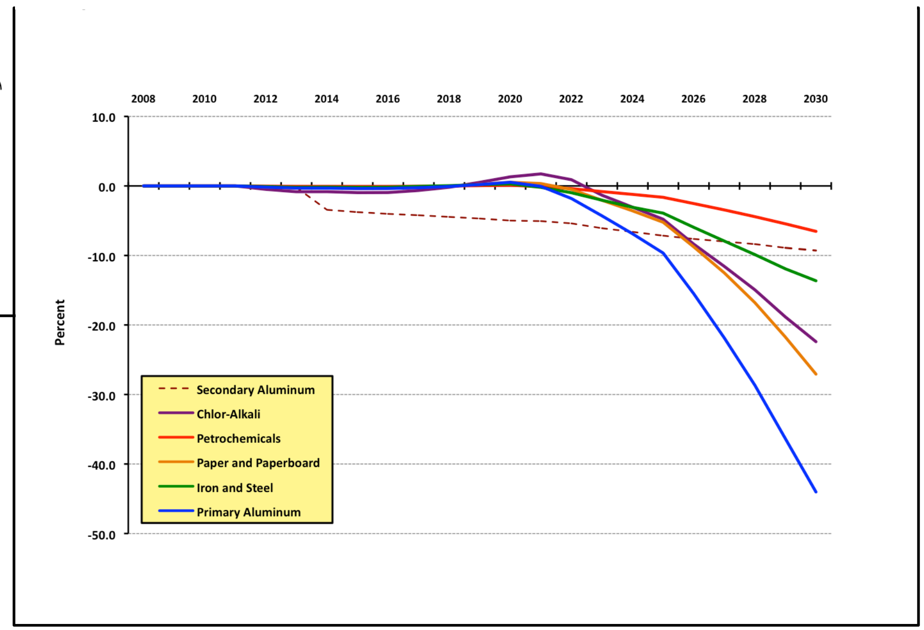
- **Competitiveness Impacts of American Clean Energy & Security Act (ACESA) of 2009** (February 26, 2010)
  - **Environmental Defense Fund (EDF)-sponsored; HRS-MI performed**
  - **Examined impacts of ACESA (Waxman-Markey bill; H.R. 2454), focus on output-based rebate measure**
- **Evaluation of ACESA Cost Mitigation Measures** (September 7, 2010)
  - **NCEP, AFL-CIO WAI-sponsored; HRS-MI performed**
  - **Evaluates alternative scenarios, output-rebates, border-adjustment measures**

Allowance Rebate Effectiveness

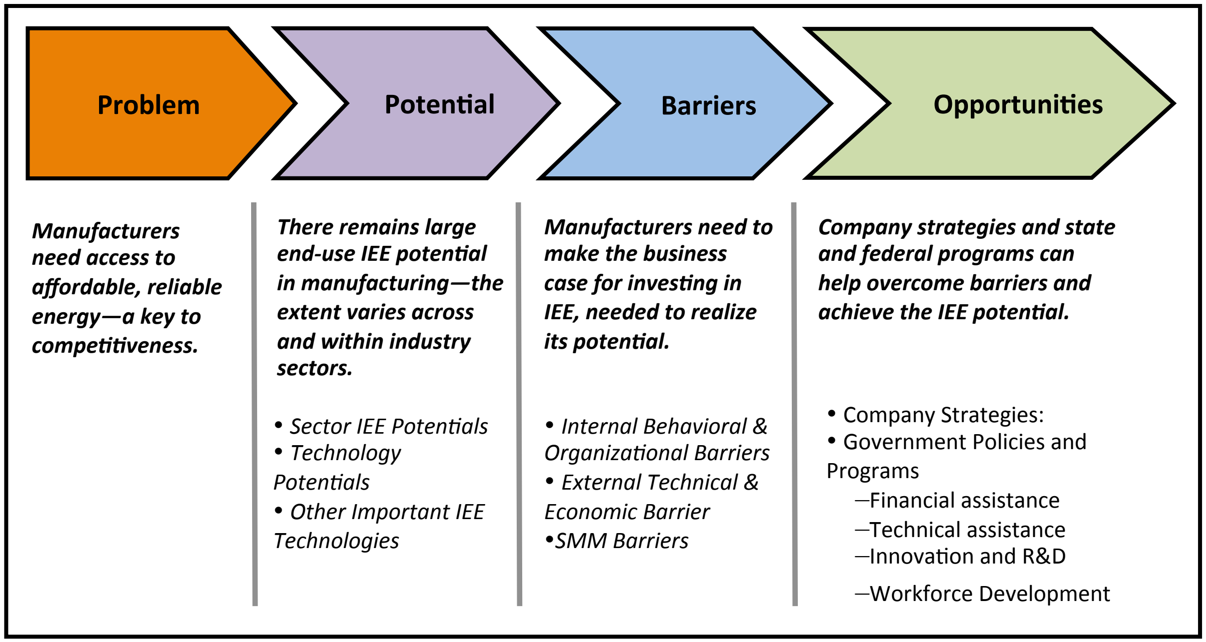
ACESA Basic–Production Costs With Rebates



ACESA Basic–Operating Surplus With Rebates

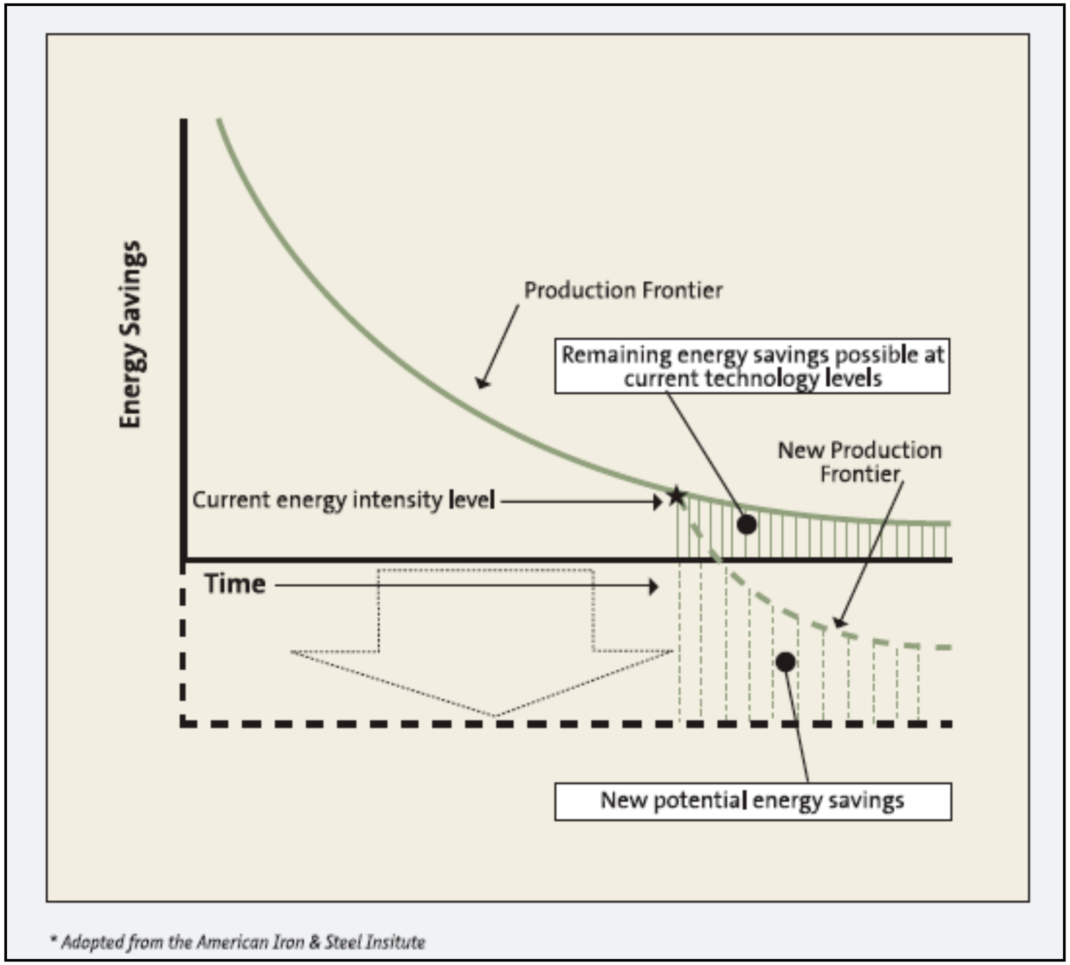


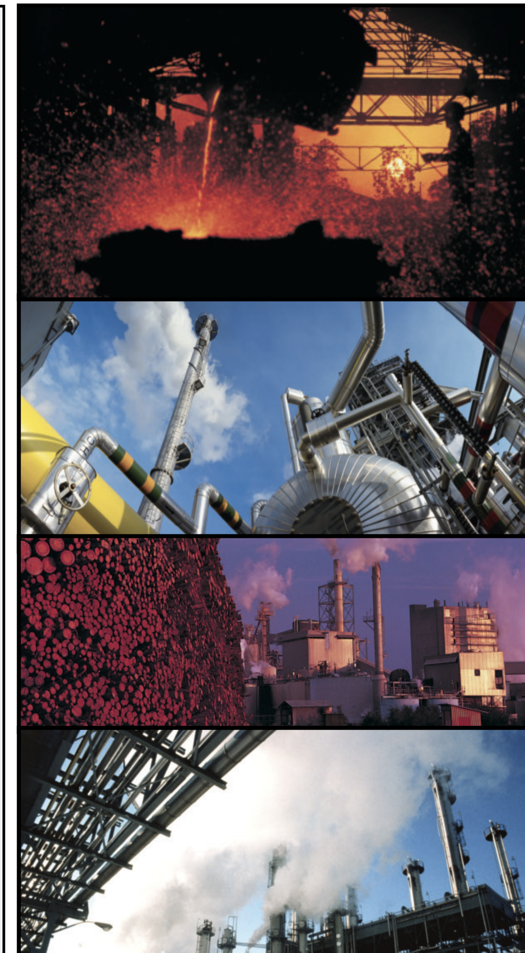
Industrial Energy Efficiency Roadmap



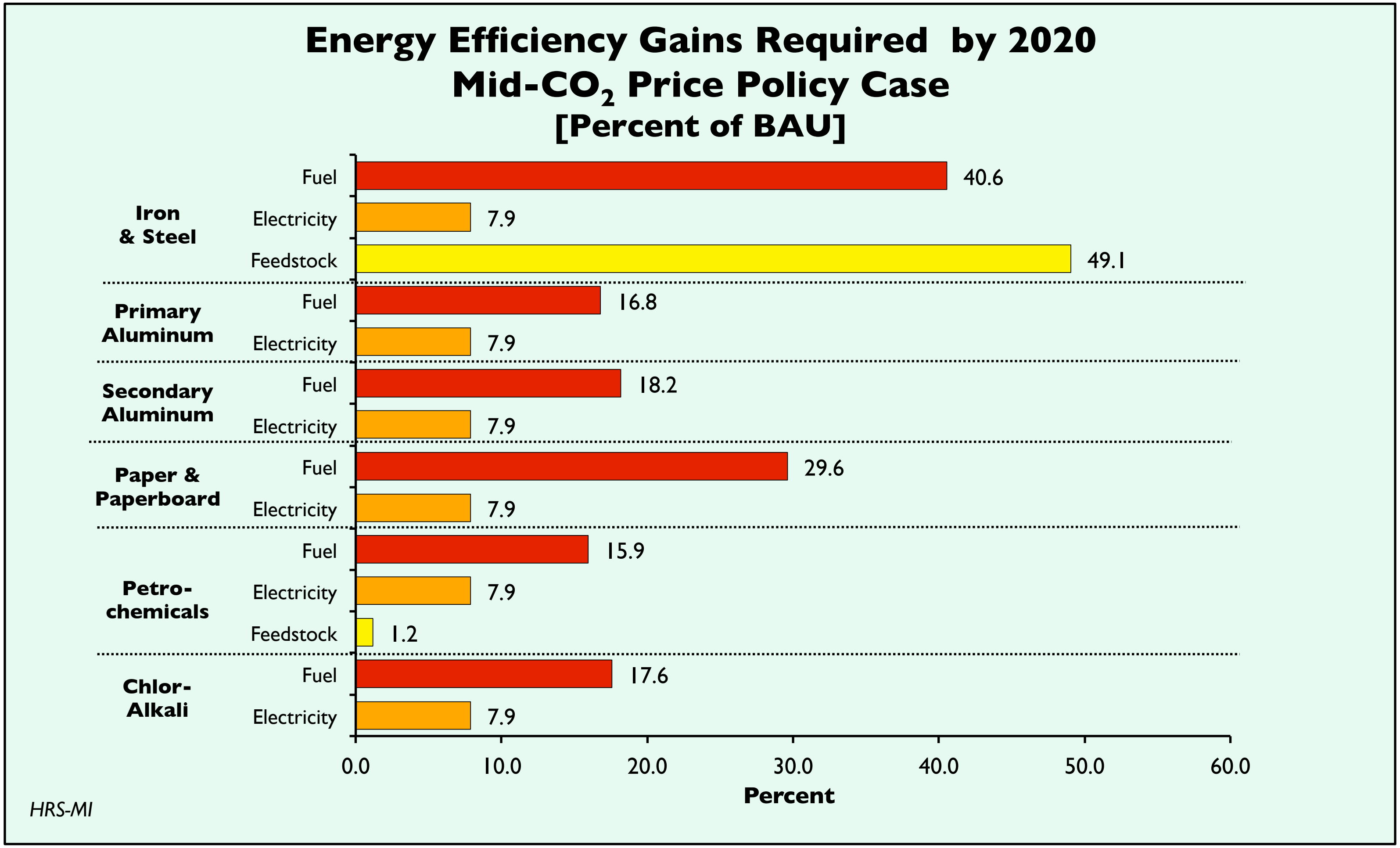
Source: Joel S. Yudken, *An Industrial Energy Efficiency Roadmap for Ohio Manufacturing: Potential, Barriers and Opportunities.* Prepared for the Ohio University Voinovich School and The Ohio Manufacturers' Association. (Forthcoming)

Energy Savings Potential





Energy Efficiency Gains Needed



IEE Technology Potential

- "Low-hanging fruit" & cross-cutting technologies
  - Heat recovery, CHP, sensors and process controls, more efficient pumping, motor, compressed air systems, etc.
- Improved recycling (steel, aluminum, paper)
- Process specific and emerging technologies
- Barriers to Adoption:
  - Costs; timing (technical feasibility, vintage); lack of capital; internal behavioral

Industry	Process-Specific Technologies		Emerging Technologies
Iron & Steel and Ferroalloy Products	• Pulverized coal and natural gas injection • Direct smelting—eliminating coke oven • Thin slab casting	• EAF—oxy-fuel burners • DC-arc furnace • Scrap preheating • Improved blast furnace controls	• Paired straight hearth furnace • Molten oxide electrolysis • Hydrogen flash melting
Petroleum Refineries	• Improved separation efficiency for distillation • Advanced separation technology	• Improved pre-heater efficiency • Improved catalyst efficiency • Convert condensing turbine to electric motor drive	• Alternative hyrdotreater and desalter designs • Progressive distillation design
Chemicals	• Improved efficiency of cold fractionation and refrigeration systems • Improved "cracking" processes and transfer line exchangers		• High temperature furnaces • Gas-turbine integration • Advanced distillation columns • Biomass-based systems
Pulp and Paper	• Cradle and dry debarking • Automated chip handling and thickness screening technology • Improving digester efficiency • Chemical recovery boilers that generate steam	• Heat chlorine dioxide with waste heat • Advanced dryer control systems • Optimize water removal in forming and pressing	• Black liquor gasification • Advanced dryer technologies (impulse, gas-fired, multi-port)
Cement	• High efficiency roller mills and classifiers • Replace energy-intensive-"clinker" with fly ash, slag, or other mineral components	• Switch from older, less efficient "wet process" • State-of-the-art dry processing • Improve efficiency of "finishing grinding"	• Oxy-combustion for CCS • Alternative fuels-biomass • Pre-combustion membranes • Superheated Calcium Oxide (Cao)

Cross-Cutting Technologies & Practices	Major Cross-Cutting Technologies
• Energy monitoring and management systems • Variable speed drives for pumps and fans • Preventative maintenance • Improved process control • Improved efficiency of boilers, heaters, turbines, conveyors, furnaces, and motors • Facility-wide opportunities (lighting, HVAC) • Insulation for steam distribution systems and boilers	• High efficiency motor systems • Combined Heat and Power (CHP)/Cogeneration • Waste heat recovery • Materials recycling • Carbon capture and storage (CCS) (Long-term)

Sources: McKinsey & Co., "Pathways"; Yudken and Bassi, *Climate Policy and Energy-Intensive Manufacturing*; EDF, *Think U.S. Industry Can't Be More Competitive*; McKinsey, *Unlocking*; EPA "whitepapers," http://www.epa.gov/nsr/ghgpermitting.html. ACEEE, *Shaping Ohio's Energy Future*.

Implications for Malaysia's Competitiveness

- IEE roadmap has generic features relevant to the Malaysian industry sector
- Roadmap could provides a framework for evaluating IEE and energy subsidy challenge and tailoring policies and programs to Malaysia's needs
- Removing prices subsidies and driving up energy costs increase incentives to invest in energy-saving technologies, but could also reduce resources to make such investments.
- Not taking action to would leave manufacturers vulnerable to rising energy costs
- There are analogous features in the U.S. problem and Malaysian energy subsidy challenge—increased energy costs impacts on Malaysian competitiveness
- Cost mitigation measures might be considered for addressing short-to-medium term impacts as subsidies phase out, while also encouraging the design of policies that encourage and enable IEE investments.
- The U.S. climate and manufacturing system dynamics approach could be applied to Malaysia's subsidy and IEE challenge: for analyzing economic impacts and potential transitional strategies that help Malaysia follow the "roadmap," leading to greater manufacturing competitiveness