Modernizing Industry in Indiana

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Key takeaways

1. Indiana is one of the largest manufacturing states in the nation. The Hoosier State's top industries, in terms of both manufacturing output and climate pollution, are iron and steel, chemicals, and refined petroleum and coke.

2. **Indiana can** leverage its specialized workforce and existing infrastructure to **establish an early-mover advantage in emerging markets**, such as green steel, low-emissions chemicals, and clean fuels.

3. **The strategies with the greatest potential** for reducing manufacturing emissions in Indiana are **electrifying thermal processes** and **converting coal-based steel facilities to hydrogen-based direct reduction.**

4. Indiana can **support industrial modernization and economic competitiveness through enabling policies**, such as a production tax credit for clean manufacturing and public procurement of low-carbon products.

The Hoosier State shows economic momentum and strength in manufacturing. It leads the nation in crude steel production and is the fourteenth-largest chemical-producing state. Indiana is also home to one of the largest refineries in the nation.

But global changes necessitate a new strategy to keep Indiana competitive. Global demand for green steel is forecast to equal 35% of current crude steel production by 2050. Chemical markets are shifting to low-emissions products.

Simultaneously, US refineries, which largely produce transportation fuels, are increasingly closing or converting to cleaner uses as global demand for renewable diesel and sustainable aviation fuel grows. By 2050, sustainable aviation fuels are expected to comprise 12% of global aviation energy demand. Ammonia and methanol will account for 37% of maritime energy demand. As these markets emerge and transition, Indiana has significant assets it can leverage to establish an early-mover advantage.

Supporting industrial decarbonization will also reduce climate pollution. In 2024, Indiana's manufacturing sector collectively released 56.8 million metric tons (MMT) of carbon dioxide equivalent (CO_2e), according to data from the Energy Policy Simulator. If the state does not take action, the manufacturing sector is forecast to increase to 60.3 MMT CO_2e by 2050. However, if the state incorporates the strategies outlined below, it could reduce manufacturing emissions to 20.1 MMT CO_2e.

Health impact from Indiana's refineries, iron and steel, and chemical facilities

Current levels of air pollution from refineries, iron and steel, and chemical facilities adversely impact public health and economic activity.

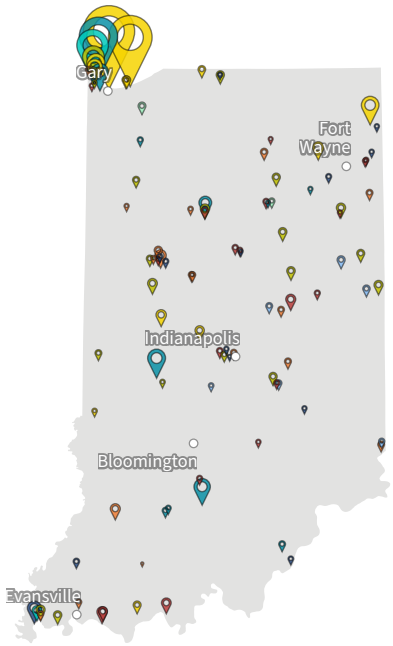
Health Event	*Estimated Annual Incidents from Facilities*			
	Refineries	**Iron and steel**	**Chemicals**	**Total**
Premature deaths	12-25	161-334	10-20	183-379
ER visits, respiratory	8	122	9	139
Asthma symptoms	6,071	84,459	6,039	96,569
Work loss days	1,466	18,826	1,013	21,305
School loss days	409	9,059	1,401	10,869
Total health costs*	$178M-$370M	$2.5 B-$5.0 B	$161M-$302M	$2.8B-$5.7B
Lost economic activity**	$2.2M	$35.3 M	$3.5 M	$41M

**Includes health costs incurred from additional incidents not listed like cardiac arrests, stroke, and hospital admits*
***Includes economic impact of minor restricted activity days, in addition to school and work loss days*

Source: EPA CO-Benefits Risk Assessment (COBRA)

In addition to having a negative climate impact, industrial emissions harm public health. Certain industrial processes can release pollutants like particulate matter, nitrogen oxides, and sulfur dioxide, which are linked to adverse health conditions, ranging from asthma exacerbation to premature death and disease. Curbing emissions from facilities is particularly critical to the health of local communities, which are disproportionately impacted by exposure to air pollution.

Indiana's industrial facilities



Facilities by industry

- Iron and steel
- Cement and other nonmetallic minerals
- Refined petroleum and coke
- Chemicals
- Other metals
- Food and beverage
- Other manufacturing
- Glass
- Pulp and paper

Metric tons CO_2e

1M 4M 10M

Source: US EPA

Strategies for emissions reduction

Modernizing facilities can support competitiveness in emerging markets while reducing air and climate pollution. Based on the Energy Policy Simulator, an open-source model for estimating the impacts of energy policies, the strategies with the greatest potential for reducing emissions in Indiana are electrifying thermal processes, especially those requiring heat below 400°C, and converting coal-based steel facilities to hydrogen-based direct reduction.

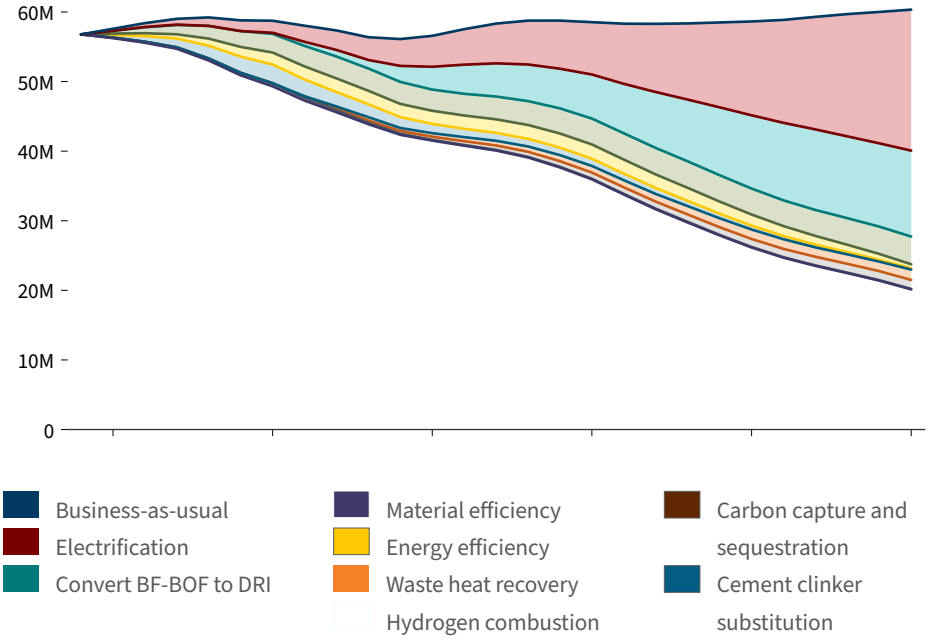
If nearly all industrial processes below 400°C are electrified by 2050, Indiana can reduce emissions from manufacturing by a cumulative 197.1 MMT CO_2e, or 38% of overall potential emissions reductions from the set of strategies. Electrification of thermal processes is an immediate opportunity to reduce emissions from on-site combustion of fossil fuels. Direct electrification for low- to medium-temperature heat has the greatest potential in light industries, including food and beverage, pulp and paper, and certain chemicals.

Indiana can also shift to direct reduced iron (DRI) facilities in lieu of relining blast furnace–basic oxygen furnace (BF-BOF) steel plants. If the transition begins promptly, this is expected to result in cumulative emissions reductions of 0.3 MMT CO_2e by 2030 and 137.9 MMT CO_2e by 2050. DRIs operating on natural gas can produce 50% fewer emissions than BF–BOF steel plants, and DRIs operating on clean hydrogen can produce 90% fewer emissions.[1]

[1] Estimates of relative emissions reductions are based on a global warming potential factor of 100, which understates the short-term impacts of methane.

Industrial emissions in Indiana

Emissions from manufacturing have the potential to decline by 40.2 million metric tons of CO_2e by 2050, compared to a business-as-usual scenario.



The wedges show each strategy's annual impact towards emissions reductions and was calculated using the Energy Policy Simulator (EPS). The conversion of BF-BOF to hydrogen-ready DRI facilities is estimated in the EPS by pairing the feedstock shifting and electrification levers. The business-as-usual scenario corresponds to the Federal Policy Repeal and Rollback scenario in the EPS, which is more representative of today's policy landscape, and assumes that Indiana takes no further action to reduce industrial emissions.

Source: RMI Analysis, Energy Policy Simulator

Cumulative emissions reduction by strategy

Strategy	cumulative MMT CO_2e reductions through 2030	cumulative MMT CO_2e reductions through 2050	% of cumulative industrial emissions reductions
Electrification	6.2	197.1	38.0%
Convert BF-BOF to DRI	0.3	137.9	26.0%
Material efficiency	9.4	80.1	15.0%
Energy efficiency	5.4	39.2	7.0%
Waste heat recovery	9.3	29.4	6.0%
Hydrogen combustion	0.0	18.6	4.0%
Carbon capture and sequestration	0.0	16.7	3.0%
Cement clinker substitution	1.5	3.9	1.0%

These values were calculated using the Indiana Energy Policy Simulator (EPS), and they assume both stringent implementation and carbon capture and sequestration and hydrogen combustion reaching technological readiness by 2031. The conversion of BF-BOF to hydrogen-ready DRI facilities is estimated in the EPS by pairing the feedstock shifting and electrification levers.

Source: RMI Analysis, Energy Policy Simulator

Additional interventions that can be deployed in the near term include:

- **Using smarter design materials** to reduce demand for new steel, cement, and other products -- — i.e., material efficiency.
- **Increasing the efficiency of industrial equipment,** including updating heat pumps and compressors and integrating advanced process control systems. Energy efficiency is the quickest and most cost-effective mitigation strategy.
- **Reducing fugitive and flaring emissions** across gas transport, oil refining, and chemicals equipment through enhanced leak detection and repair and upgrades to flare gas systems.
- **Lowering the threshold** for defining a methane leak to mitigate emissions from natural gas transportation and petroleum refining.

Supporting policies

With recent changes in federal policy causing market uncertainty, state leadership is critical to maintaining the interest and energy of its investors and project developers. Indiana's policymakers can support industrial competitiveness and decarbonization through policies that establish certainty, which involves setting standards, and providing support, including reducing costs of technical interventions and increasing the value of low-emissions products.

There are several actions that Indiana can take to modernize its industrial sector. Examples include:

Creating standards

- **State target setting** or mandates to direct the industry sector's transition to green products.
- **Material efficiency standards** — which involve using smart design to reduce the required amount of material in manufacturing — provide the same services with less material, thereby decreasing the energy demand for new production.
- **Improve transparency around upstream methane emissions** associated with natural gas and petroleum utilized in-state by requiring measurement-informed, independently verified, facility-specific emission data.

Providing support

- **Technical assistance grants** to assist facilities in transitioning to low-emissions production. Technical assistance can help facilities overcome capital barriers, capacity constraints, or knowledge gaps in modernizing.

Adding value

- **A production tax credit (PTC) for clean manufacturing** to increase the cost-competitiveness of clean production. A PTC rewards firms for shifting away from fossil-based inputs and helps bring new production methods in pilot and demonstration phases to scale.
- **Facilitate offtake agreements** that enable refineries to shift production toward heavy non-fuel products, such as asphalt, lubricants, and metals recovery. This can improve industry resilience to fuel market shocks while reducing emissions.
- **Government procurement for low-emissions products** to create the offtake certainty required for capital expenditures, such as redevelopment of BF-BOF facilities.

For more information about industrial decarbonization, please email USAnalysis@rmi.org