

Executive Summary

Though the industrial sector has historically been deemed hard to abate, many of Illinois's industrial emissions — about 8.7 million tons (Mt) of CO₂¹ — come from burning natural gas in low- and medium-temperature ranges for which low-emissions technologies like industrial heat pumps, electric boilers, and thermal energy storage have already proven viable.² As these next-generation technologies continue down the cost curve and improve in performance, this roadmap provides a plan for Illinois policymakers to ease the transition to clean manufacturing and production methods.

Manufacturing is a driving force of the Illinois economy. Across the state, approximately 580,000 Illinoisans are employed in manufacturing, specializing in products ranging from food and beverage to biofuel inputs.³ The state was the nation's fifth largest exporter of goods in 2024, and goods exports accounted for 7.4% of state gross domestic product in the same year.⁴ In addition to advancing the economy, the industrial sector is a significant source of climate pollution in the state, comprising 18% of Illinois's total emissions (or 45 Mt of CO₂e).⁵ Modern manufacturing also benefits public health, with new analysis estimating that replacing boilers with low-emissions equipment could help avoid 1.7 million asthma attacks by 2050 in Illinois alone.⁶ To meet the climate and health targets mandated by the Climate and Equitable Jobs Act while maintaining Illinois's manufacturing might, the state must work to reduce emissions from its industrial sector in a way that allows businesses to stay regionally and globally competitive.⁷ The near-, mid-, and long-term actions contained within this roadmap are designed to achieve these dual ambitions.

Technical solutions

In this roadmap we focus on solutions that are technologically and commercially ready (technology readiness level of 9 or higher, meaning the technology has successful full-scale deployment in an operational environment⁸) can be deployed in the near term, and fall into three main categories: energy efficiency, electrification, and geothermal heat.

- **Energy efficiency:** Many assume industrial facilities have already maximized energy efficiency, but a study from ENERGY STAR finds that energy efficiency still represents 34% of feasible carbon emissions reductions in U.S. manufacturing by 2050.⁹ This leaves a major opportunity for cost savings and emissions reductions, especially as technologies' efficiency improves. Illinois facilities can implement solutions like industrial heat pumps, low-carbon or geothermal combined heat and power, and energy management systems, which reduce waste without disrupting production.
- **Electrification:** Electrification is a key strategy for reducing emissions in low- and medium-temperature industrial processes. Facilities like those in the food and beverage and chemical sectors can adopt electric resistance heating and thermal energy storage to replace fossil-fueled systems. These technologies are reliable and can be tailored to specific heat and power needs.
- **Geothermal heat:** Advanced geothermal systems now allow heat extraction in regions without geologic activity, making them viable across Illinois. Geothermal heat is ideal for industrial use because it provides direct heat without needing conversion to electricity. Though still emerging, it is already being implemented in similar contexts to Illinois and offers strong potential for demonstration projects.¹⁰

Barriers to adoption

Despite the maturity of many of these technologies, nearly every facility in Illinois remains reliant on natural gas to fuel operations. Where facilities consider adopting lower-emissions equipment, they face barriers including technology integration, equipment financing, and system-level capabilities. The following barriers were surfaced through informational interviews with facility owners and managers:

- **No one-size-fits-all solution:** Each facility has unique energy needs, making it difficult to apply a universal electrified heating solution. Long equipment lead times and potential production disruptions are major deterrents.
- **Limited capacity among smaller manufacturers:** Small and medium-sized manufacturers often lack the resources to conduct energy audits or evaluate alternative equipment investments.
- **High up-front and operating costs:** Efficient and electrified systems are more expensive than traditional gas boilers. In Illinois, industrial electricity is about 2.4 times more costly than gas.¹¹
- **Grid and infrastructure constraints:** Facilities need reliable, affordable electricity, but grid capacity and transmission planning are still catching up. Long deployment cycles and a lack of commercial-scale demonstrations also slow adoption.

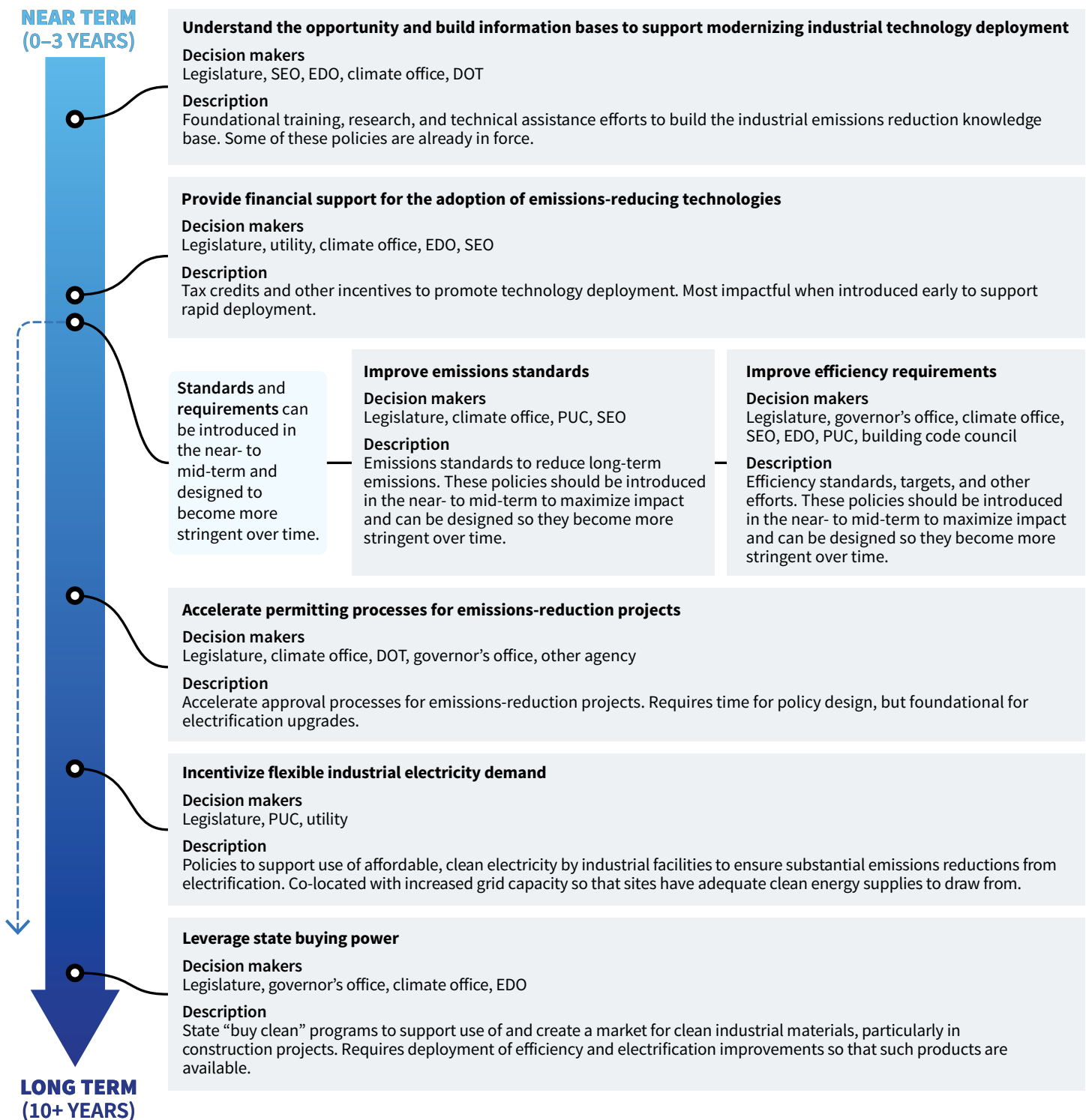
Enabling policies

To overcome these barriers and unlock the clean manufacturing potential, Illinois can enact targeted policies and programs. We focus on eight key strategies, many with specific subpolicies, discussed in detail in the [State Interventions](#) section of the report:

1. Support the adoption of emissions-reducing technologies financially
2. Improve efficiency requirements
3. Increase grid clean capacity
4. Incentivize flexible industrial electricity demand
5. Streamline permitting processes for emissions reduction projects
6. Improve emissions standards
7. Leverage state buying power
8. Understand the opportunity and build information bases to support modernizing industrial technology deployment

There is no silver bullet to achieve low-emissions industry, so the state should consider its funding resources, administrative capacity, and input from industrials to unlock the greatest emissions reduction potential. In concert, a number of these strategies (depicted in Exhibit ES1) can be powerful levers to change Illinois's industrial emissions landscape and drive private investment in clean technology.

Exhibit ES1 Timeline of policy interventions to aid industrial emissions reductions



RMI Graphic. Source RMI analysis

How will the people of Illinois benefit?

Improving efficiency and electrifying operations in the industrial sector create ripple effects beyond the borders of the facilities.

First, there are tangible air quality benefits to industrial electrification, especially to communities near the facilities. A new report from the American Lung Association found that “the transition to zero-emission technology for low- and mid-temperature industrial boilers would generate substantial reductions in both climate-forcing emissions and local air pollutants that threaten public health.”¹² In Illinois specifically, the report estimates the cumulative health benefits of switching low- and medium-temperature boilers to heat pumps to be \$61.6 billion.¹³ The analysis uses the Environmental Protection Agency’s Co-Benefits Risk Analysis (COBRA) tool to assess the frequency of health incidents like asthma and premature mortality caused by industrial pollutant emissions and evaluates the monetary benefit of avoiding them.

Beyond the state’s stated ambition to reduce emissions and the obligation to deliver clean air to its residents, Illinois has the opportunity to lead the U.S. towards low-emissions industry and export goods produced to global markets, which are increasingly willing to pay premiums for green products. Given that \$12.6 billion of goods produced in the state were exported to the European Union in 2024,¹⁴ the state can consider tightening regulations and supporting Illinois businesses to compete in low-carbon global markets with a carbon border adjustment mechanism.¹⁵

