Modernizing Industry in North Carolina

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Key takeaways

1. The **Tar Heel State's manufacturing sector** heavily **relies on chemicals** and **pulp and paper** production. The chemicals industry recently experienced 11.4% employment growth, and the state employs 1.3 times more workers in pulp and paper compared to the national average.

2. As demand for chemicals and paper shifts to low-emissions products, **North Carolina can** leverage its specialized workforce and existing infrastructure to **establish an early-mover advantage in green markets**.

3. The **strategies with the greatest potential** for reducing manufacturing emissions in North Carolina are **electrifying thermal processes and deploying green hydrogen** as a fuel source.

4. North Carolina can **support industrial modernization and economic competitiveness through enabling state policy**, such as a production tax credit for clean industrial heat and green product certifications.

North Carolina shows economic momentum and strength in the chemicals and pulp and paper sectors. It's the seventh-largest chemical-producing state, and the pulp and paper industry generates $131 million in tax revenue for the state annually. The Tar Heel State has a specialized workforce in these industries. Chemical manufacturing experienced 11.4% employment growth in the last five years, and the state employs 1.3 times more workers in the paper industry per capita than the national average.

But global changes necessitate a new strategy to keep North Carolina competitive. Chemical markets are shifting to low-emissions products. Meanwhile, new global regulations and growing consumer concern are compelling sustainable approaches to pulp and paper manufacturing. Aligning with environmental priorities presents long-term growth potential for producers. As the chemicals and pulp and paper markets transition, North Carolina has significant assets it can leverage to establish an early-mover advantage.

Development of low-emissions chemicals and green pulp and paper industries will also reduce climate pollution. For North Carolina to achieve its economy-wide goal of a 50% emissions reduction by 2030 from 2005 levels, it must reduce pollution from its leading sources of industrial emissions, which are chemicals and pulp and paper. In 2024, North Carolina's manufacturing sector collectively released 18.3 million metric tons (MMT) of carbon dioxide equivalent (CO_2e), according to

Health impact from North Carolina's iron and steel, chemicals, food and beverage, and refining facilities

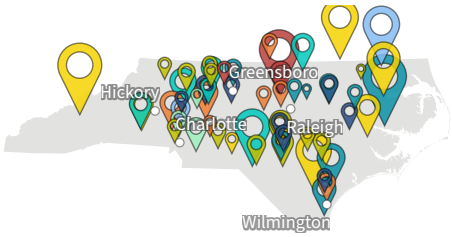
Current levels of air pollution from North Carolina's manufacturing facilities adversely impact public health and economic activity.

Health Event	*Estimated Annual Incidents from Facilities*		
	Chemicals	**Pulp and Paper**	**Total**
Premature deaths	18-36	64-119	82-155
ER Visits, respiratory	21	67	88
Asthma symptoms	9,934	28,517	38,451
Work loss days	1,958	3,888	5,846
School loss days	1,828	9,044	10,872
Total health costs*	$276M-$538M	$722 M-$1.3B	$1B-$1.9B
Lost economic activity**	$5.2M	$19.5M	$24.7 M

**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)

North Carolina industrial facilities



Facilities by industry

- Pulp and paper
- Chemicals
- Glass products
- Food and beverage
- Computers and electronics
- Cement and other nonmetallic materials
- Other manufacturing
- Iron and stell
- Other metals

Metric tons CO_2e

30K 100K 300K

Source: US EPA

data from the Energy Policy Simulator. If the state does not take action, by 2050, the manufacturing sector is forecast to emit similar levels of pollution as today. However, if the state incorporates the strategies outlined below, it could reduce manufacturing emissions to 7 MMT CO_2e.

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.

Strategies for emissions reduction

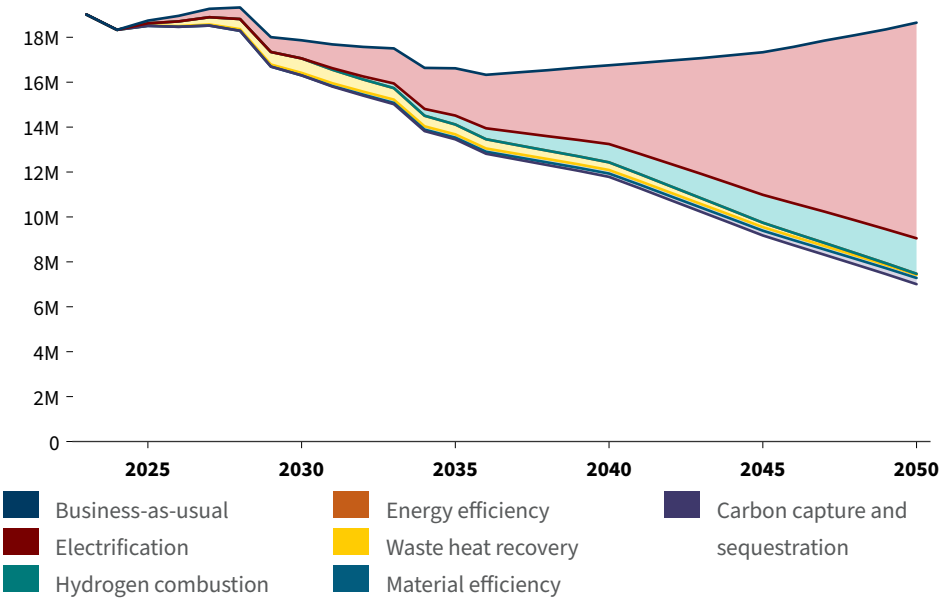
Modernizing facilities can support competitiveness in emerging markets while reducing air and climate pollution. Based on the Energy Policy Simulator, an open-source model for estimating the impacts of energy policies, the strategies with the greatest potential for reducing emissions in North Carolina are electrifying thermal processes, especially those requiring heat below 400°C, and deploying green hydrogen as a fuel source.

If nearly all industrial processes below 400°C are electrified by 2050, North Carolina can reduce emissions from manufacturing by a cumulative 92.5 MMT CO2e, or 68% 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 pulp and paper and certain chemicals.

Deploying green hydrogen as a fuel source is a longer-term opportunity to abate emissions from processes that require high-temperature heat. If the transition to hydrogen begins in 2031, at which time the cost of production is expected to fall 50%-60%, there is the potential to reduce cumulative statewide emissions by 17 MMT CO_2e by 2050.

Industrial emissions in North Carolina

Emissions from manufacturing have the potential to decline by 11.6 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 business-as-usual scenario corresponds to the Federal Policy Repeal & Rollback scenario, which is more representative of today's policy landscape, and assumes that North Carolina does not take additional action on 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	2.7	92.5	68.0%
Hydrogen Combustion	0.0	17.0	12.0%
Energy Efficiency	1.4	12.5	9.0%
Waste Heat Recovery	2.3	8.5	6.0%
Material Efficiency	0.4	3.4	2.0%
Carbon Capture and Sequestration	0.0	3.0	2.0%

These values were calculated using the North Carolina Energy Policy Simulator (EPS), and they assume both stringent implementation and carbon capture and sequestration and hydrogen combustion reaching technological readiness by 2031.

Source: RMI Analysis, Energy Policy Simulator

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

- Increasing the efficiency of industrial equipment, including updating heat pumps and compressors, and integrating advanced process control systems. Other technologies include enzyme-assisted refining and impulse drying. Energy efficiency is the quickest and most cost-effective mitigation strategy.
- Recovering waste heat using economizers and heat exchangers and converting it into usable energy.
- Using smarter design to reduce demand for new cement, food and beverage, and other manufactured goods – i.e., material efficiency.
- Prioritizing the use of low-carbon intensity methane in industries relying on high-heat processes while the infrastructure and supply for cleaner low carbon fuels is developed.

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. North Carolina's policymakers can support industrial competitiveness and decarbonization through policies that establish certainty, which involves setting standards, and providing support, including reducing the costs of technical interventions and increasing the value of low-emissions products.

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

Creating standards

- **State target setting** or mandates to direct the industry sector's emissions reductions.
- **Energy efficiency standards** for industry to drive development and deployment of energy-saving technologies, such as electrified Haber-Bosch processes for chemical production and infrared dryers for pulp and paper manufacturing.

Providing support

- **Technical assistance grants** to assist facilities in transitioning to low-emissions production. Technical assistance can help facilities overcome financial barriers, capacity constraints, or knowledge gaps in modernizing.
- **Developing hydrogen infrastructure**, including pipelines, storage facilities, and liquification plants, can provide the robust and resilient quality infrastructure needed to transition to green hydrogen as a fuel source.
- **Shift any remaining fossil fuel demand towards low methane intensity** resources by incentivizing the use of oil and gas that was produced with lower upstream emissions over other sources.

Adding value

- **A production tax credit (PTC) for clean industrial heat** would reward industrial facilities for meeting thermal energy needs with clean fuel sources, like electricity or green hydrogen, instead of fossil fuels. The credit can be structured per unit of clean heat delivered to an industrial process and increases clean fuel's cost competitiveness. A PTC for clean industrial heat may also incentivize black liquor gasification for generating heat and steam in pulp and paper facilities.
- **Labels for low-carbon products** based on an established certification process provide credible assurance to buyers. The use of labels helps manufacturers capitalize on emerging markets and partnerships that prioritize environmental responsibility.

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