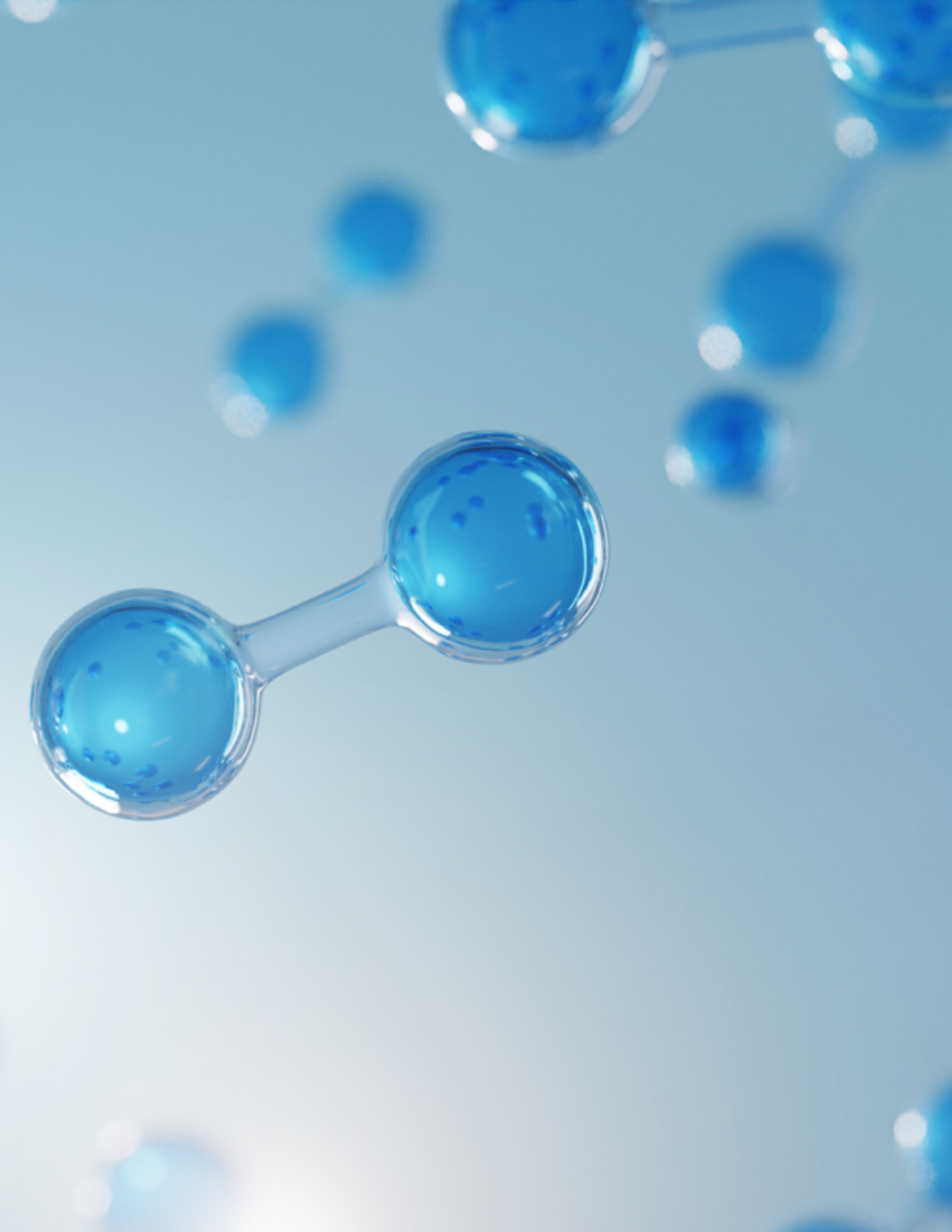
American Chemistry Council

Natural Gas

Its Key Role in a Strong Economy and a Lower Emissions Future

Natural Gas



A Message from Chris Jahn, President & CEO of the American Chemistry Council:

As the nation strives for a strong economy, an energy transition, and a lower emissions future, we must not lose sight of the importance of natural gas. This versatile resource supports U.S. chemical manufacturing growth and investment, a strong economy, a globally competitive manufacturing sector, and the creation of climate solutions. Natural gas and its infrastructure also have a role in certain emerging and potential lower-emissions technologies.

The American Chemistry Council (ACC) prepared this white paper to discuss the benefits of natural gas and why it should be recognized in energy and climate conversations.

Natural gas is vital to American chemistry and the manufacturing supply chain. U.S. chemical manufacturing uses natural gas for fuel and power and natural gas liquids (NGLs) as a feedstock. Abundant and affordable domestic supplies of natural gas have created a competitive advantage for the United States in the making of basic petrochemicals, and companies are investing in new production capacity here.[1] This investment benefits the national economy and local communities. Chemistry is positioned at the front end the manufacturing supply chain, and virtually all manufactured goods are directly touched by the business of chemistry.

Natural gas is used by every major sector of the U.S. economy – electric power, residential, transportation, industrial, and commercial.[2] Natural gas accounted for 32% of total U.S. energy consumption in 2021[3], and will remain a key energy source going forward. Nearly every sector will increase natural gas use between now and mid-century, according to the U.S. Energy Information Administration. By 2050, natural gas will be the largest global energy source.[4]

Natural gas supports the energy transition and a reliable, resilient energy delivery system. Fuel switching from coal to natural gas has helped reduce greenhouse gas emissions. In 2019, U.S. electric power sector CO_2 emissions were 32% lower than in 2005.[5] In the future, much of our nation's new generation capacity is expected to come from natural gas or renewables.[6] As other sources of energy (e.g., wind, solar) continue to come online with expanded access, natural gas can support grid reliability.[7]

Some emerging and potential lower-emissions technologies can be paired with natural gas. Hydrogen can be produced from natural gas, and it may be possible to convert natural gas pipelines to carry a blend of natural gas and hydrogen.[8] Energy-

efficient[9] combined heat and power (CHP) systems often rely on natural gas.[10] In the future, carbon capture, utilization, and storage (CCUS)[11]; direct air capture; and catalysis could be employed during electricity generation or in manufacturing processes using natural gas. Chemistry companies are among the leaders and participants[12] in exploring the use of lower-emissions technologies.

Natural gas empowers American chemistry to provide climate solutions. Solar panels and wind turbines, advanced battery storage, electric vehicles (EVs) and lightweight vehicle parts, and high-performance building materials are among the many energy-saving and renewable applications that rely on chemistry and plastics. Chemistry and plastics products and technologies often start with natural gas as an energy source or feedstock.

To fully realize the economic and environmental benefits of natural gas, our nation needs the right policies – those that encourage secure and reliable energy and electricity, new infrastructure, timely and efficient permitting, and the development and use of diverse energy sources and technologies. The Inflation Reduction Act (IRA) and the Bipartisan Infrastructure Law (BIL) offer exciting opportunities for investment and collaboration.

I hope this report is a helpful reference as you explore the ways natural gas supports a stronger economy and a lower emissions future.

Chris Jahn
President & CEO
American Chemistry Council

Natural Gas Supports...

A strong economy

- A more competitive U.S. manufacturing sector
- American chemistry growth and investment
- New jobs, payroll, and economic output
- More resilient supply chains

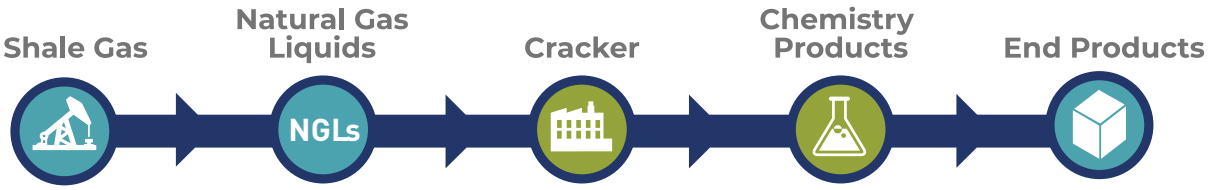
A lower emissions future

- Development and use of lower-emissions technologies
- An energy transition that accelerates reductions in GHG emissions
- A reliable and resilient energy delivery system
- Climate solutions enabled by chemistry and plastics

Natural gas is fundamental to American chemistry...

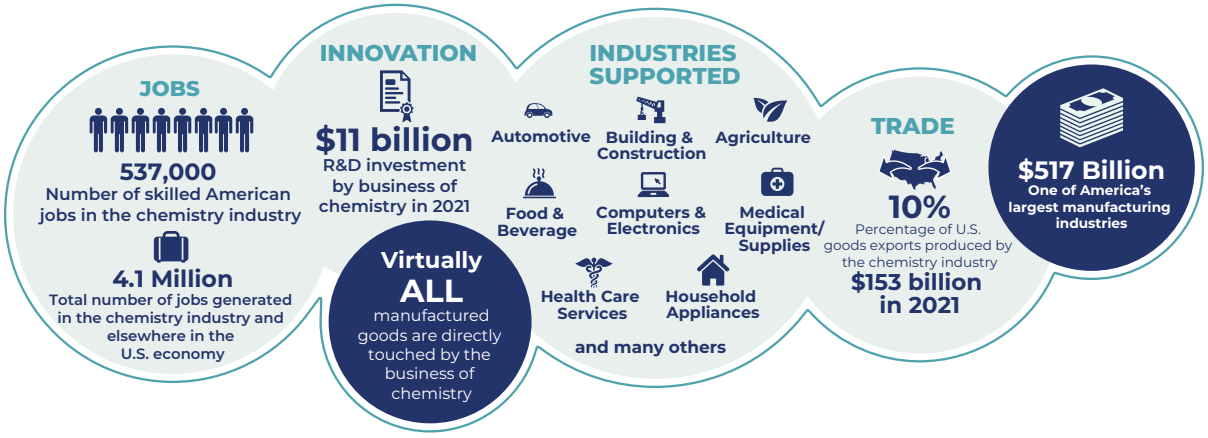
U.S. chemical manufacturers use natural gas for fuel and power at facilities and use NGLs (e.g., ethane) as the main feedstock.

During chemical processing, hydrocarbon molecules contained in natural gas are split apart and recombined to make valuable chemistry products.



...and the U.S. manufacturing supply chain.

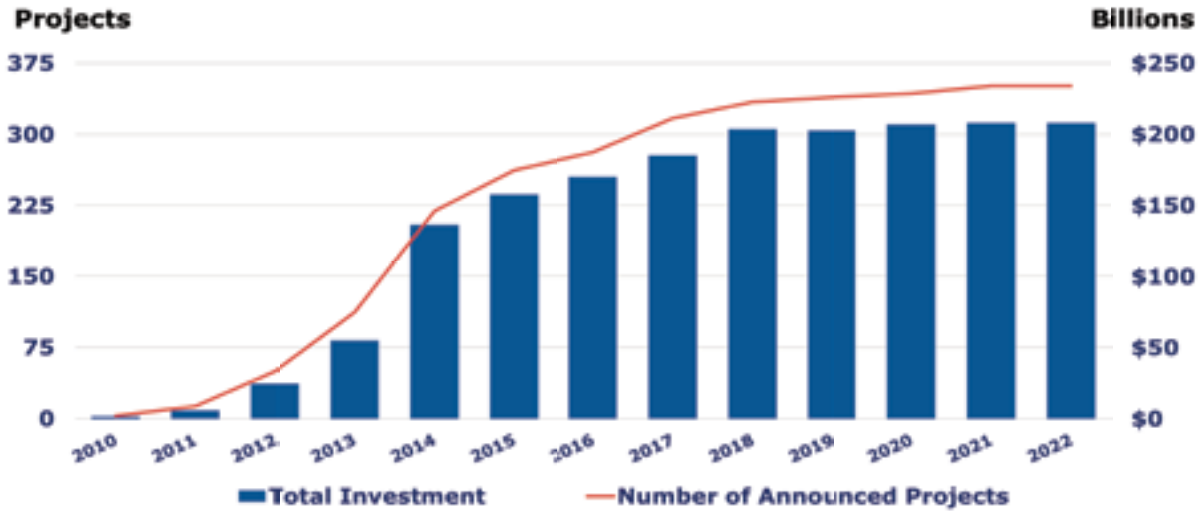
The chemical industry is positioned early in the manufacturing supply chain. Nearly every industry buys chemistry products and services. Virtually all manufactured goods are directly touched by the business of chemistry.



SOURCE: 2022 Guide to the Business of Chemistry, American Chemistry Council

Natural gas drives American chemistry growth…

Plentiful & affordable natural gas/NGLs are attracting chemical company investment from around the world.



SOURCE: ACC Analysis, 2010-2022

"U.S. chemical makers are transforming natural gas into a stronger economy and new jobs. Thanks to this versatile resource, American chemistry has experienced more than a decade of growth. Our new investment boosts output, employment, and payrolls nationally and in local communities."

— CHRIS JAHN

...and is used by major sectors of the U.S. economy.

Electric Power

- Natural gas is used to generate electricity and produce thermal output. Most of the electricity is used by other sectors and is included in each sector's total energy consumption.
- In 2021, natural gas comprised about 32% of primary energy consumed by the sector.
- The sector represented 37% of total U.S. natural gas consumption in 2021.[13]

Industrial

- Natural gas is used in process heating; CHP systems; as a feedstock for chemicals, fertilizer, and hydrogen; as a fuel for well, field, and lease operations; and as fuel in natural gas processing plants.
- In 2021, natural gas comprised about 34% of the energy consumed by the sector.
- The sector represented 33% of total U.S. natural gas consumption in 2021.[13]

Residential

- Natural gas is used in heating for buildings, hot water, cooking, clothes drying, and appliances.
- In 2021, natural gas comprised about 23% of the energy consumed by the sector.
- The sector represented 15% of total U.S. natural gas consumption in 2021.[13]

Commercial

- Natural gas is used in heating for buildings, hot water, refrigeration & cooling equipment, cooking, clothes drying, & outdoor lighting.
- In 2021, natural gas comprised about 19% of the energy consumed by the sector.
- The sector represented 11% of total U.S. natural gas consumption in 2021.[13]

Transportation

- Natural gas is used for pipeline and distribution operations and as a vehicle fuel as compressed natural gas and liquefied natural gas.
- In 2021, natural gas comprised about 4% of the energy consumed by the sector, of which 95% was for pipeline and distribution operations.
- The sector represented 3% of total U.S. natural gas consumption in 2021.[13']

Natural Gas Supports a Lower Emissions Future

Natural gas has an important role in the energy transition, a lower emissions future, and a reliable, resilient energy delivery system. Natural gas is a relatively clean burning fossil fuel, which has led to increased use for electric power generation and as a transportation fuel for fleet vehicles. Natural gas and its infrastructure are needed to expand renewable energy use, deploy, and employ innovative lower-emissions technologies, manufacture climate solutions, and meet the needs of a growing population and economy.

Natural gas is and will remain a vital energy source.

Lower-Emissions Electricity

Direct use of natural gas is a source of **back-up generation for renewables such as wind and solar.**

As deployment of renewable generation grows and the U.S. explores the "electrification" of transportation and some industrial processes, robust natural gas supplies and infrastructure **can help improve electric grid reliability and resiliency.**[14]

Increased natural gas use has helped reduce U.S. electric power and industrial sector GHG emissions over the past 15 years.[15] Natural gas will remain a key source of feedstock and a reliable source of power and heat for households, businesses, and industry.

> "Chemical companies, including many ACC members, are among the leaders and participants in exploring the use of innovative technologies to help reduce emissions in the manufacturing sector and beyond."
>
> **— CHRIS JAHN**

Clean Hydrogen

Hydrogen is a lower-emissions energy source[16] that can be burned in power plants and heavy-duty vehicles; used in fuel cells to generate electricity for cars, homes, and buildings; or used as an industrial feedstock. Hydrogen can be produced from a variety of resources, **including natural gas**, nuclear power, biomass, and renewable power (e.g., solar and wind).[17]

Chemical manufacturers are exploring and developing hydrogen as part of their strategies to reduce GHG emissions. The use of lower- emissions sources of heat such as hydrogen could help transform steam cracking and other energy-intensive processes.[18]

Large-scale deployment of hydrogen will require infrastructure to transport it. **There is growing interest in using natural gas pipelines** for this purpose, potentially by converting pipelines to carry **a blend of natural gas and hydrogen.** Researchers are also exploring the transport of pure hydrogen, an approach that would require more extensive changes to the pipeline.[19]

Carbon Capture, Utilization, and Storage (CCUS)

In the future, CCUS technologies could help reduce emissions from coal and **natural gas-fired power plants**, biomass energy facilities, synthetic fuel plants, and industrial sources. CCUS could be used to **produce clean hydrogen from natural gas** or coal.

The chemical sector is a promising emerging and future market for CCUS technologies and utilization of captured CO_2[20], where these innovations could help reduce carbon emissions during the production of hydrogen, ammonia, and methanol as well as high-value chemicals like ethylene, propylene, and aromatics.

While chemistry companies are exploring bio-based and recycled feedstocks, new low or no-emissions energy sources, and process electrification, these alternatives are in the developmental stage. **Today, natural gas is often the only adequate source of heat energy available for heat-intensive chemical processes.**[21] CCUS use could be a smart way for chemical makers to maintain U.S. production capacity while reducing emissions.

Captured CO_2 is used to extract additional oil from developed fields (i.e., enhanced oil recovery) and as a feedstock to make building materials. It has potential uses as a feedstock for fuels, chemicals, plastics, and a variety of commercial products.

Combined Heat and Power (CHP)

The business of chemistry is a leader in the use of CHP, a highly efficient process for generating heat and electricity on-site. **Most CHP facilities use natural gas to create two forms of energy with the same amount of fuel.** They are often twice as efficient as older coal-burning electric utilities. DOE projects significant potential for additional deployment in the industrial sector, with almost one-third of this new capacity coming from the chemical sector.[22]

> **"While the chemical industry is energy intensive, ACC members are taking action to reduce the industrial GHG intensity of their operations, supply chains, and products and are deploying commercially available solutions to reduce emissions."**
>
> **— CHRIS JAHN**

Climate Solutions — Enabled by Chemistry

Chemistry and plastics-based solutions and technologies are used to make many of the things that help society save energy and reduce emissions. Wind turbines, solar panels, high-capacity battery storage, electric vehicles (EVs) and infrastructure, lightweight vehicle parts, and high-performance building materials are good examples. **Often, these chemistries start with natural gas.**

Many traditional carbon capture technologies rely on amine scrubbing chemistries and other product chemistries to capture and purify CO_2 streams. New chemistries may help improve CCUS efficiency and reduce its cost.[23]

"Natural gas provides much of the energy used to run complex chemical operations. For many companies, access to affordable, industrial-scale supplies of natural gas and NGLs is critical to the competitiveness of U.S. operations."

— CHRIS JAHN

Policy Priorities

Energy Security, Reliability, & Resilience

Enact and implement policies to ensure secure supplies and a reliable, resilient energy system

- Promote approaches that encourage development, deployment, and use of diverse sources
- Implement responsible, state-based regulations that enable robust natural gas production
- Promote policies to improve energy efficiency in all sectors of the economy

Energy & Manufacturing Innovation

Encourage development and adoption of innovative lower-emissions technologies

- Support a broad range of sources, technologies, solutions, programs, and policies
- Expedite implementation of research and funding programs for innovative technologies
- Facilitate public-private collaboration to overcome barriers to development, deployment, and use
- Boost scientific and technical resources and support workforce development
- Ensure effective coordination across government agencies and programs
- Support a robust, competitive U.S. manufacturing sector that can continue to drive economic growth, create jobs, and provide necessary products

Infrastructure Development

Expedite the building of reliable infrastructure to transport diverse energy sources

- Support expansion of natural gas pipelines and other infrastructure
- Support development of high-capacity renewable electricity generation, transmission, and distribution infrastructure
- Support the building of CO2 pipelines and other infrastructure for CCUS and direct air capture
- Support development of a distribution network to connect industrial users with suppliers of hydrogen and connect carbon capture facilities with use markets or sequestration sites
- Collaborate with government agencies, states, and local communities
- Implement research and funding programs for lower emissions hubs and infrastructure
- Update permitting policies to ensure timely, transparent, and efficient review of diverse energy production, energy infrastructure, and manufacturing projects

Free and Open Trade

Adopt and implement approaches that support free trade and secure, resilient supply chains

- Open new markets for U.S. exports of innovative chemicals and plastics
- Deliver much-needed tariff relief to U.S. businesses and consumers
- Reduce and prevent non-tariff barriers to trade through greater regulatory cooperation in key regions and markets
- Cultivate resilient and integrated global supply chains, particularly with key trading partners
- Modernize the World Trade Organization and the rules-based international trading system

Footnotes

1. Infographic: "Natural Gas and American Chemistry," American Chemistry Council, August 31, 2022
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11. "A New Era for CCUS: CCUS In Clean Energy Transitions," International Energy Agency, 2022
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15. "Electric Power Sector CO2 Emissions Drop As Generation Mix Shifts from Coal to Natural Gas," U.S. Energy Information Administration, June 9, 2021
16. Burning hydrogen, or reacting it in fuel cells, does not produce CO2. Fuel Cells | Department of Energy
17. "Hydrogen Production Pathways," Hydrogen and Fuel Cell Technologies Office, U.S. Department of Energy
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22. Ibid, p. 3
23. Ibid, p. 3

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