

A New Opportunity for European Energy-Intensive Manufacturers

THE SHALE CRESCENT USA ENERGY/FEEDSTOCK ADVANTAGE

March 2024: A Report by Shale Crescent USA



Introduction

There exists a new opportunity for European energy-intensive manufacturers to capitalize on low-cost American natural gas and natural gas liquids (feedstock). Manufacturers the world over are actively searching for reliable supplies of affordable energy and petrochemical feedstocks. The U.S. possesses energy in abundance. However, the sources of energy are not spread evenly across the country. There is a prime industrial region with abundant low-cost natural gas and natural gas liquids. **The Shale Crescent USA (Ohio, West Virginia, Pennsylvania) presents a new investment opportunity and feedstock lifeline for the European petrochemical industry.**

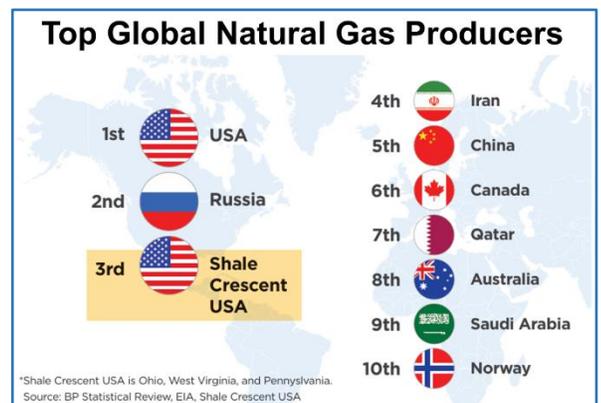
Feedstock and energy are the largest cost drivers of petrochemical-based goods, and they have a dramatic impact on profitability. **The Shale Crescent USA (SCUSA) has the lowest natural gas prices in the industrialized world.** This report demonstrates that the Shale Crescent USA region's proximity to low-cost raw materials coupled with direct access to American consumer markets is unique and these two factors provide manufacturers with significant emissions and cost reductions. **These world class assets are fundamental and will continue for the foreseeable future.**

Abundant U.S. energy, favorable U.S. industrial policies, and increasing problems with the Chinese manufacturing model are stirring global investment into the U.S. market. European manufacturers are committing to significant investments. **There is a growing opportunity for European-based manufacturers to capitalize on the U.S.'s low-cost energy & markets while also supporting European-based operations.** As Germany is the industrial heartland of Europe, the Shale Crescent USA is the industrial heartland of America.

What has changed: Location of global energy sources and price disparity

The global economy has changed drastically in recent years. **Historically, Europe has relied on Russian energy, a China-driven customer base, and American security to operate efficiently. This is no longer a reality:** Russian energy is limited; economic relations with China are unstable; and the U.S. is prioritizing domestic investments. This paradigm shift favoring American operations has accelerated in recent years.

The shale gas revolution in America has led to low-cost natural gas and natural gas liquids. If Ohio, West Virginia, and Pennsylvania (SCUSA) were a country, **they would be the third greatest natural gas producing country in the world.** SCUSA combined now produce over one-third of the American



natural gas supply, and they produce more natural gas than Texas. Europe is energy-scarce and is reliant on global supply chains to import LNG and feedstocks.

The Shale Crescent USA is the only region in the world where an energy intensive manufacturer can build on top of their feedstock supply and in the center of their customers, thus eliminating the costs and emissions associated with transporting feedstock and finished products. In 2023, natural gas prices in Europe averaged \$14.48 per million British thermal units (MMBtu). The average price in Asia was \$15.46 per MMBtu, and in the U.S. it was \$2.88 per MMBtu. Compare this to SCUSA, where the average 2023 price of natural gas was \$1.84 per MMBtu, the lowest in the industrialized world. **European Natural Gas on average was 8 times greater than the price in the SCUSA region.** Since the advent of the shale gas revolution in 2008, natural gas prices have declined so markedly that in the SCUSA region the MMBtu barrel of oil energy equivalent has sold for around \$15.00. Compare this to the 2023 average global oil price of \$80.00 per barrel.

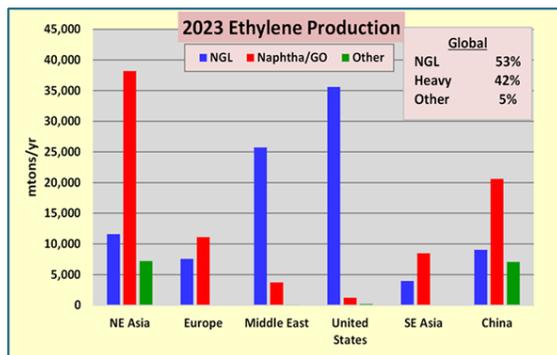
What is the opportunity: Servicing U.S. and European markets - Exporting intermediary production

Germany and other industrial economies throughout Europe are concerned that the reindustrialization of the U.S. will lead to deindustrialization in Europe. This does not have to be the case. **A new model is developing that creates 'win-win' opportunities for both the U.S. and Europe.** The rest of the world covets low-cost U.S. LNG, but America's infrastructure and policy have impeded the export of energy molecules in their raw form. However, there is another method to take advantage of U.S. energy, as follows: **1)** A European-based manufacturer strategically expands into the SCUSA market; **2)** The manufacturer consumes low-cost natural gas and feedstocks to produce a higher intermediary product such as ethylene, propylene, ammonia, methanol, polyethylene, polypropylene, etc.; **3A)** A percentage of the intermediary product is sold into the robust U.S. industrial market; **3B)** The intermediary product is transported by barge or rail to the Gulf Coast or East Coast ports and exported to Europe; **4)** The intermediary product is sold directly into the European market or used as feedstock in the production of other products. **The ability to transport and export product out of the Shale Crescent USA region is common and logistically friendly.**



A case study on ethylene

The SCUSA region is ideally positioned for substantial expansion of petrochemical assets, which would unlock the value chain of ethane, ethylene, and various ethylene derivatives. Over the next decade and beyond, *Ethylene Strategies International* predicts that rising global crude prices coupled with low U.S. natural gas prices will give ethylene production from NGL's a competitive edge, particularly in North America. Global markets for ethylene and ethylene derivatives are anticipated to grow faster than GDP. Marginal cost producers will continue to face significant financial pressures from low-cost producers. U.S. ethane supply is a very competitive feedstock into international crackers. Monthly U.S. export volumes of ethane exceeded 500,000 barrels per day (b/d) multiple times in 2023 with approximately 100,000 b/d consistently heading to Europe (U.K., Norway, Sweden, & Belgium). U.S. ethylene is also exported to Europe & normally lands in Northwest Europe (NWE) below the European spot price for ethylene.



Why now?

The accessibility of American shale gas, reduced emissions opportunities, prioritization of 'Made in America' industrial policies, increasing volatility of Asian-based global supply chains, ease of transportation and exports, are long-term fundamental shifts that are disrupting the current global manufacturing model. As a result, major U.S. investments are underway.

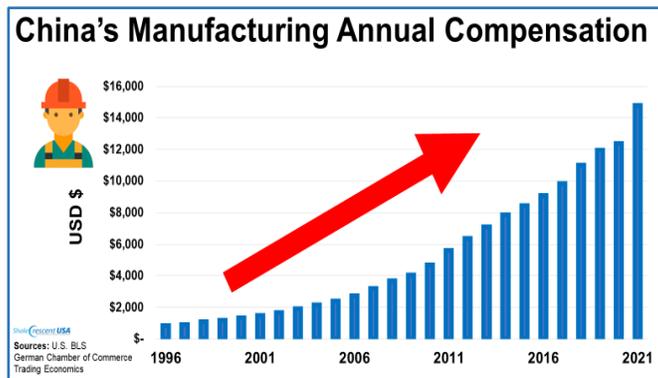
Sustainability and emissions advantages: ESG (Environment, Social, and Governance) performance has become an integral part of business operations and investment decisions. This report highlights the natural ESG advantage that SCUSA-based manufacturers enjoy based on location and type of feedstock used. Manufacturing in the region eliminates the significant



transportation emissions that burden many global-based manufacturers who must import raw materials and export finished goods via transcontinental supply chains. SCUSA located manufacturers are already natural leaders in sustainability and can significantly reduce their environmental impact without having to change their core business practices. New entrants have a timely opportunity to capitalize on this emissions advantage.

U.S. industrial policy: ‘Made in America’ is a growing priority. As well as the current administration, each of the past two presidential administrations prioritized American manufacturing in its own way. New bills introduced during the Biden administration, such as the Investment and Jobs Act (IIJA), Inflation Reduction Act (IRA), and CHIPS Act, have stimulated new manufacturing investment. These bills have established thresholds of ‘Made in America’ content required to qualify for tax subsidies. The nearly \$1 trillion IRA aims to stimulate investment into many different new energy technologies. In the bill, are subsidies for manufacturers as long as certain ‘Made in America’ criteria are met. **European manufacturers of all types are eligible and thus they can capitalize on these significant incentives.**

China’s eroding manufacturing advantages: China, the manufacturer of the world, is losing its historic labor cost advantage. Manufacturing wages over the past 25 years have increased more than tenfold, and they continue to rise. Geopolitical concerns and strict government oversight are also discouraging new investment. **European and U.S. emissions goals do not align with the Chinese manufacturing model.** In China, coal is the primary source of energy, and naphtha is the feedstock for many petrochemicals. Consequently, Chinese production creates significantly more emissions than equivalent operations in the U.S. **The U.S. as a whole produces less than half the CO2 emissions that China produces.**



Exports and U.S. transportation: The U.S. benefits from robust river and rail systems. Goods are easily moved throughout the country and exported. **As Germany is the industrial heartland of Europe, the Shale Crescent USA is the industrial heartland of America.** The SCUSA region sits in an area containing half of the U.S. population and is considered to be the country’s logistical center. Chemical products from the region are distributed throughout the country and across the globe. The manufacturing facilities of many petrochemical companies are located along the Ohio River and/or adjacent to rail corridors. **Like the Danube and Rhine rivers, the Ohio River is large and can accommodate significant commercial activity such as transporting finished products by barge.** There are many major East Coast ports capable of transloading and shipping petrochemical-based products. Exporting products to Europe is a common and logistically friendly operation.



Why Shale Crescent USA?

Shale Crescent USA is the only area of the world where an energy intensive manufacturer can build on top of their feedstock supply and also be located in the center of a concentrated customer base, thus minimizing transportation costs and associated emissions. **The advantages are fundamental and will continue for the foreseeable future.**

European manufacturers are well positioned to capitalize on new strategic investment opportunities to expand into the American market. The transportation and export infrastructure of the U.S. also makes it feasible for European-based operations to import intermediary products sourced and produced from low-cost U.S. natural gas and feedstock. Companies of different types and all over the world are currently pursuing this model. This report does not provide a comprehensive study or business plan for investment in the Shale Crescent USA; rather, it aims to create awareness of growing opportunities for European-based energy-intensive manufacturers to capitalize on world-class assets.



NEXT STEPS

This research 'A New Opportunity for European Energy-Intensive Manufacturing' is available to all manufacturing operations.

Supporting materials available at www.shalecrescentusa.com:

- Executive Summary
- Complete 30 Page Report
- PowerPoint Graphs and Tables

ABOUT SHALE CRESCENT USA

Shale Crescent USA (SCUSA) has recently expanded its research and prospect development to include downstream plastics manufacturing, to support data-driven investment decisions and attract manufacturing operations to the region. **Shared proximity to raw materials and consumer markets make Shale Crescent USA one of the most economic and sustainable petrochemical and manufacturing hubs in the world.** Eliminating global transportation and significantly decreasing national transportation results in reduced costs, reduced global emissions, energy efficiency and inventory advantages.

Since 2016, SCUSA has designed and commissioned industry research that examines key indicators for potential investment in the energy and manufacturing supply chain. **This investigation – that examines factors related to supply & demand, manufacturing operations, international imports, logistics, and labor - has produced data that show Shale Crescent USA is one of the most profitable & resilient locations to manufacture energy intensive products.** SCUSA research for manufacturers and associated industries include:

- (2016) **The Natural Gas Resource Advantage of the Shale Crescent USA**
- (2017) **Understanding U.S. Chemical Industry Investments**
- (2018) **Benefits, Risks, & Estimated Cash Flows: Ethylene Project in the SCUSA vs the U.S. Gulf**
- (2019) **Estimated Logistics Benefits of the SCUSA vs U.S. Gulf for Natural Gas, Propane, & Butane**
- (2020) **Natural Gas Savings to U.S. End-Users: Industrial, Commercial, Electric, Residential**
- (2020) **U.S. Manufacturing Jobs: Directly tied to Oil and Gas Production in the Shale Crescent USA**
- (2021) **Extreme Weather Impacts on the Industrial U.S. Gulf Coast. SCUSA Advantaged**
- (2023) **Global Economic Factors Favor U.S. Plastic-Product Manufacturing over China- Based Operations**
- (2024) **A New Opportunity for European Energy-Intensive Manufacturers**
- (2024) **Proposed: ESG Enhancer: Emissions Savings Created by Eliminating Long-haul Transportation**

Shale Crescent USA (SCUSA) is a tax exempt 501(c)4 organization with leadership that includes a network of senior level management and experts in the energy industry, manufacturing industry, economic development, academia, and private investment. **SCUSA was established to promote the region of Ohio, Pennsylvania, and West Virginia that sits atop two of the most prolific natural gas fields (the Marcellus & Utica) in the United States. This new energy supply is disrupting traditional value chains and prompting domestic manufacturing operations to reexamine their competitive advantage.**

For more (no cost) industry research, to speak with members of our team,
or to connect with our broad network of leading companies in the
Energy, Transportation, Manufacturing, and Site Selection industries,

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