

# Green Steel in the Ohio River Valley

*The Timing is Right for a Rebirth of a Clean, Green Steel Industry*



## SUMMARY

For more than a century, steel has played an important role in the economy and culture of the Ohio River Valley. But the traditional method of making steel, known as **BF-BOF (blast furnace-blast oxygen furnace)**, requires lots of energy and produces lots of climate-warming emissions. The iron and steel sector is currently responsible for about 7% of global greenhouse gas (GHG) emissions, according to the International Energy Agency.

Shifting to fossil fuel-free steelmaking could reduce greenhouse gas emissions, boost jobs, and grow the region's economy. **Fossil fuel-free DRI-EAF (direct reduced iron-electric arc furnace)** steelmaking uses green hydrogen—created with wind and solar energy—to make steel with nearly zero climate-warming emissions.

A new report shows why investing in fossil fuel-free steelmaking is a win for the climate *and* the economy. The report looks at Mon Valley Works, a steelmaking facility in southwestern Pennsylvania, as a model for transitioning from carbon-intensive **BF-BOF** steelmaking to **fossil fuel-free DRI-EAF** steelmaking. Here's what's at stake:

→ Continuing “business as usual” with traditional **BF-BOF** steelmaking will see total regional jobs supported by steelmaking to fall by 30% by 2031 due to economic forces like outsourcing and automation.

→ Shifting to **fossil fuel-free DRI-EAF** steelmaking, powered by new wind and solar infrastructure, would instead increase total regional jobs supported by steelmaking by 27% to 43% by 2031.

**Figure 1:** Total Regional Steelmaking Jobs, Ohio River Valley, 2023-2031



Jobs supported by the shift to fossil fuel-free steelmaking would mostly stay in the Ohio River Valley. And as businesses and industries across the globe try to reduce carbon emissions, developing wind and solar energy infrastructure would give the region a “first-mover advantage” by attracting firms in search of renewable power sources.

## THE STATE OF THE STEEL INDUSTRY

**Demand for steel is growing—modestly—around the world.**

Global steel production grew by 3% per year from 2010 to 2020 and nearly 4% from 2020 to 2021. Analysts say steel demand will grow by 1% to 2% per year through 2035. The world economy needs steel, but traditional **BF-BOF** steelmaking faces serious economic challenges.

**BF-BOF** steelmaking jobs are declining & expected to fall.

US steel manufacturers shed 12,500 jobs from 2015 to 2020. Globalization, market shifts, and automation could be to blame. Data shows steelmakers are becoming increasingly efficient, requiring *fewer* direct jobs to produce *more* steel. These trends suggest traditional steelmaking jobs could continue to decline in coming decades.

**Industry leaders are looking to cut emissions due to market pressure.**

Steelmaking produces nearly a quarter of the world’s industrial emissions. Customer demand for low-emissions steel, pressure from environmental regulators, and the growing popularity of sustainable investments have forced many steel companies to promise to reduce industry emissions.

**Federal legislation could boost US steel production.**

The Bipartisan Infrastructure Law, the Inflation Reduction Act, and the CHIPS and Science Act outline federal investments in infrastructure, manufacturing, and renewable energy that will boost demand for American-made steel.

A BETTER WAY TO MAKE STEEL

Traditional **BF-BOF** steelmaking heats a blast furnace with concentrated coal to melt iron ore. The melted ore is then processed into steel hot metal in a basic oxygen furnace. The process uses lots of energy and generates up to 2.2 tons of CO<sub>2</sub> per ton of steel.

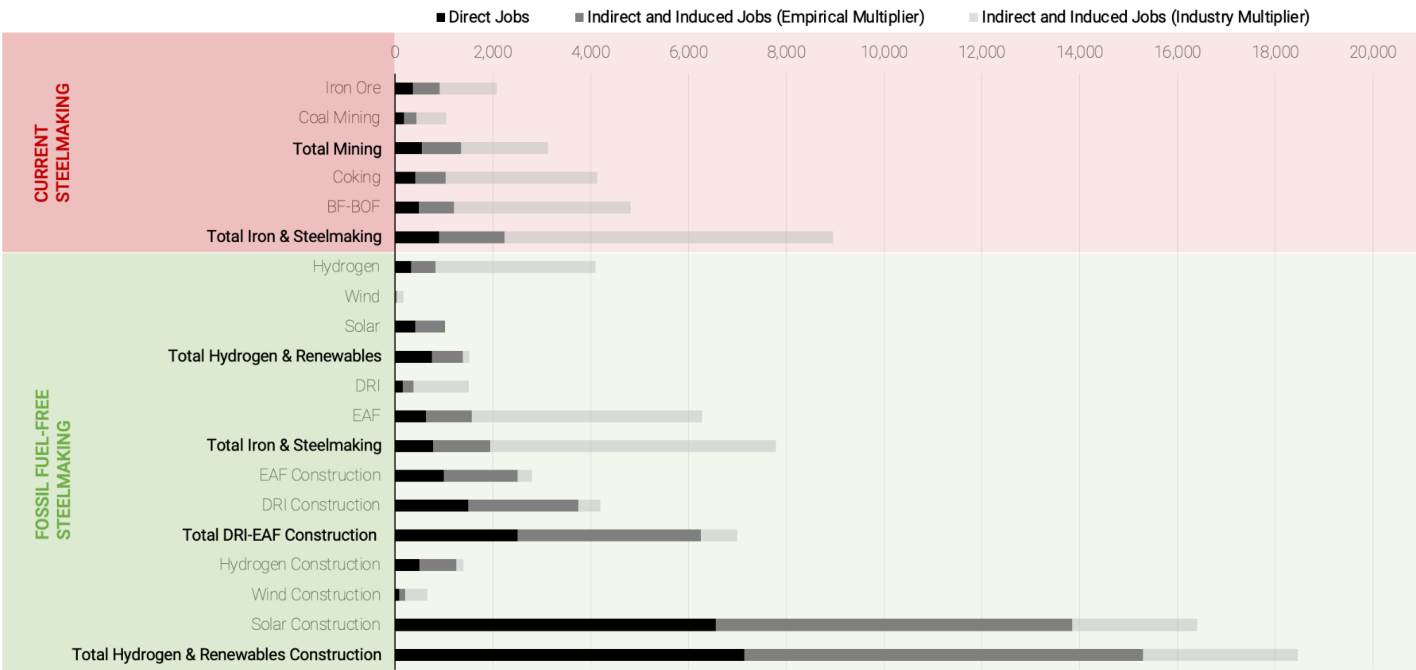
**Fossil fuel-free DRI-EAF** steelmaking uses green hydrogen—generated entirely from renewable energy—to “reduce,” or process, iron ore. A renewable-powered electric arc furnace melts the “direct reduced iron” into crude steel. Electric arc furnaces can also melt recycled “scrap” steel. If the **DRI-EAF** process is powered with renewable wind or solar energy, it produces nearly zero carbon emissions.

ECONOMIC IMPACTS

Traditional steelmaking jobs are in decline due to automation, outsourcing, and other market forces. Continuing “business as usual” with traditional **BF-BOF** steelmaking would yield 1,858 total regional jobs by 2031, a net loss of more than 800 steelmaking jobs. A transition to **fossil fuel-free DRI-EAF** steelmaking, powered by new wind and solar infrastructure, would yield 3,820 total regional jobs by 2031, a net *increase* of nearly 1,150 jobs.

*These estimates use “multipliers,” or formulas designed to predict employment impact, verified by other economists. They reflect empirical and relatively conservative assumptions. The total regional job growth under a transition to fossil fuel-free steelmaking could be even greater according to more optimistic multipliers typically used by the steel industry (see Figure 3).*

Figure 3: Jobs Estimates Comparison, Fossil Fuel-Free Steelmaking vs. Current Steelmaking Methods



Source: Ohio River Valley Institute

## WHY THE OHIO RIVER VALLEY IS PRIMED FOR A FOSSIL FUEL-FREE STEEL TRANSITION

The Ohio River Valley has a unique set of resources that can power a transition to **fossil fuel-free DRI-EAF** steelmaking. Taking advantage of these resources—and moving quickly to support the new, growing green manufacturing sector—could help the region become a clean industry ‘hub.’

- **Access to iron ore**

Iron ore is a crucial steelmaking ingredient. The Ohio River Valley has ready access to iron ore supplies in Minnesota.

- **Access to water**

Water is used in both traditional **BF-BOF** steelmaking and **fossil fuel-free DRI-EAF** steelmaking. The Ohio River and its tributaries can power steelmaking facilities and help transport steel to markets and buyers.

- **An experienced workforce & federally funded training programs**

Thanks to a legacy of coal mining and steel production, the region has many workers with the right experience to jumpstart the transition to green industry. And, communities across the Ohio River Valley can take advantage of federal rural economic development funding to train or retrain workers to make fossil fuel-free steel.

- **Wind & solar potential**

Southwestern Pennsylvania has high potential for the development of wind power. The region has about 2,200 MW of wind energy potential, half of which is achievable by 2050. The region also has about 20,000 MW of utility-scale solar energy potential, about 10% of which could be deployed by 2050.

- **Green hydrogen potential**

**DRI-EAF** steelmaking uses green hydrogen—made from renewable energy—to power the “reduction” of iron ore. Constructing a renewable-powered green hydrogen hub in the region could create a hydrogen supply for **DRI-EAF** facilities. A green hydrogen hub would also boost the effort to develop renewable energy capacity in the Ohio River Valley and improve the reliability of the power grid. The geology of the Ohio River Valley is well-suited for underground hydrogen storage, an important part of hub plans.

- **Federal incentives for hydrogen & renewable energy development**

Recent federal legislation, such as the Inflation Reduction Act, the Bipartisan Infrastructure Law, and the CHIPS Act, outline billions of dollars in federal funding and incentives for green hydrogen and renewable energy development.

## OPPORTUNITIES

The fossil fuel-free steelmaking industry promises enormous potential for jobs and economic growth. It can also provide health benefits, protect the climate and the environment, and improve residents’ quality of life.

- **Lower carbon emissions**

Replacing Pennsylvania’s **BF-BOF** steelmaking with **fossil fuel-free DRI-EAF** steelmaking will cut the state’s industrial sector emissions by 4 million metric tons of carbon dioxide equivalent.

- **Better health & quality of life**

Reducing carbon emissions will lower the risk of pollution-related health harms, like asthma and other respiratory problems, and make the Ohio River Valley a cleaner, safer, better place to live.

- **Cost savings**

Research shows a transition to green steelmaking would save Pennsylvania \$380 million in health, community, and environmental costs as carbon emissions fall.

- **Population growth & new economic activity**

Cutting emissions could draw new residents to live, work, and spend in the region, boosting economic activity.

## **CHALLENGES**

A transition to **fossil fuel-free DRI-EAF** steelmaking offers many advantages. Maximizing the economic and health benefits of the transition will require careful planning and smart investments.

- **Fossil fuel-free steel will require a large investment in renewable energy.**

Making steel with zero emissions will require a significant expansion of renewable energy infrastructure. But the region is well-suited for the challenge. Southwestern Pennsylvania offers lots of wind energy. The region can also provide solar power. Investing in these renewable power sources can create jobs and attract other green industries, growing the regional economy.

- **Approving new renewable power projects could take time.**

The PJM electricity market, which serves the Ohio River Valley region, is currently reviewing a backlog of thousands of new power projects. Approving and connecting new renewable power sources to the grid could take up to two years.

- **Developers must make sure the industry is truly emission-free from the start.**

The region must make sure renewable power development for green hydrogen and **DRI-EAF** steelmaking doesn't accidentally increase emissions or delay efforts to decarbonize the power grid. Tracking the emissions of the regional power grid is difficult. The grid will also take time to decarbonize. Connecting facilities that produce green hydrogen *directly* to renewable power sources—like solar panels or wind turbines—instead of the grid can ensure green hydrogen is produced with zero carbon emissions right away.

## **CONCLUSION**

Current **BF-BOF** steelmaking is in decline. Green manufacturing, including **fossil fuel-free DRI-EAF** steelmaking, is a new and growing industry with great economic potential. Investing in fossil fuel-free steelmaking can create hundreds of jobs, improve quality of life, and protect public health, the climate, and the environment.

Many communities are trying to replicate the economic success of regions like the Silicon Valley. Smart investments can turn the Ohio River Valley into tomorrow's "Clean Energy Valley," one of the world's very first green manufacturing hubs.