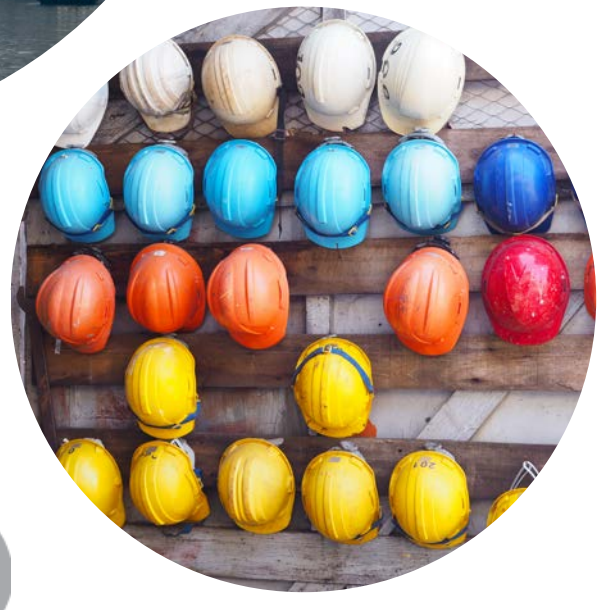
The American Steel Industry



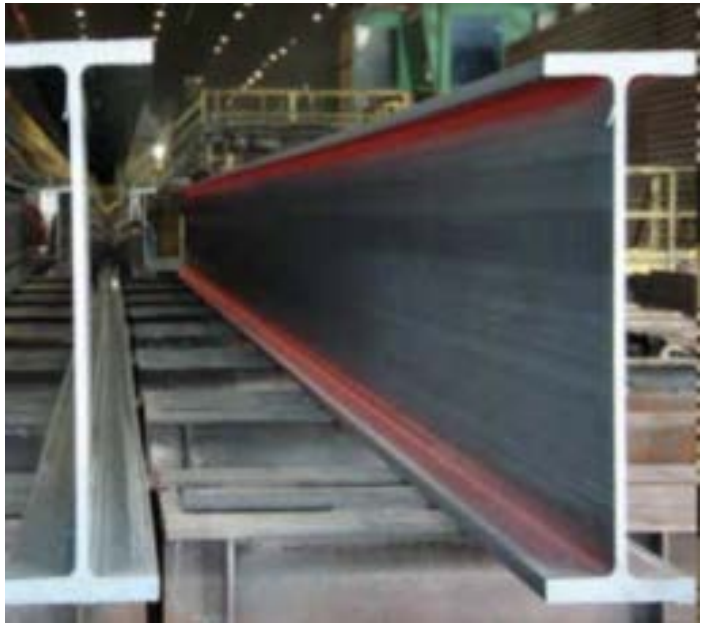
- Is essential to U.S. national and economic security and critical infrastructure
- Supports nearly two million American jobs
- Is the cleanest and most energy efficient of the major steel industries in the world

Sustainable Steel

- Steel is vital to many aspects of daily life
  - Enables infrastructure projects that provide efficient transportation and safe water distribution
  - Supports construction of wind, solar and tidal renewable energy projects, as well as energy distribution and transmission
  - Provides over 70% of the weight of a typical large wind turbine
  - Stainless steel is vital to industries like solar power, biofuels, wind energy, sustainable construction, low-carbon transportation and sea-water purification

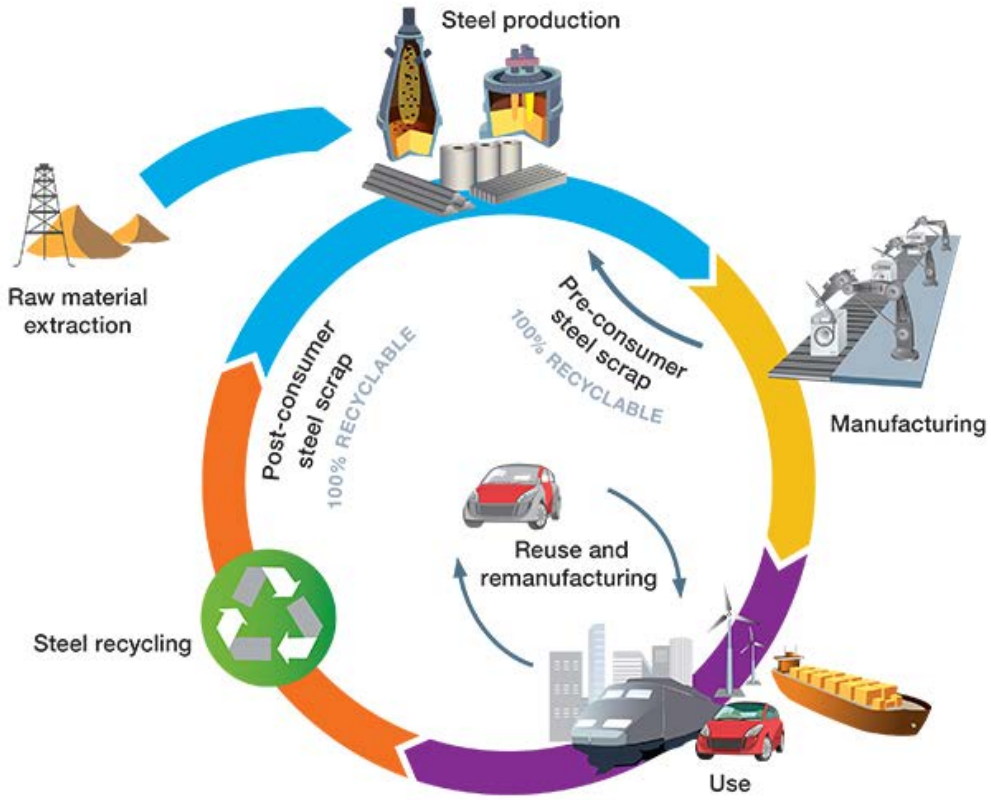
Sustainable Steel

- Steel can be recycled without loss of inherent properties across multiple applications
  - Steel is the most recycled material on the planet
  - A steel beam can become another steel beam, or a refrigerator, car door, or roof panel
  - 60 to 80 million tons of steel scrap are recycled annually, with over 1 billion tons recycled in the last 30 years
  - Some steel construction products, such as structural sections and rebar, are produced from over 90% recycled steel

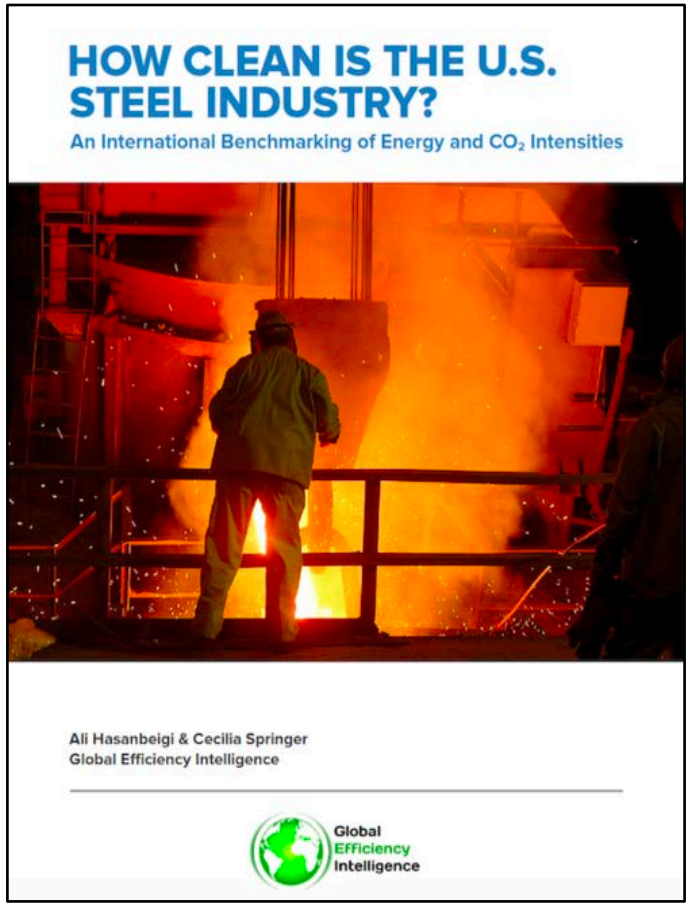


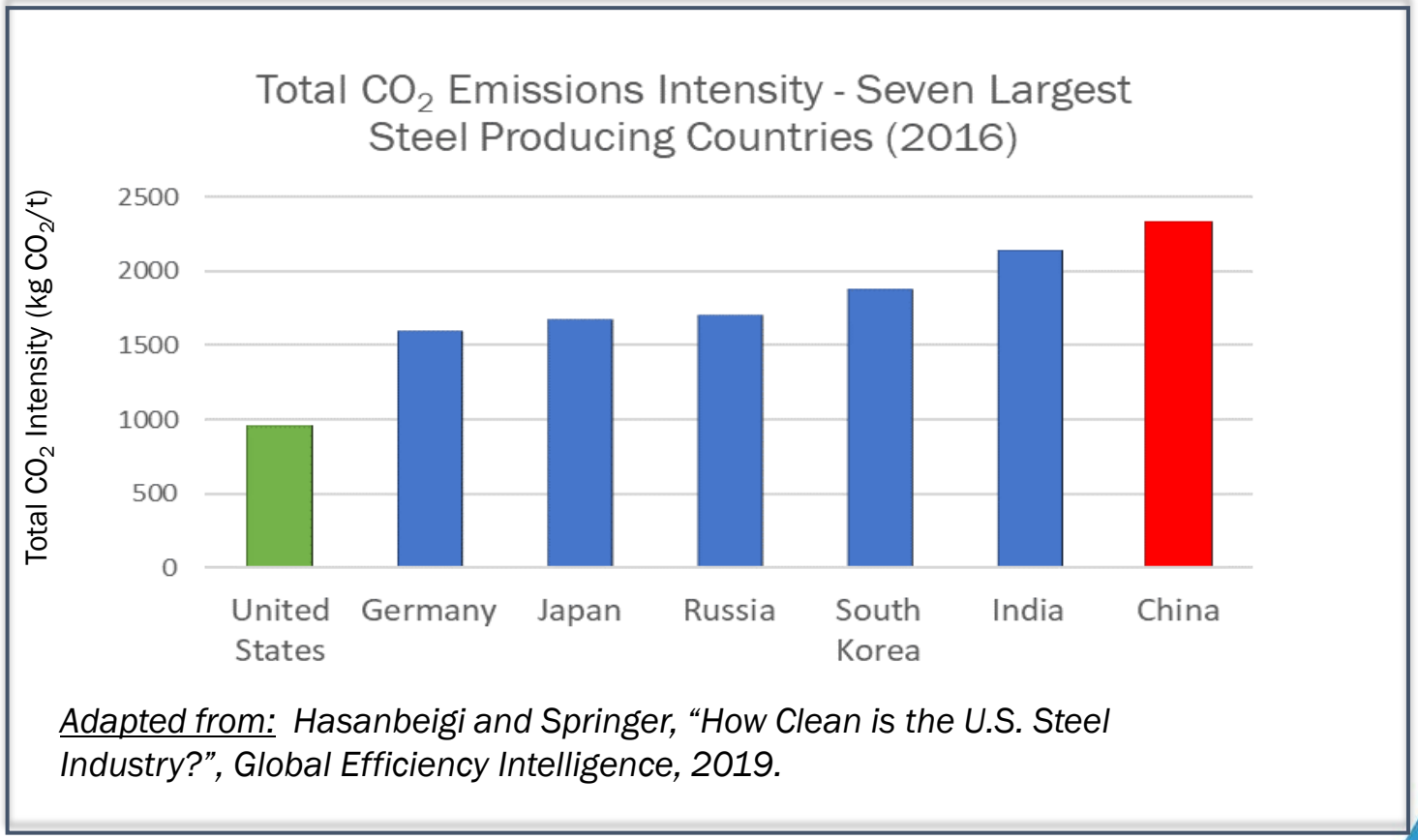
Sustainable Steel

- Steel is a good fit for the circular economy:
  - Contains recycled content, and can be continuously recycled
  - Durable and conducive to reuse and remanufacturing
  - Designed for flexibility and easy disassembly
  - New steel grades allow greater design efficiency (same function with lower weight)



Sustainable American Steel

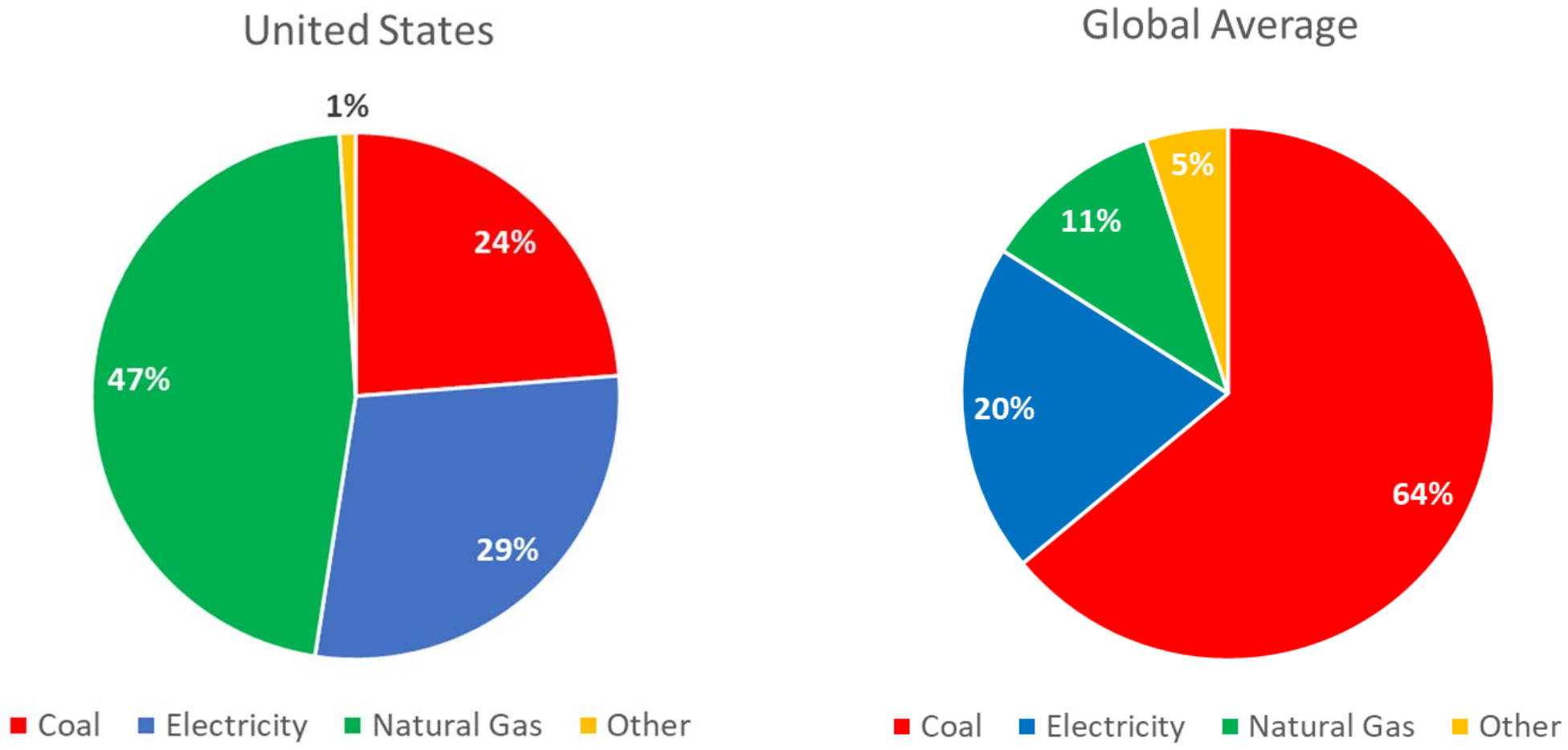




Adapted from: Hasanbeigi and Springer, "How Clean is the U.S. Steel Industry?", Global Efficiency Intelligence, 2019.

Sustainable American Steel

Steel Industry Energy Structures – U.S. and Global - 2017



Source: He, K.; Wang, L.; Li, X. "Review of the Energy Consumption and Production Structure of China's Steel Industry: Current Situation and Future Development". Metals, 2020, 10, 302.

Sustainable American Steel

- Work is also underway on projects to further enhance the sustainability of domestic steelmaking:
  - Increased use of renewable energy in EAF production
  - Advancements in the use of Direct Reduced Iron and Hot Briquetted Iron in place of pig iron in both integrated and EAF steelmaking
  - Using renewable energy-based hydrogen as a reduction agent in DRI/HBI production
  - Carbon capture and storage/use

Sustainable American Steel

businesswire
A BERKSHIRE HATHAWAY COMPANY

Cleveland-Cliffs Holds Groundbreaking Ceremony for Its First HBI Production Plant in Toledo, Ohio

DOE awarding $72M to 27 projects to develop and advance carbon capture technologies, including direct air capture

03 September 2020

"Enabling Production of Low Carbon Emissions Steel Through CO2 Capture from Blast Furnace Gases", ArcelorMittal USA, Burns Harbor, IN

Solar Power World

Steel producer Nucor signs massive PPA for 250 MW of new solar energy in Texas

ENERGY & RESOURCES BEST PRACTICES

Nucor Micromill to be the First U.S. Steel Plant to Run on Wind Energy

John Krukowski (https://www.besteandrpractices.com/author/jkrukowski/) • December 10, 2019

SSAB says it can make fossil-fuel-free steel in Iowa by 2026

Donnelle Eller Des Moines Register

Des Moines Register

Why Steel for Bridges?

- Economical
- Sustainable
- Durable
- Accelerated
- Innovative

Options for Durability and Corrosion Protection

Weathering Steel

Stainless/Highly Corrosion Resistant Steel

Galvanized Steel

Metallized Steel

Painted Steel

Weathering Steel

ASTM A709 – Grades 50W, HPS 50W, HPS 70W, & HPS 100W

- High Performance Steel (HPS) has improved weathering characteristics
- Simple, low maintenance
  - Patina – thin layer of dense corrosion by-products
    - Acts as a skin to protect against further corrosion

Weathering Steel

Benefits

- Lower fab cost
- Shorter fab time
- No field painting
- Natural appearance
- Minimal Maintenance

Cautions

- Not appropriate in foggy, coastal regions
- Not for use in tunnel-like conditions where deicing salts are used
- Evaluation needed in heavy industrial areas (corrosive chemicals)

Highly Corrosion Resistant Steel

ASTM A709–50CR (Duracorr® / ASTM A1010-50 / Cleveland-Cliffs)

- Approved by ASTM and established in the A709 bridge standards
- Contains approx. 12% Chromium
- Economical choice in highly corrosive environments
- Significant impact on life-cycle cost (extends the life a bridge)
- In service in 5 states (OR, CA, IA, PA, VA) and in the Canadian province of Ontario.

Thank You / For More Information

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