The American Iron and Steel Institute’s (AISI) Board of Directors has long identified environmental stewardship and commitment to sustainability as part of our industry’s strategic plan and our vision for the future. As we have in the past, we will continue to actively examine strategies to advance that vision and our commitment to global leadership for our sector.

“If all industries were as interested in the environment as steel, the habitats for both animals and mankind would be dramatically improved.”

– Jan Hartke, former Executive Director, EarthVoice

Industry Commitment

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As a result of this commitment, we are aggressively seeking ways to reduce our environmental footprint even while producing the advanced and highly recyclable steel that our economy needs. The American steel sector is recognized as having the steepest decline of total air emissions among nine manufacturing sectors studied in the U.S. Environmental Protection Agency’s (EPA) 2008 Sector Performance Report.¹

The steel industry’s long-standing commitment to sustainability is backed by significant investment in state-of-the-art facilities that improve energy efficiency, reduce carbon emissions and heighten productivity. We have also been a leader in reducing energy intensity in steel manufacturing processes and correspondingly reducing greenhouse gas emissions through recycling and process innovation. Since 1975, steel companies have invested over $60 billion in new technologies and that investment has paid off. By deploying new steelmaking technologies, and through the innovation of the women and men working on the plant floor, the industry has reduced energy intensity per ton of steel produced by 33 percent since 1990, the Kyoto benchmark year, as shown in Figure 1.² In fact, the United States as a nation would exceed the target emissions reductions (which are related to energy intensity) set at the Kyoto accords by a significant margin if every segment of the U.S. economy had achieved the same energy improvements as the domestic steel industry. The American steel industry is the only significant industry in the U.S. that has reduced its total energy consumption while increasing its production from 1990 to 2005.³

Climate Challenge

Steel is fundamental to American society and to our modern way of life. Our nation’s energy supply, transportation infrastructure, urban centers, clean water and safe food supply all depend on steel.

Manufacturing steel by today’s steelmaking processes produces CO₂ as a by-product. CO₂ is one of the major greenhouse gases identified as contributing to climate change. On average, 1.14 tons of carbon dioxide was emitted in 2007 for every ton of steel produced in the USA.⁴ One of the American steel industry’s objectives is to reduce this figure by lowering the carbon footprint of our products throughout their life cycle, including the development of increased resource and energy efficiency in the production of steel and during the use of steel products. As part of that objective, we actively promote the recovery, reuse and recycling of steel.

¹ 2008 EPA Sector Strategies Performance Report.
⁴ AISI Statistics.
Steel is produced by two methods in the United States. Approximately 40 percent is made by integrated steelmakers by the blast furnace/basic oxygen furnace process (BOF), which typically uses 70 to 80 percent molten iron and 20 to 30 percent scrap. Integrated steelmaking uses coke (a coal derivative) and other carbon-bearing materials to provide the source of carbon that serves as the chemical reactant to convert (“reduce”) the iron ore to iron and to sustain the chemical reactions required for the process.

Electric arc furnaces (EAFs) account for about 60 percent of steel production in the United States. EAFs use electricity as the primary source of energy to melt the input materials, which are typically 75-100 percent recycled steel. Other iron-containing materials make up the balance. Because the EAF process is mainly one of melting steel and iron scrap as opposed to reducing iron ore, carbon’s direct role is not as dominant as it is in the blast furnace/BOF process. However, since carbon is associated with the generation of electric power in power plants, it has a significant indirect role in EAF steel processing. Consequently, control of CO₂ at electric utilities is a major concern for steelmakers. Although EAF production has increased in recent years, the demand for steel in a growing economy cannot be met solely from recycled steel. Steel produced from iron ore will always be required.

Recycling

AISI’s long-term focus on recycling has resulted in a continuous steady rise in the recycling rate for steel. For example, the steel can has outperformed the aluminum can for the past several years by having a higher recycling rate.

The recycling rate of steel has reached an all-time high based on the most recent data compiled through 2007, with an overall recycling rate of 82.5 percent. As a result of this high recycling rate, steel scrap is the American steel industry’s number one raw material. Surprisingly, the industry must still work to make the public aware that steel is the most recycled material on the planet – more than aluminum, paper, glass and plastic combined.

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⁵ AISI Statistics.
⁶ Steel Recycling Institute, 2008.
⁷ Ibid.
the planet. In fact, more steel is recycled each year than aluminum, paper, glass and plastic combined. Steel is the engine that drives the recycling of many consumer goods as evidenced by computed recycling rates for the following products: automobiles (100 percent), appliances (over 80 percent) and steel packaging (over 60 percent).  

Innovation has led to the introduction of a wide variety of new steels. In fact, 50 percent of the steels used to make automobiles today did not exist just 10 short years ago. The efficiencies gained from using lighter-weight yet higher-strength steel components are impressive. Such mass savings not only conserve material but, when taken in the context of life cycle assessment (LCA), help, as well, to achieve significant emissions reductions. If, for example, currently available Advanced High Strength Steels (AHSS) were applied throughout the present U.S. automotive fleet, greenhouse gas emissions from automobiles would be reduced by approximately 12 percent — an amount greater than the emissions generated by the entire American steel industry today. This reduction in emissions is, in fact, occurring already as automotive designers around the world use increasing amounts of AHSS in their vehicles.

In considering greenhouse gas emissions, this LCA approach is measuring the real environmental impact of a material. It considers the total greenhouse gas emissions generated by the production, use and end-of-life (recycling or disposal) phases of a product. Of course, some materials are lower density than steel and they might, at face value, seem to offer environmental advantages. However, LCA demonstrates that steel offers superior environmental benefits largely because of its relatively low production energy, its recyclability, structural efficiency, and due to the tremendous process

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8 Steel Recycling Institute, 2008.

9 AISI.
efficiencies the industry has achieved. Figures 2 and 3 compare the emissions production energy of steels and other structural materials.

Figure 2: Greenhouse gas emissions from the production of automotive materials.\textsuperscript{10}

Figure 3: Energy required for the production of various automotive materials.\textsuperscript{11}

\textsuperscript{10} Data from Peer Reviewed LCA Model available on IISI WorldAutoSteel Website, 

Global Steel Sectoral Approach

We believe the first principle of any approach to climate change rests with the reality that climate change is a global concern that can only be addressed effectively on a global basis. If the Administration and Congress are guided by this principle, two outcomes are assured: (1) actual and meaningful CO₂ emission reductions will be attained globally, and (2) reductions will occur without damaging the competitive position of U.S. manufacturers in the global marketplace.

The adoption of any CO₂ regulatory scheme in the U.S. involving the American steel industry that does not incorporate, induce, or provide for similar measures to be taken by other major steel-producing nations, such as China, on a contemporary time line, will distort or adversely impact the competitiveness of U.S. steelmakers in comparison to global steelmakers. We must hold foreign manufacturers to comparable standards, or we will risk our own manufacturing jobs and the economic health of the nation. At the same time, we risk further harming the global environment by shifting manufacturing to countries with lower environmental standards.

One such global approach to climate change the worldwide steel industry is working on is the “Global Steel Sectoral Approach,” under study by the World Steel Association.¹² It is an approach that would obligate all major steel producers, including those in

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Brazil, Russia, India and China, to reduce CO$_2$ emissions. It is the type of proposed agreement that has the potential to lower global CO$_2$ emissions without creating market distortions. Negotiators from the United Nations Framework Convention on Climate Change are discussing this policy with world steel representatives as a model for post-Kyoto policy. We believe that all governments should look to the Global Steel Sectoral Approach to guide their own public policy initiatives.

At the core of the steel sectoral approach to climate change, unveiled at the United Nations COP-13 meeting in December 2007, is the collection and reporting of energy intensity and carbon dioxide emissions data by steel plants in all major steel producing countries. The information collected will lead to improvements in emissions reduction by enabling the establishment of intensity-based targets for implementation during this post-Kyoto period. Because this proposed approach is global, it will lead to global reductions in CO$_2$ in countries such as China, where approximately 50 percent of total steelmaking CO$_2$ emissions are generated.\(^\text{13}\)

In the absence of a successful global steel sectoral approach that avoids distortions in the marketplace, legislators and regulators from all nations must address manufacturing competitiveness issues that will surely arise concurrent with new, regional climate change emissions regulations. For example, prior legislative efforts have included various "competitiveness provisions." We emphasize that any competitiveness provision should impose the same cost obligations on imports that are imposed on domestic producers. For example, tactics can include border adjustment measures on a contemporaneous timeline which proportion the cost borne by domestic producers for reduction of greenhouse gas emissions. In addition, the practice of waiving such duties for specific foreign manufacturers should be eliminated.

Asia-Pacific Partnership on Clean Development and Climate

In the international arena, AISI is an active participant in the steel task force of the Asia-Pacific Partnership (APP), a seven-nation effort representing nearly 60 percent of the world’s steel production.14 APP members are working toward technology-based solutions for energy and CO₂ reductions through the identification of best energy and environmental practices, and the application of commercially available and emerging equipment that can improve the environment.

Partners are actively working on a number of key objectives, designed to:

• Develop sector-relevant benchmark and performance indicators;
• Facilitate the deployment of best practice steel technologies;
• Increase collaboration between relevant Partnership country government, research, and industry steel-related institutions;
• Develop processes to reduce energy usage, air pollution and greenhouse gas emissions from steel production;
• Increase recycling across the Partnership.15

The U.S. steel industry has the lowest overall energy consumption per ton of steel produced and the lowest CO₂ emissions per ton of steel produced in the world16 making the manufacture of steel in the U.S. environmentally preferable. Because of advances and energy management over the last two decades, U.S. steelmaking processes are highly optimized and further efforts will be made to continue to achieve incremental improvements. However, in order to continue to make major reductions in future energy use, new processes are required.

Breakthrough Technologies

The development of new methods of making steel requires completely fresh and innovative thinking. The diagram on page 17 illustrates the relationship

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16 Based on AISI Statistics, worldsteel statistics and comparative data analysis.
between energy use (and carbon-based emissions) and the need for research and development into new transformational processes for making steel. In fact, the chart could apply to many energy-dependent industries in the manufacturing sector in addition to steel.17

Figure 4: Future energy/CO2 reductions require new processes.

The American steel industry is currently conducting research on the next generation of iron and steelmaking technologies that will dramatically reduce or eliminate CO2 emissions. This research is called the CO2 Breakthrough Program.18 These new “breakthrough technologies” are being developed over the next 15 to 20 years. Accordingly, any proposed CO2 reduction regulations must recognize the time required for these technologies to first be fully developed and tested in order for them to then become commercially available. Widespread adoption of new technology historically has proven to take from two to three decades in our industry.

17 AISI Department of Manufacturing & Technology, 2008.
18 “Steelmakers to launch CO2 breakthrough program; international effort aims to develop enabling technologies to reduce CO2 emissions,” November 19, 2003, AISI press release.
The North American steel industry is committed to principles of sustainable development in manufacturing innovative products that answer society’s needs. This commitment is aimed at improving the quality of life for everyone, now and for generations to come. Our industry recognizes and values the interdependence of environmental, social and economic factors, a goal that is best realized through market forces operating in a growth-oriented regulatory framework.

AISI’s Commitment to Sustainability

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The Member Companies of the American Iron and Steel Institute (AISI) are committed to sustainable development and we will:

1. Operate our business in an efficient and financially sustainable way in order to supply steel products and solutions that satisfy our customers and add value to stakeholders.

2. Optimize the eco-efficiency of our products through their life cycle, including increased resource and energy efficiency in the production of steel and during the use of steel products. We are committed to promoting the recovery, reuse and recycling of steel.

3. Foster the health and safety of employees in the steel industry and provide healthy, safe and environmentally sound operations and products.

4. Demonstrate social responsibility by promoting values and initiatives that show respect for people and communities associated with our business.

An example of a breakthrough technology project is the current program with Massachusetts Institute of Technology to produce iron by molten oxide electrolysis (MOE). The technique generates near-zero CO₂ emissions. A second project called “Ironmaking by Hydrogen Flash Smelting” now being conducted at the University of Utah, replaces carbon as a blast-furnace fuel with hydrogen. These projects represent significant steps towards carbon-free ironmaking since both will have near-zero CO₂ emissions if successful.

In the nearer term, AISI members are also developing the Paired Straight-Hearth Furnace, a high productivity, low energy ironmaking unit that can process steel plant wastes, as well as virgin iron materials. Using coal instead of coke, this type of equipment will be available for commercial demonstration in less than five years and will potentially achieve an estimated 30 percent reduction in energy use compared to the technologies it will replace.

These research investments make clear steel’s commitment to a sustainable future. The results thus far are promising. AISI recognizes that these projects represent long-range research and development that could fundamentally change the way steel is produced. With Congress and the country focused on the issue of climate change, America’s steel industry is demonstrating that it will be part of the solution to this challenge.

20 Environmental Briefing, Washington, D.C., by Dr. H.Y. Sohn, University of Utah, April 2008.
To influence public policy, educate and shape public opinion in support of a strong, sustainable U.S. and North American steel industry committed to manufacturing products that meet society’s needs. AISI’s member companies represent approximately 75 percent of both U.S. and North American steel capacity.

Mission of the American Iron and Steel Institute

5. Conduct our business with high ethical standards in our dealings with employees, customers, suppliers and the community.

6. Engage stakeholders and independent third parties in constructive dialogue to help implement sustainable development.

7. Build our knowledge of sustainability and willingly share it with others. We will be open and active in our communications and help steel companies and organizations in the supply chain implement sustainable practices.