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June 1, 2007

Mr. Scott Ek, Principal Planner
Environmental Review & Policy
Minnesota Department of Natural Resources
500 Lafayette Road, Box 25
St. Paul, MN 55155-4025

Re: Minnesota Steel, Estimated CO_2 Footprint

Dear Mr. Ek:

As requested and on behalf of Minnesota Steel attached are the following:

- Minnesota Steel Industries CO_2 Emission Footprint and Comparison submitted via e-mail on April 27, 2007
- Minnesota Steel Industries Estimated CO_2 Emissions from Electricity Usage submitted via e-mail on May 18, 2007

Minnesota Steel, because of its integrated design and energy choices, will contribute 50 percent less greenhouse gas emissions, when considering both direct emissions and indirect emissions from electricity usage, than traditional blast furnace-based steel production operations (i.e., coal-fired taconite production, transport of pellets from taconite facility to blast-furnace, blast-furnace based steel production).

This estimate assumes that all electricity used by Minnesota Steel comes from fossil fuel based generation. It is likely that some portion of the electricity used by Minnesota Steel will come from green energy sources which will result in lower CO_2 emissions from electricity usage than assumed in the estimate.

If you have any questions please feel free to contact myself or Deb McGovern.

Sincerely,

Lori L. Stegink
Vice President

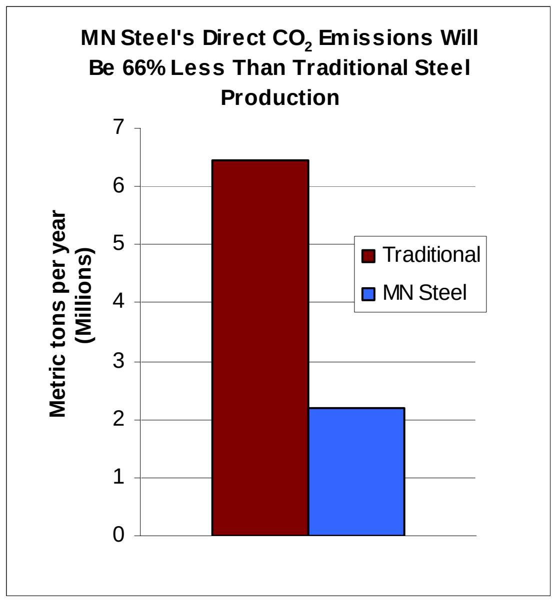
Cc: Jon Alhness, USACE (w/enclosure)

Ann Foss, MPCA (w/enclosure)
Steve Menden, Wenck (w/enclosure)
Jennie Ross, Wenck (w/enclosure)
Debra McGovern, MN Steel (w/enclosure)
Howard Hilshorst, MN Steel (w/enclosure)
Jim Mennell, ELG (w/enclosure)

Minnesota Steel Industries CO_2 Emission Footprint and Comparison

Introduction and Summary

Carbon dioxide and greenhouse gas emissions from the Minnesota Steel project are not subject to any federal, state, or local laws or regulations. Emissions are estimated here to provide general information regarding greenhouse gas emissions for inclusion in the Final Environmental Impact Statement for the project. The maximum direct carbon dioxide ("CO_2") emissions from the Minnesota Steel project (from mining through steel production) are estimated at 2.19 million metric tons per year. This represents less than one tenth of one percent of estimated global CO_2 emissions of more than 25 billion tons per year.



Minnesota Steel, because of its integrated design and energy choices, will contribute 66 percent less direct greenhouse gas emissions than traditional blast furnace-based steel production operations (i.e., coal-fired taconite production, transport of pellets from taconite facility to blast-furnace, blast-furnace-based steel production). Integration of mining, processing, and steel making facilities at Minnesota Steel will reduce energy use and associated greenhouse gas emissions. On-site processing of taconite into steel also will reduce greenhouse gas emissions associated with rail and ship transport of taconite pellets to off-site blast furnace facilities. Use of natural gas (which contributes 40 to 50 percent fewer CO_2 emissions than coal) at Minnesota Steel will further reduce greenhouse gas emissions compared to coal-fired operations.

Methodology

Because there is no mandatory or uniform method for calculation of greenhouse gas emissions, CO_2 emissions from the project (and coal-fired blast furnace operations for comparison) were estimated using available methods and emission factors from the World Resources Institute Greenhouse Gas Protocol Standard, International Energy Agency, the U.S. Department of Energy, and the U.S.

Environmental Protection Agency. Details of CO_2 emissions estimates for Minnesota Steel are included in Attachment A. Details of CO_2 emissions estimates for traditional blast-furnace operations are included in Attachment B.

CO_2 Emissions Estimate

Maximum direct CO_2 emissions from the Minnesota Steel project are estimated at 2.19 million metric tons per year or 0.88 metric tons per ton of steel produced. Specifically, maximum CO_2 emissions by source are estimated as follows:

Source	CO_2 Emissions (Metric Tons per Year)
Mining Equipment and Vehicles	42,500
Concentrator	1,900
Taconite Production	151,800
DRI Production	1,445,500
Steel Mill	548,300
Facility Total	2,190,000

Comparison of Direct CO_2 Emissions

Direct CO_2 emissions for equivalent steel production from a traditional steel-making operation are estimated at 6.44 million metric tons or 2.58 metric tons per ton of steel produced. Thus, Minnesota Steel will produce approximately 3 times less direct CO_2 for the equivalent amount of steel.

Conclusion

Minnesota Steel's design and energy choices will reduce direct CO_2 emissions compared to traditional steel-making facilities. Production at Minnesota Steel will result in approximately 4.25 million metric tons fewer of CO_2 being emitted each year than traditional steel production facilities being operated and constructed around the world. Greenhouse gases produced by the project will represent a fraction of a percent of total global CO_2 emissions and therefore are not anticipated to have any discernable impact on global CO_2 concentrations or climate.

Attachment A
Minnesota Steel Industries, LLC
CO_2 Emission Calculations

This summary presents the potential CO_2 impacts of the Minnesota Steel project as described in the air permit application.

Direct CO_2 Emissions [1]

	Amount of Material	Units of Material	Emission Factor	Emission Factor Units	Equivalent m.t. CO_2
Mining and Crushing					
Carbon-Containing Inputs					
Diesel Fuel Use [2]	4,087,330	gal/yr	22.91	lb CO_2 / gal	42,500
Net CO_2 Emissions					42,500
Concentrator					
Carbon-Containing Inputs					
Crude Ore [3]	13,078,929	mt/year	--		--
Natural gas [4]	25	10^6 ft^3/yr	0.11	lb CO_2 / ft^3 NG	1,300
Diesel Fuel [2]	56,324	gal/yr	22.91	lb CO_2 / gal	600
Non CO_2 Carbon-Containing Outputs					
Tailings [3]	9,278,519	mt/year	--		--
Concentrate [3]	3,800,410	mt/year	--		--
Net CO_2 Emissions					1,900
Pelletizer					
Carbon-Containing Inputs					
Natural gas [4]	1,222	10^6 ft^3/yr	0.11	lb CO_2 / ft^3 NG	61,400
Powder coating [5]	67,185	mt/year	0.48	mt CO_2 / mt	32,100
Concentrate [3]	3,800,410	mt/year	0.0016	C fraction	20,300
Limestone ($CaCO_3$) [6]	41,804	mt/year	0.44	mt CO_2 / mt	18,400
Soda ash [6]	41,804	mt/year	0.42	mt CO_2 / mt	17,400
Binder [7]	2,090	mt/year	0.44	C fraction	3,100
Diesel Fuel [2]	58,888	gal/yr	22.91	lb CO_2 / gal	700
Non CO_2 Carbon-Containing Outputs					
Pellets [3]	3,800,410	mt/year	0.0001	C fraction	(1,300)
Net CO_2 Emissions					151,800
DRI					
Carbon-Containing Inputs					
Natural gas [4]	37,218	10^6 ft^3/yr	0.11	lb CO_2 / ft^3 NG	1,868,100
Pellets [3]	3,800,410	mt/year	0.0001	C fraction	1,300
Diesel Fuel [2]	82,819	gal/yr	22.91	lb CO_2 / gal	900
Non CO_2 Carbon-Containing Outputs					
DRI [3]	3,500,000	mt/year	0.037	C fraction	(424,700)
Net CO_2 Emissions					1,445,500
Steel Mill					
Carbon-Containing Inputs					
Carbon [8]	12,185	mt/year	1	C fraction	40,600
Natural gas [4]	1,419	10^6 ft^3/yr	0.11	lb CO_2 / ft^3 NG	71,300
Electrodes [9]	4,375	mt/year	1	C fraction	14,600
Limestone [6]	30,537	mt/year	0.44	mt CO_2 / mt	13,500
DRI [3]	3,500,000	mt/year	0.037	C fraction	424,700
Casting powder [10]	1,000	mt/year	0.25	C fraction	900
Diesel Fuel [2]	58,888	gal/yr	22.91	lb CO_2 / gal	700
Non CO_2 Carbon-Containing Outputs					
Steel Product [11]	2,500,000	mt/year	0.0017	C fraction	(14,300)
Slag (non-metallics) [12]	304,517	mt/year	0.0033	C fraction	(3,400)
Net CO_2 Emissions					548,300

Total Direct CO_2 Emissions:	2,190,000

Attachment A
Minnesota Steel Industries, LLC
CO_2 Emission Calculations

References

(1) Throughputs and CO emissions from Minnesota Steel Air Emission Inventory. Molecular weights used:
Methane = 16.05 lb/lb-mol; Soda Ash = 105.99 lb/lb-mol; Limestone = 100.09 lb/lb-mol;
Carbon = 12.01 lb/lb-mol; Carbon dioxide = 44.01 lb/lb-mol
Cooling tower and lime added in the melt shop assumed to have negligble CO_2 emissions.
No carbon reported in EAF dust (Danieli).
mt = metric tonne = 1000 kg.
When using "C fraction" emission factor, the assumption is made that all carbon is oxidized to CO_2.
Molar conversion factor from C to CO_2 : 3.66 g CO_2 / g C

(2) Emission factor calculated from International Panel on Climate Change data:

IPCC Emission Factor[a]	Lower Heating Value [b]	Emission Factor
kg CO_2 / GJ	GJ / gal	lb CO_2 / gal
74.01	0.1404	22.91

(a) International Panel on Climate Change 2006 Guidelines; Volume 2, Chapter 3
(b) American Petroleum Institute, 2001

(3) Crude ore carbon fraction of 0.0108, concentrate carbon fraction of 0.0016, pellet carbon fraction of 0.0001 and tailings carbon fraction of 0.0051 from Midland Research Center analysis obtained from 1998 Minnesota Iron & Steel pilot study. Compositions based upon dry weights. It is assumed that no CO_2 will be released in the concentrator because no heating is involved. DRI carbon content of 3.5-3.8% provided by HYL.

(4) Natural gas CO_2 emission factor calculated using World Resources Institute worksheet data. Worksheet from http://www.ghgprotocol.org. See Table 1A for natural gas emission factor details. Natural gas consumption rates from Emission Inventory, based upon vendor/design specifications.

Table 1A. Natural Gas Emission Factor Calculation

NG Typical Heating Value[a]	NG Typical Density[a]	NG Carbon Content[b]	CO_2 : Carbon molar ratio	Emission Factor
Btu/lb	lb/ft^3	lb C / MMBtu	lb CO_2 / lb C	lb CO_2/ft^3 NG
21,945	0.043	32.0	3.66	0.11

(a) Typical values are based on a compilation of commonly accepted sources such as IPCC, U.S. DOE/EIA, national inventory reports to the UNFCCC, and other sources.
(b) International Panel on Climate Change default value (from World Resources Institute worksheet)

(5) Powder coating in both pellet plant and DRI areas. Assume composition of limestone. Limestone emission factor from 1996 IPCC Guidelines, Volume II, p. 2.7 (via World Resources Institute worksheet).

(6) Limestone and soda ash emission factors from 1996 IPCC Guidelines, Volume II, p. 2.7 and 2.8 (via World Resources Institute worksheet).

(7) Binder (Peridur) composition is cellulose based ($C_6H_{10}O_5$)

(8) Coal (as anthracite) consumption rate of 4 kg per 1149 kg DRI fed.

(9) AISE Electric Furnace Steelmaking Seminar, May 2000, SGL Carbon Corporation: Observed electrode consumption for US DC EAFs: 3.5 lb/ton steel avg for 6 EAFs; 2,500,000 tpy steel

(10) Assume 200 lbs casting powder per 250 ton steel heat. Carbon fraction from MSDS, assuming C-2, C-3, and C-4 are the maximum in the specified range of composition and are 100% carbon.

(11) Refer to Table 1B for steel carbon content by anticipated grade and production.

Table 1B. Anticipated Minnesota Steel Production by Grade and Associated Carbon Content

	% Carbon				
Grade	**Low**	**High**	**% of Product**	**Avg.**	**tons C**
Ultra Low Carbon	0.002	0.01	5	0.006	8
Low Carbon	0.034	0.075	15	0.055	204
Peritectic	0.075	0.15	15	0.11	422
Medium Carbon	0.15	0.28	40	0.22	2150
High Carbon	0.28	0.40	5	0.34	425
HSLA	0.15	0.28	20	0.22	1075
			Total:	**0.0017**	4284

(12) % carbon = 0.33%; BAT Reference Document on the Production of Iron & Steel; European Commission; March 2000

Attachement B
Minnesota Steel Industries, LLC
CO_2 Emission Calculations

Comparison With Direct CO_2 Emissions From Traditional Steel-Making Processes

Table B-1 - Coal-Fired Pellet Production Versus Natural Gas-Fired Pellet Production

Method / Fuel used	MN Steel Throughput (1)	MN Steel Throughput Units (1)	Heat Input (MMBtu/yr) (2)	Emission Factor (3)	Emission Factor Units (3)	Emissions (mt CO_2 / yr)	Steel Production (mt / yr) (4)	Emissions (mt CO_2 / mt steel)
Traditional / Coal	--	--	1,176,738	216.82	lb CO_2 / MMBtu	116,000	2,500,000	0.05
Minnesota Steel / Nat. Gas	1,247	10^6 ft^3 / yr	1,176,738	117.26	lb CO_2 / MMBtu	63,000	2,500,000	0.03
					Net Difference =	*53,000*		*0.02*

(1) Sum of natural gas use for Concentrator and Pelletizer from Attachment A.
(2) Converted heat input from sum of natural gas use. Assume that heat input is equal in each case.
(3) IPCC default value for anthracite carbon content is: 59.17 lb C / MMBtu
which assuming 100% conversion converts to : 216.82 lb CO_2 / MMBtu
(4) Steel production total from Attachment A.

Table B-2 - Blast Furnace + Coke Production Versus DRI + EAF

Method - Process	Emissions From DRI (mt CO_2/yr) (5)	Emissions From EAF (mt CO_2/yr) (6)	Total Emissions (mt CO_2 / yr) (7)	Steel Production (mt / yr) (8)	Emissions (mt CO_2 / mt steel) (9)
Traditional - Blast Furnace + Coke Production	--	--	5,806,365	2,500,000	2.32
Minnesota Steel - DRI + Electric Arc Furnace	1,445,500	548,300	1,993,800	2,500,000	0.80
		Net Difference =	*3,813,000*		*1.53*

(5) Net CO_2 emissions for DRI from Attachment A.

(6) Net CO_2 emissions for EAF from Attachment A.

(7) Traditional CO_2 emissions are based on an average of efficiency factors for blast furnace + coke production facilities from Table 2a, multiplied by Minnesota Steel production.
(8) Steel production total from Attachment A.

(9) "Carbon Intensity" Factor. Traditional steel production intensity factor is an average of values for blast furnace + coke production facilities. *Calculating Direct GHG Emissions from the Production of Iron & Steel, Calculation Worksheets. June 2002. Version 1.0, 1996 IPCC Guidelines* and *An Initial View on Methodologies for Emission Baselines: Iron and Steel Case Study", Ecofys Energy & Environment, 2000.*

Attachement B
Minnesota Steel Industries, LLC
CO_2 Emission Calculations

Comparison With Direct CO_2 Emissions From Traditional Steel-Making Processes
Table B-3 Shipping Pellets Versus On-Site Steel Mill

Method - Travel	MN Steel Throughput (mt / yr) (10)	Method of Travel	Distance Per Round Trip (miles) (11)	Emission Factor (kg CO_2 / s.t.-miles) (12)	Emissions (mt CO_2 / yr)	Steel Production (mt / yr) (13)	Emissions (mt CO_2 / mt steel)
Traditional - Shipping Ore to IN	3,800,410	Rail	200	0.0287	25,000	2,500,000	0.01
Traditional - Shipping Ore to IN	3,800,410	Barge	1700	0.0511	364,000	2,500,000	0.15
MN Steel - On-Site Steel Mill	3,800,410	--	--	--	0	2,500,000	0.00
				Net Difference =	*389,000*		*0.16*

(10) Pellet production per year from Attachment A.
(11) Approximate distance between site and Duluth (harbor) is 100 miles. Approximate distance from Duluth to Gary, Indiana is 850 miles. Each shipping operation is calculated as round trip.
(12) Emission factors from *World Resources Institute / World Business Council for Sustainable Development worksheet*. "Diesel Locomotive" emission factor used for rail shipping, and "Inland Water Shipping" emission factor used for water shipping.
(13) Steel production total from Attachment A.

Table B-4 Total Emission Reductions

Method	Mining & Crushing (mt CO_2)	Pellet Production (mt CO_2)	Blast Furnace + Coke Prod. / DRI + EAF (mt CO_2)	Pellet Shipping (mt CO_2)	Total Emissions (mt CO_2 / yr)	Steel Production (mt / yr) (10)	Emissions (mt CO_2 / mt steel)
Traditional	133,200	116,000	5,806,365	389,000	6,444,565	2,500,000	2.58
Minnesota Steel	133,200	63,000	1,993,800	0	2,190,000	2,500,000	0.88
				Net Difference =	*4,254,565*		*1.70*

(10) Steel production total from Attachment A.

Minnesota Steel Industries Estimated CO_2 Emissions from Electricity Usage

Minnesota Steel will purchase electricity to meet the facility's electrical needs. CO_2 emissions from electrical generation vary depending on how the energy is generated. To date, Minnesota Steel has not entered any power purchase agreements and thus CO_2 emissions from generation of electricity for use by Minnesota Steel are unknown and may range from zero emissions if all purchased electricity comes from non-CO_2 emitting electrical generation sources (e.g., wind, hydropower) to an estimated maximum of 1.5 million metric tons of CO_2 per year if all purchased electricity comes from coal-fired generation.

Details of this maximum calculated estimate are provided in Table 1. Tables 2 and 3 provide information regarding estimated CO_2 emissions from electricity generated for use at traditional blast furnace steel production facilities. Table 4 provides a comparison of total estimated CO_2 emissions at a traditional steel production facility and Minnesota Steel as well as all estimated CO_2 emissions from electricity generated for use by such facilities. This comparison shows that even if all electricity used by Minnesota Steel were to come from coal-fired generation, combined CO_2 from off-site electrical generation and on-site production activities would be approximately 50 percent lower from Minnesota Steel than from traditional blast-furnace based steel production.

Because there is no mandatory or uniform method for calculation of greenhouse gas emissions, CO_2 emissions were estimated using available methods and emission factors as documented in the attached tables.

Table 1. Indirect Emissions from Electricity Purchase

Power Demand (MWh Total)[1]	Emission Factor (mt CO_2 / MWh)[2]	CO_2 Emissions (mt/yr)
1,845,000	0.83	1,539,000

(1) Power demand breakdown based on equipment vendor information:

Area/Process	Power Demand (MWh/mt throughput)	Throughput	Throughput Units	Power Demand (MWh)
EAF	0.400	2,500,000	mt/year steel	1,000,000
LMF	0.035	2,500,000	mt/year steel	87,500
Caster	0.115	2,500,000	mt/year steel	287,500
DRI	0.100	2,800,000	mt/year iron pellets	280,000
Pellet Plant	0.050	3,800,000	mt/year oxide pellets	190,000
			TOTAL:	1,845,000

(2) From WRI/WBCSD GHG Inventory: Electricity, Steam and Heat Purchase spreadsheet. Worksheet from http://www.ghgprotocol.org.

Original Source: *eGRID: Emissions and Generated Resource Integrated Database, Data Years 1996-2000, Version 2.01.* US EPA Office of Atmospheric Programs. Prepared by E.H. Pechan & Associates, Inc. May 2003. http://www.epa.gov/cleanenergy/egrid.htm

The Mid-Continent Power Pool (MAPP) area includes all or parts of Minnesota, North Dakota, South Dakota, Nebraska, Iowa and Wisconsin.

MAPP Region Emission Factor: 834.10 g CO_2 / kWh

Table 2. Traditional Steelmaking Facilities Electric Demand Data

Facility	Electric Consumption (MW)	Annual Steel Production (million tons)	Electric Demand (MWh/mt steel)	Reference
US Steel - Gary Works	227	7.5	0.29	1
US Steel - Mon Valley	160	2.8	0.55	2
Mittal Steel - Indiana Harbor	285	10	0.28	3
Mittal Steel - Weirton	140	3	0.45	4
		Average:	0.39	

References:
1. http://www.steel-technology.com/projects/gary/
2. http://www.puc.state.pa.us/PcDocs/616283.pdf
   http://www.epa.gov/epaoswer/hazwaste/minimize/ussteel.htm
3. http://www.primaryenergy.com/facilities/cokenergy.htm
   http://www.mittalsteel.com/Facilities/Americas/Mittal+Steel+USA/Operating+Facilities/Indiana+Harbor.htm
4. http://www.cad.state.wv.us/060960WVEUGDirect.pdf
   http://www.mittalsteel.com/Facilities/Americas/Mittal+Steel+USA/Operating+Facilities/Weirton.htm

Minnesota Steel Industries, LLC
CO_2 Emission Calculations

Table 3. Estimated CO_2 Emissions from Electicity Use for Traditional Blast Furnace Steel Production

Method	Electrical Demand [1]		Steel Production (mt / yr) [2]	Additional Electrical Usage (MWh)[3]	Emission Factor (mt CO_2 / MWh) [4]	Emissions (mt CO_2 / yr)	Emissions (mt CO_2 / mt steel) [5]
Traditional Steel Production	0.39	MWh / mt steel	2,500,000	190,000	0.83	1,009,000	0.40

(1) See Table 2 for traditional electrical demand data.
(2) Steel production total from Air Permit Application.
(3) Electrical usage for equavalent pellet production based on the electrical use of Minnesota Steel's pellet plant. Actual electrical usage of existing taconite pellet facilties is expected to be higher because they are older plants and may be less energy efficient. See Table 1 for more information on the Minnesota Steel pellet plant electric demand.
(4) From WRI/WBCSD GHG Inventory: Electricity, Steam and Heat Purchase spreadsheet. Worksheet from http://www.ghgprotocol.org. Original Source: eGRID: Emissions and Generated Resource Integrated Database, Data Years 1996-2000, Version 2.01. US EPA Office of Atmospheric Programs. Prepared by E.H. Pechan & Associates, Inc. May 2003. http://www.epa.gov/cleanenergy/egrid.htm
(5) "Carbon Intensity" Factor.

Minnesota Steel Industries, LLC
CO_2 Emission Calculations

Table 4. Total Estimated CO_2 Emission Reduction

Method	Mining & Crushing (mt CO_2)[1]	Pellet Production (mt CO_2)[1]	Blast Furnace + Coke Prod. / DRI + EAF (mt CO_2)[1]	Pellet Shipping (mt CO_2)[1]	Electricity Use (mt CO_2)[2]	Total Emissions (mt CO_2 / yr)[2]		Steel Production (mt / yr) [3]	Emissions (mt CO_2 / mt steel)[2]	
Traditional Steel Production	133,300	116,000	5,806,365	389,000	1,009,000	7,453,665		2,500,000	2.98	
Minnesota Steel	133,300	63,000	1,993,800	0	0 - 1,539,000	2,190,100	3,729,100	2,500,000	0.88	1.49
					Net Difference =	*5,263,565*	*3,724,565*		*2.11*	*1.49*
					Percent Reduction =	71%	50%			

(1) CO2 emission estimates from Minnesota Steel CO2 Footprint submitted 4/27/2007.

(2) Electricity usage and CO_2 emissions for Minnesota Steel are represented as a range because some portion of electricity is likley to come from green energy sources that do not emit CO_2.

(3) Steel production total from Air Permit Application.