

Upcoming Carbon Management Legislations: Impacts on and Opportunities for the Global Aluminum Industry

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Global Metals Industry

(Million Metric Tonnes)

<u>Metals</u>	<u>World Production (2008)</u>	<u>CO2E (T/T)</u>	<u>% Global GHG</u>
Iron & Steel	1,330	1.0	>4
Aluminum	35	9.8	>1
Copper	17	5.5	<<1
Magnesium	1	> 18	<<1
Titanium	0.1	> 20	<<1

Impact of Aluminum Industry on GHG

Aluminum is responsible for > 1% of global human induced greenhouse gases (Carbon Dioxide and Perfluoro Carbons)

Carbon Dioxide (CO₂)

15.6 kg CO₂ per kg of aluminum production

453.8 billion metric tonnes CO₂ per year for worldwide production

Perfluoro Carbons (PFC)

1.0 kg PFC per tonne of aluminum production

Equivalent to 208 million metric tonnes of CO₂

Advent of the Carbon Market

- 1992
Ratification of the United Nations Framework Convention on Climate Change
- 1997
Negotiation of the Kyoto Protocol, a legally binding treaty
- 2004
Russia ratifies the Kyoto Protocol, making the protocol binding for signatories
- 2005
Phase I of the European Union Emissions Trading Scheme (EU-ETS) begins
- 2006
California passes “Global Warming Solutions Act” (AB32), first state to do so
- 2008
Phase II of the EU-ETS begins; Kyoto compliance period begins
- 2009
Copenhagen Drama
- 2010
EPA Invokes Clean Air Act Regulating , Reporting for >> 25,000 MT CO2E

Kyoto Protocol

- Reduction in greenhouse gas emission CO_2 , CH_4 , CF_4 , SF_6 , PFC (CF_4), NO_x
Divides the world into: Developed/transition/Developing economies
5.2% $\text{CO}_{2\text{eq}}$ reduction from 1990 level by 2012
- Emission limits on Developed and Transition economies only.
- No emission limits on Developing countries.
- Emission reductions are administered nationally or regionally
- Credits for carbon reduction in Developing economies.
- Both carbon credits and emission allowances are traded
- Ratified by all but Afghanistan, Somalia and US.
- Kyoto Protocol expiry at the end of Mayan Calendar in 2012

Kyoto Protocol Details

- Developed Countries will reduce their emissions by 5.2% (average) below 1990 levels by 2012
- Three Flexible Mechanisms (All denominated in tCO₂e)
 - Emissions Trading
 - Joint Implementation (JI)
 - Clean Development Mechanism (CDM)
- Carbon Market has doubled every year since 2006
 - 32 B US\$ (2006)
 - 64 B US\$ (2007)
 - 120 B US\$ (2008)

Kyoto protocol progress

- CO_{2eq} emissions capped in EU, Japan and regionally from utilities in eastern NA through (RGGI)
- Carbon Allowance and Credit trading system operating in EU since 2005 and in the eastern US since 2008
- Allowances are a windfall to existing companies that downsize & national economies in recession.
- Credits fund development in China and India, accelerate globalization & transfer of industry to Asia.
- Kyoto emission reductions ahead of target in EU de-industrialization

Kyoto Outcome /Concerns

- EU reductions balanced by emission growth in NA.
- China rapidly expands coal-based power generation and become #1 CO₂ emitter.
- China and India take the lead in cement, steel and metal production.
- Primary Al capacity expansion taking place in coal and oil based China and Middle east
- Magnesium production shifts from electrolytic extraction in the West to coal based CO₂ emission inefficient Pigeon process in China.
- Billions of \$ worth of Kyoto Clean Development Mechanism credits benefit overwhelmingly China and India. SF₆ elimination in the new Chinese Mg industry funded through CDM credits.

Change in Political Realities

- EU expands adding 10 Eastern European countries in-transition.
- Asia becomes the world's manufacturing hub.
- EU and NA de-industrializes leading to significant unemployment
- China and Middle East become world's leading creditors.
- US becomes world's biggest debtor
- Democrats in US Senate loose super majority
- World's financial system collapses

What's cooking in the U.S.?

- AB 32
 - ☞ California law requiring reduction of emissions to 1990 levels by 2020
- Regional Greenhouse Gas Initiative (RGGI)
 - ☞ Northeastern trading market for power plants; reduce emissions 10% by 2020
- Western Climate Initiative (WCI)
 - ☞ Voluntary initiative among western states and Canadian provinces
- Waxman-Markey
 - ☞ Legislation passed the U.S. House of Representatives in June
 - ☞ 17% reduction in GHG emissions from 2005 levels by 2020

Waxman and Markey House Bill

Waxman and Markey “The American Clean Energy and Security Act” of 2009

- includes:
 - federal “carbon cap and trade” system.
 - US aluminum industry CO₂ equivalent sources of more than 25,000 CO_{2eq} tons per year
- passed by the House in 2009
- supported by Obama Whitehouse,
- with loss of supermajority will not pass senate without major amendments.

Kerry-Boxer Senate bill

- Likely to include carbon cap-and-trade.
- Similar cap-and-trade provisions to the Waxman-Markey House Bill
- Initial free allocation of ~50% of all allowances
- May get bipartisan support with inclusion of subsidies to nuclear and oil and gas exploration
- Cap-and-Trade is the most politically palatable option in the US political climate

Copenhagen COP-15 meeting

- Increased public pressure for urgent action.
- Political acknowledgement of climate change problem by US, China, India and Brazil.
- US commitment of some money for climate change abatement in Developing Nations
- Yet:
 - No binding commitment to do anything
 - Only voluntary GHG reduction targets

How will Carbon policy impact Aluminum Industry?

- Domestic Carbon Legislation
- H.R. 2454, The American Clean Energy and Security Act (ACES) (aka Waxman Markey)
 - ☞ Passed by the House in June 2009; covers 7 GHG types
 - ☞ Establishes emissions caps on 85% of the economy
 - ☞ Empowers the EPA to establish reporting requirements and a national registry
 - ☞ Allows for domestic and international offsets
 - ☞ Regulates offsets and allowances as commodities (jurisdiction of the CFTC)
 - ☞ Aims to reduce emissions below 2005 levels:
 - 17% by 2020
 - 83% by 2050
- AB 32, The Global Warming Solutions Act
 - ☞ California law limits GHG emissions
 - ☞ Return to 1990 levels by 2020
 - ☞ Establish state-wide reporting rules

Impact to European / American Aluminum Industry

- Existing plants - Initially Given Free Allowances
- Minimal Impact on Expansions – not many planned
- Future - May negatively affect ongoing operations ??

How do we quantify your liabilities?

- Mandatory GHG emissions reporting began in 2010
- EPA's reporting authority a provision of the Clean Air Act, NOT Waxman Markey
- Some entities over 10,000 mtCO₂e required to report
- All fleets over 25,000 mtCO₂e required to report
- 2007 – 2010 emissions required by 2011; quarterly reporting begins in 2011
- Energy Efficiency requirements to increase
- Reporting tools:
 - ☞ EPA GHG Reporting Protocols
 - ☞ CAR
- Renewable Energy Standard will increase the percentage of renewable energy Utilities must purchase

Hall- Herault CO_{2eq} Emissions

	kg CO _{2eq} / ton Al					
Emissions	Mining	Refining	Anode	Smelting	Casting	Total
Process			388	1,626		2,014
Electricity		58	63	5,801	77	5,999
Fossil Fuel	16	789	135	133	155	1,228
Transport	32	61	8	4	136	241
Auxiliary		84	255			339
Fluoro-carbons				2,226		2,226
Total	48	992	849	9,790	368	12,047

Electricity Generation on GHG Emissions

Smelting electricity source	Total GHG Emissions	Change	Where
	kg CO _{2eq} /kg Al	%	
Hydro	6	-50%	Quebec, Norway
Average grid	12	0%	World
Natural gas	13	8%	Middle East
Heavy oil or coal	16	33%	China

Alternative Aluminum Production Routes

	t CO _{2eq} /t Al	Change
H-H @ 4.5cm ACD	12.7	0%
Wetted drained cathode @ 2cm ACD	9.5	-25%
Wetted cathode and inert anode @ 2 cm ACD	8.7	-31%
Carbothermic electric furnace	8.6	-32%
Clay carbochlorination & chloride electrolysis	9	-29%

Carbon management strategies in other aluminum production intensive regions

Country	Strategy
Canada	Follow US lead for NA continental strategy
Australia	Confusion following defeat of Cap-and-Trade legislation
Brazil	Get credit from avoidance of jungle deforestation
China, India	Use available cash to invest in best available, most efficient technology, claim credit for emission/GDP reduction fuelled by rapid GDP growth. No fixed caps
Middle East	Invest oil wealth in modern AI industry, No fixed caps.

Climate Neutral Services



Calculate your Emissions

Develop an Effective, Tailor-Made Carbon Management Strategy



Reduce the Avoidable Emissions and Cut Costs

Offset



the Unavoidable Emissions with High Quality Carbon Credits



Communicate your Engagement to the Stakeholders that Matter Most

Possible Offset Project Activities in Aluminum

- Emissions result from:
 - Energy Consumption (Coal-based)
 - PFC Consumption
 - CO₂ emissions during smelting
- Emission Reduction Project Activities could include:
 - AM0059: Reduction of PFCs in the Aluminum Industry
 - Methodology applicable in the CDM and the VCS
 - Reductions in PFCs and Energy Consumption
 - Reductions cannot lead to increase in Al production

Legislative Solutions

1. Promote Bottle / Deposit Bill
2. Develop/Implement Protocols for Qualifying Recycling as Carbon Credits/Offsets
3. Meet & Promote Voluntary Commitments (EPA Climate Leadership Programs)

