

# 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 (CO<sub>2</sub>)

15.6 kg CO<sub>2</sub> per kg of aluminum production

453.8 billion metric tonnes CO<sub>2</sub> per year for worldwide production

## Perfluoro Carbons (PFC)

1.0 kg PFC per tonne of aluminum production

Equivalent to 208 million metric tonnes of CO<sub>2</sub>

# 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  $\text{CO}_2$ ,  $\text{CH}_4$ ,  $\text{CF}_4$ ,  $\text{SF}_6$ , PFC ( $\text{CF}_4$ ),  $\text{NO}_x$   
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 tCO<sub>2</sub>e)
  - 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<sub>2eq</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> emission inefficient Pigeon process in China.
- Billions of \$ worth of Kyoto Clean Development Mechanism credits benefit overwhelmingly China and India. SF<sub>6</sub> 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 CO<sub>2</sub> equivalent sources of more than 25,000 CO<sub>2eq</sub> 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 mtCO<sub>2</sub>e required to report
- All fleets over 25,000 mtCO<sub>2</sub>e 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<sub>2eq</sub> Emissions

	kg CO <sub>2eq</sub> / ton Al					
Emissions	Mining	Refining	Anode	Smelting	Casting	Total
Process			388	1,626		2,014
Electricity		58	63	<b>5,801</b>	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				<b>2,226</b>		2,226
Total	48	992	<b>849</b>	9,790	368	<b>12,047</b>

# Electricity Generation on GHG Emissions

Smelting electricity source	Total GHG Emissions	Change	Where
	kg CO <sub>2eq</sub> /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 <sub>2eq</sub> /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
  - CO<sub>2</sub> 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 )

