

# De-Coupling Business Growth from Carbon Emissions - Opportunities in Industry

Pew Center on Global Climate Change/  
National Commission on Energy Policy  
“10-50 Workshop”

# Alcoa's "10" year plan



- Alcoa has committed to reducing its direct GHG emissions by 25% from a 1990 base by 2010. Alcoa has achieved the 25% reduction as of 2003 and is now working to maintain the reduction as the company expands by up to 40% by 2010. (No additional GHS emissions)
- We will expand using low carbon technologies and sources of electric power that are as efficient as practicable
- There are technology limitations associated with our processes as well as socioeconomic/political limitations associated with power availability, but these limitations should not impact our plans through 2010
- We will continue to emphasize efficiency and sustainability in our product designs and applications.

# Hall - Heroult Process

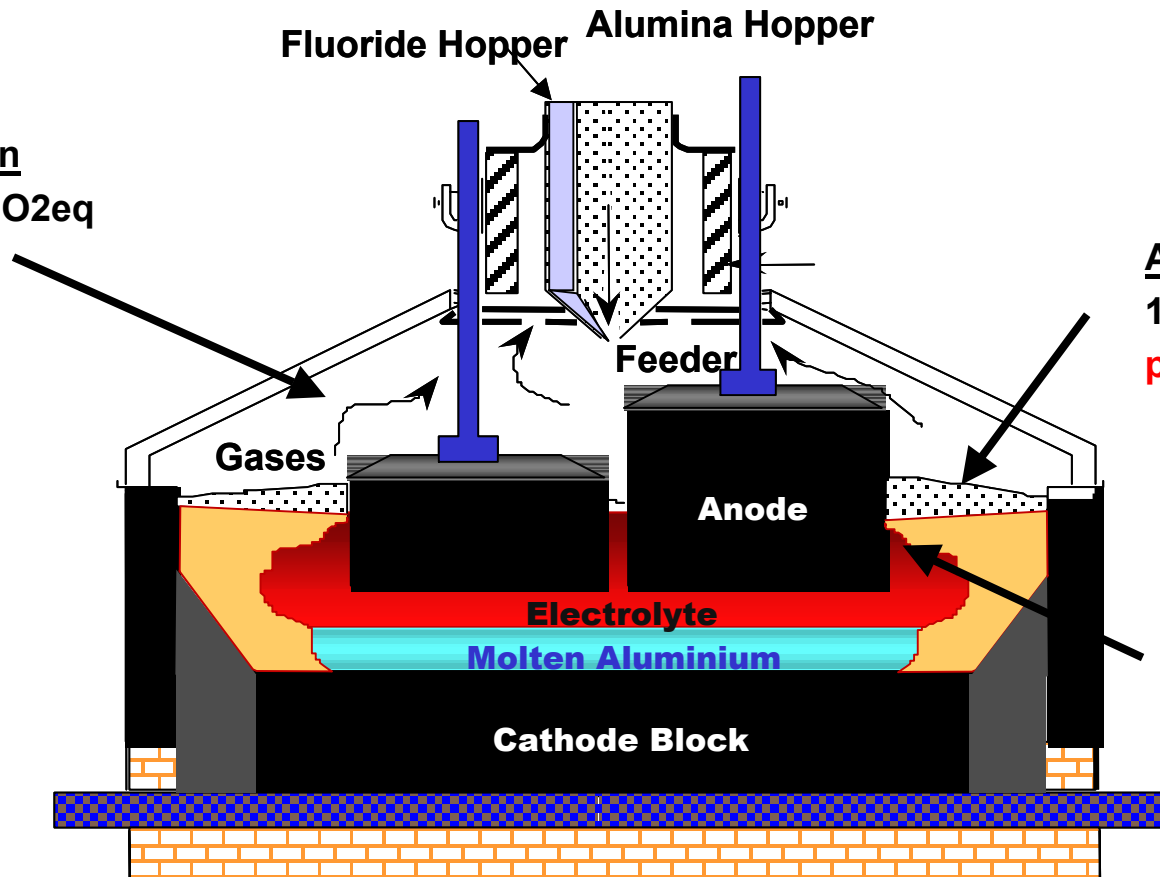
## Center Point Break Prebake Anode Cell



Fluoride Hopper Alumina Hopper

### PFC Generation

0.3 - 10.8 t of CO<sub>2</sub>eq



### Alumina Production

1.0 - 1.5 t of CO<sub>2</sub>eq  
per ton of aluminum

### Anode Carbon

1.5-2.0 t of CO<sub>2</sub>eq

### Fabrication

0.6 - 1.3 t of CO<sub>2</sub>eq

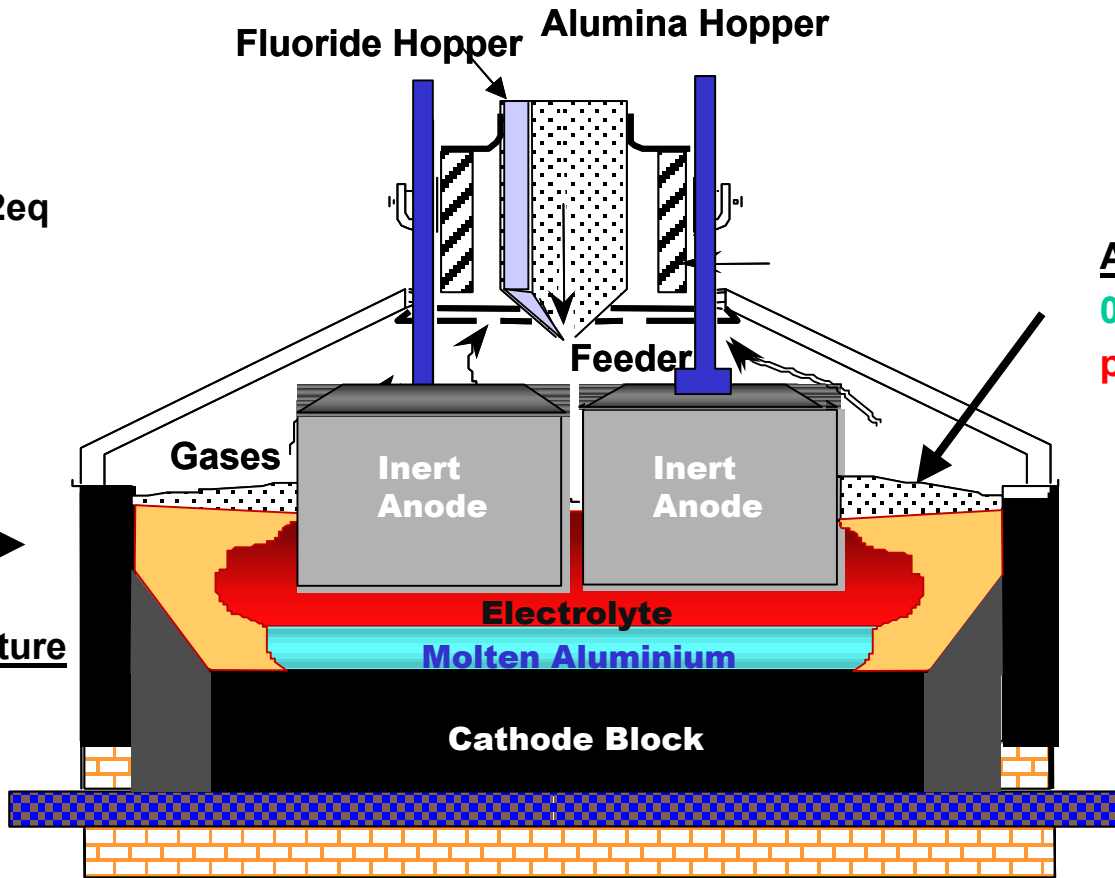
### Total

3.9 - 15.6 t of CO<sub>2</sub>eq

# Hall - Heroult Process Center Point Inert Anode Cell



~~PFC Generation  
0.3 - 10.8 t of CO<sub>2</sub>eq~~



Alumina Production  
0.8 - 1.5 t of CO<sub>2</sub>eq  
per ton of aluminum

~~Anode Carbon  
1.5- 2.0 t of CO<sub>2</sub>eq~~

Inert Anode Manufacture  
0.2 - 0.3 t of CO<sub>2</sub>eq

Fabrication  
0.6 - 1.3 t of CO<sub>2</sub>eq

Total  
1.6- 3.1 t of CO<sub>2</sub>eq

# Alcoa's Business in 2050



- Alcoa will be a low carbon emitter with the use of inert anodes and highly efficient processes that will reduce GHG from our processes by 50%.
- Alcoa will source electric power from highly efficient providers that manage GHG emissions well.
- Alcoa products will be designed to minimize GHG emissions by our customers, and all GHGs associated with aluminum production, fabrication and recycling can be completely offset by product use.
- Alcoa, through products and processes, will be a net reducer of GHGs in society.

**1 pound of  
Aluminium Used  
In Automotive**



***Potential to Eliminate***

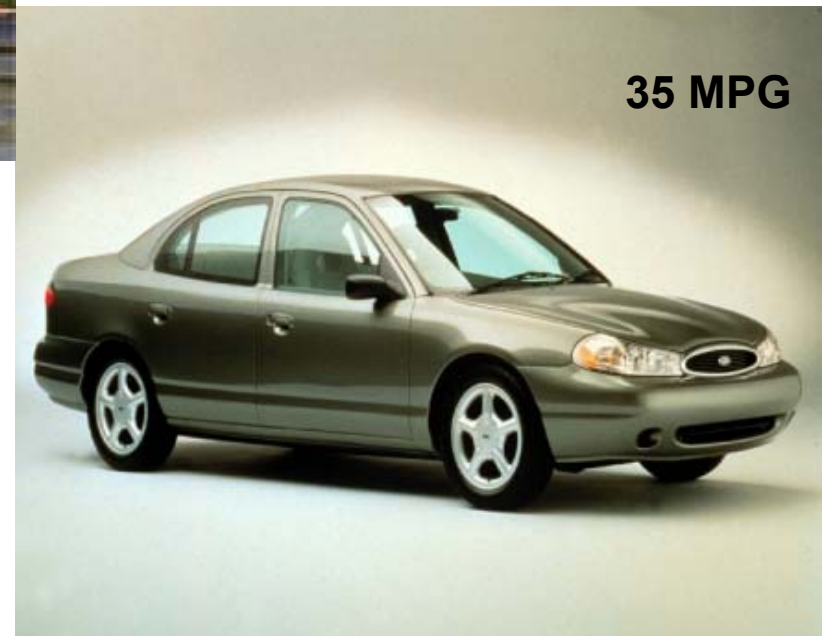
**20 pounds of CO2  
Emissions Over the Life of  
an Average Vehicle**

# Life Cycle Data - Improved Vehicle Fuel Economy



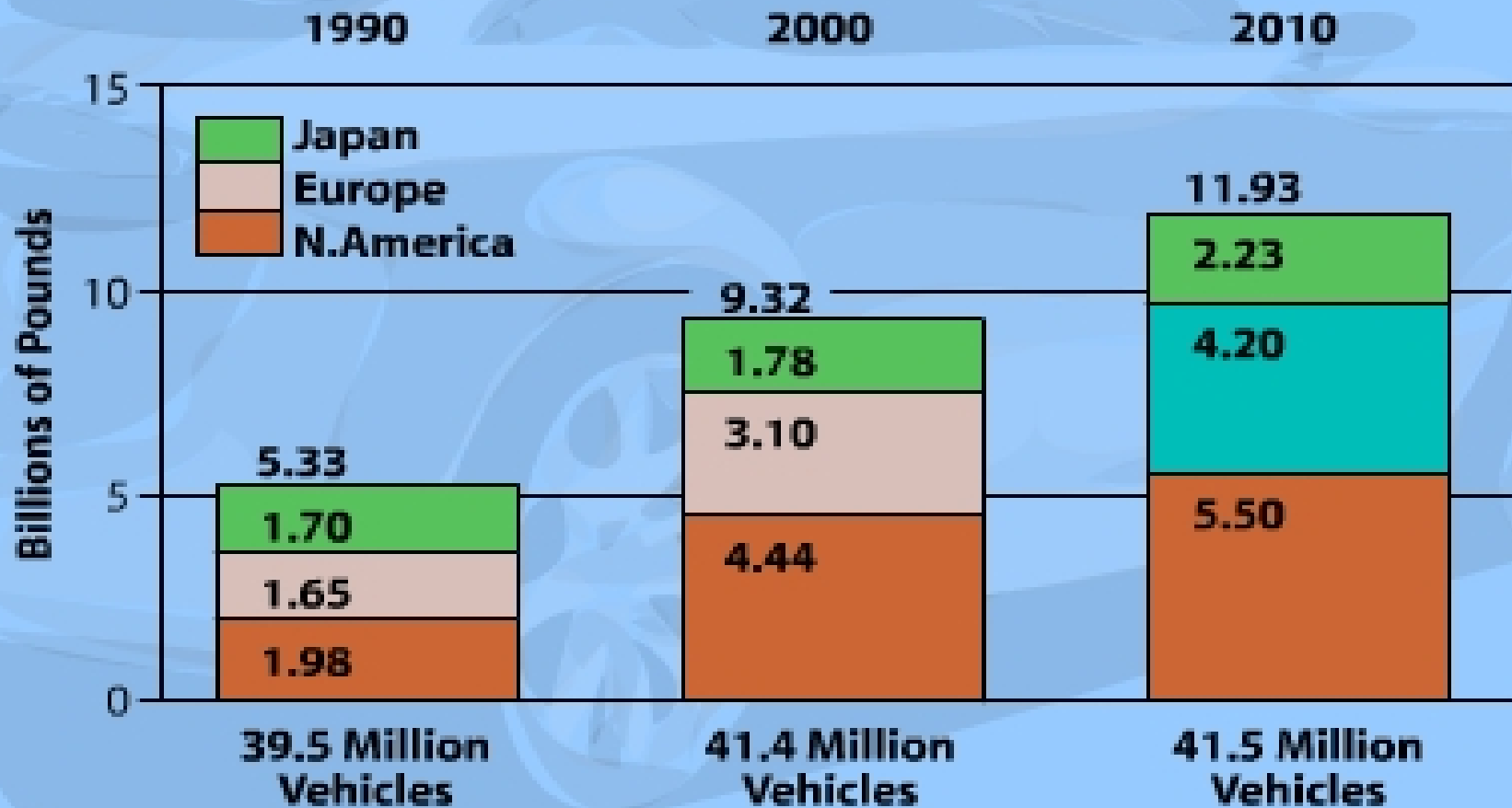
*Improved  
fuel economy  
30%*

*Weight saving  
40 %*



# Executive Summary & Assumptions For The Future

## Global Light Vehicle Aluminum Content (Billions of Pounds)



Source: Ducker Research Company, Inc.

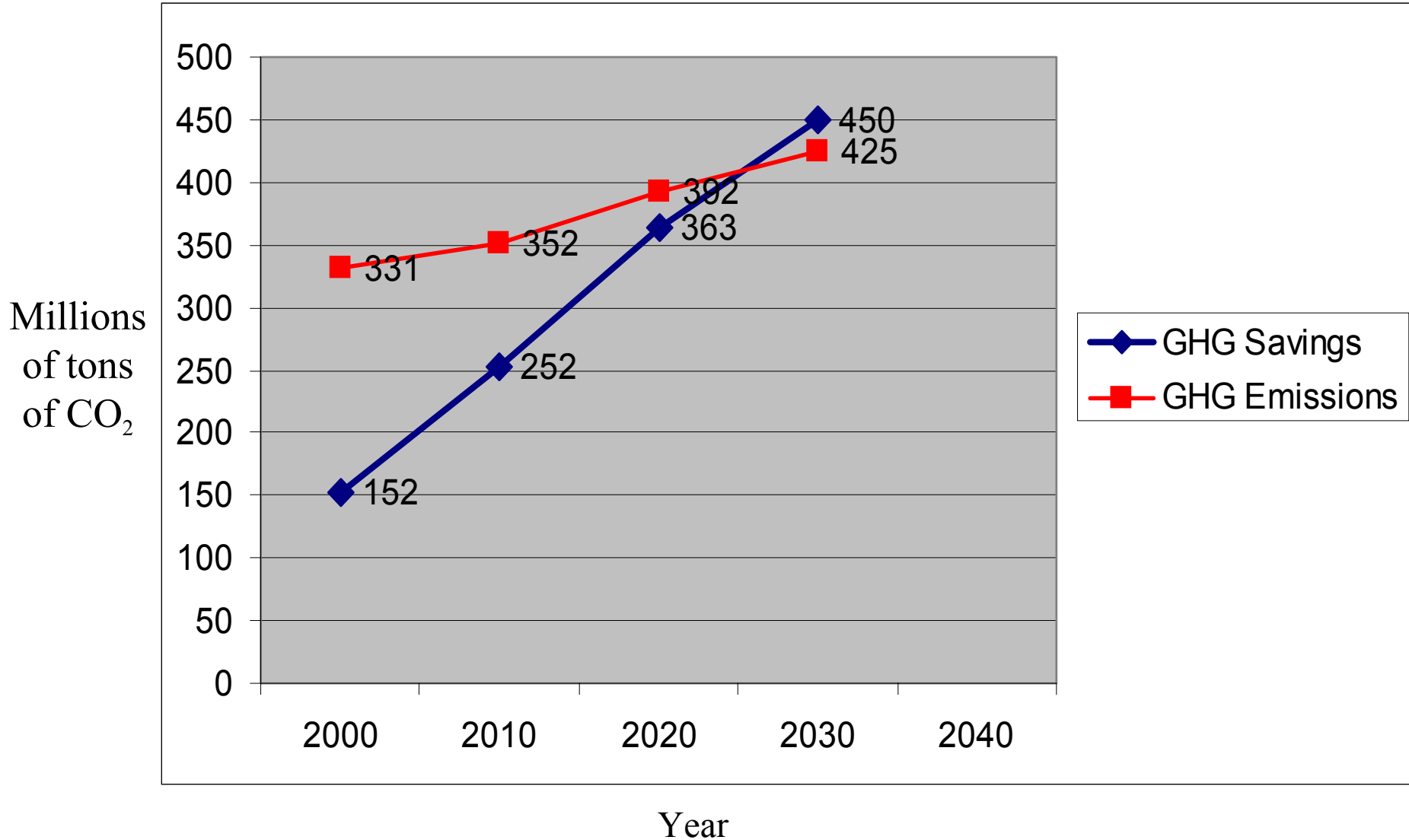
# ENVIRONMENTAL – GHG EMISSIONS

Year		1950	1990	2000	2002	2010	2015	2020
<b>Units 1000 Metric tons unless noted</b>								
<b>Metal balance</b>								
Demand		2,741	35,308	49,912	50,400	61,666	70,242	80,267
Scrap return		1,096	17,306	25,103	25,463	32,055	36,550	43,053
Primary consumed		1,645	18,001	24,810	24,937	29,611	33,692	37,215
Ratio All Scrap/Primary	ratio	0.40	0.49	0.50	0.51	0.52	0.52	0.54
<b>Primary Consumed/ Needed</b>								
pre 2004 need		1,645	18,001	24,810	24,810	24,810	24,810	24,810
post 2004 need						4,802	8,882	12,405
<b>GHG Intensity - Primary</b>								
pre 2004 capacity	MT CO2e/	13	13	13	13	12	12	12
post 2004 capacity	MT AL					6	6	6
				Assumed Improvement	0.995	0.995	0.995	0.995
<b>Production CO2e Calculations</b>								
New Capacity CO2e						28,809	53,293	74,429
Total primary CO2e		20,889	228,562	315,009	313,434	329,923	346,954	360,822
Predicted Scrap CO2e		1,096	17,306	25,103	25,463	32,055	36,550	43,053
<b>Total Production CO2e</b>		<b>21,985</b>	<b>245,869</b>	<b>340,112</b>	<b>338,897</b>	<b>361,979</b>	<b>383,504</b>	<b>403,874</b>

# ENVIRONMENTAL – GHG SAVINGS

Year		1950	1990	2000	2002	2010	2015	2020
<b>GHG Intensity - Ingot &amp; Products</b>								
CO2 per Al processed	MT CO2e/	8.0	7.0	6.8	6.7	5.9	5.5	5.0
CO2 per Net Shipments	MT AL	11.1	9.6	9.5	9.3	8.1	7.6	7.0
<b>Potential Transport Savings</b>								
<b>Auto &amp; LT shipments</b>		345	5,293	8,322	8,516	11,836	14,539	17,860
% increase - decade				57%		40%		40%
Savings/tonne auto	MT CO2e/ MT Auto Al	20	20	20	20	20	20	20
<b>Heavy Transport - Shipments</b>		81	915	1,522	921	1,290	1,592	1,965
Savings/tonne Rail/Truck/Bus		40	40	40	40	40	40	40
<b>Amortised credit for transport</b>								
Savings/tonne/year (12 year life)		1.67	1.67	1.67	1.67	1.67	1.67	1.67
Total credit (Auto)			-92,038	-139,650	-150,974	-205,566	-249,035	-305,913
Savings/tonne/year (25 year life)		1.6	1.6	1.6	1.6	1.6	1.6	1.6
Total credit (rail etc)	MT CO2e		-26,274	-38,811	-40,612	-46,334	-51,063	-57,691
<b>Total Saving Transport</b>	MT CO2e		-118,312	-178,460	-191,586	-251,900	-300,098	-363,604
<b>Total Al Production CO2e</b>	MT CO2e		245,869	340,112	338,897	361,979	383,504	403,874
<b>Net total GH (Production - Transport)</b>			127,557	161,652	147,311	110,079	83,406	40,270

# Aluminum Industry GHG Budget



# Competitiveness



- Alcoa sees GHG reductions as a process improvement strategy. Given enough flexibility, we see our GHG management program as a positive contributor to Alcoa's sustainability (financial, environmental, social progress)
- Overall, aluminum and Alcoa will be more competitive in most of our markets as low-GHG pathways are adopted. There must be flexibility to avoid major disruptions, such as efficient emissions trading opportunities since there will be some losses of markets and businesses over time.
- The uncertainties associated with the lack of worldwide constraints, or at least an articulated strategy for worldwide constraints can impact regional competitiveness

# Policy Signals for Business Action



- Uniform measurement and reporting standards worldwide.
- Efficient emission trading programs that are market based and worldwide.
- A process to identify and provides some credit or at least recognition for GHG reductions that result from material use and product design to companies such as Alcoa.
- Mechanisms to reward developing countries for the use of efficient processes and low GHG emitting approaches to satisfying the needs of their societies.
- Government engagement in approaches such as “reverse auctions” to signal support for action on GHG reduction.