



Climate Change Central

Final Report  
Results of the  
The 2<sup>nd</sup> Alberta Emissions Trading  
Simulation  
A Multi-Pollutant Scenario

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# Results of the The 2<sup>nd</sup> Alberta Emissions Trading Simulation A Multi-Pollutant Scenario

## OVERVIEW

Climate Change Central's 2<sup>nd</sup> Alberta Emissions Trading Simulation was held in Calgary on November 19-20, 2003. The primary objective of the event was to give participants a first-hand feel for the complexities of meeting company and national emission's reduction targets through a multi-emission trading system. Approximately 100 representatives from industry, government and research institutions participated in the two-day Trading Simulation.

Key learnings from the Simulation included:

- Trading is more cost effective than meeting targets exclusively through internal reductions;
- Participants did not always trade their excess permits;
- Uncertainty inhibited trading;
- Participants became better traders with experience.

Information in this report is designed to provide an overview of this event. It starts with a description of the structure of the trading simulation. Next, an overview of the weighted prices per trading round is discussed.<sup>1</sup> A summary of participant abatement and trading activity follows and a discussion of the trading simulation results concludes.

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<sup>1</sup> All dollars are expressed in Canadian dollars and all volumes of emissions in metric tonnes SO<sub>2</sub>, NO<sub>x</sub> and GHG.

## STRUCTURE OF THE TRADING SIMULATION

The 2<sup>nd</sup> Alberta Emissions Trading Simulation provided participants with a practical introduction to SO<sub>2</sub>, NO<sub>x</sub> and GHG emissions trading in realistic scenarios. The CO<sub>2</sub>e Trading Simulation is a web-based educational tool built to help participants understand the interactions inherent in a multi-emissions trading regime, how risk affects pricing, and what compliance strategies work best for corporations with different marginal abatement cost. Climate Change Central enhanced the realism of the simulation through the use of realistic emissions, financial and abatement cost data for the 44 participating Canadian companies.

### Structure of the Alberta Emissions Trading Simulation

The trading simulation participants were grouped into teams each representing an individual virtual company. At the outset, companies were divided into **BUYERS** (organizations facing a cap on their SO<sub>2</sub>, NO<sub>x</sub> and/or GHG emissions) and **SUPPLIERS** (organizations capable of producing project-based reductions in NO<sub>x</sub> or GHGs). Each buyer knew forecast emissions, emission allowances/limits, cost of internal reductions and their starting cash position. Each supplier also knew their internal investment opportunities and starting cash position. This data was then used to develop abatement and trading strategies during six consecutive rounds. Each round represented a series of trading simulation years and consisted of two parts:

- **ANALYSIS SESSION** - where participants analyzed their position and planned their trading and compliance strategy; and
- **TRADING SESSION** - where participants executed their trading strategy.

Table 1 summarizes the structure of the emissions caps and markets. Table 2 illustrates the trading activity allowed and year included in each round.

**Table 1: Market Scenarios by Emission Type at Start of Simulation**

	Market		
	SO <sub>2</sub>	NO <sub>x</sub>	GHG
<b>Start Date</b>	2004	2004	2007
<b>Target</b>	30% below 2000 levels by 2015	2000 levels by 2015	15% intensity reduction from 2000 levels
<b>Market</b>	Cap & Trade	Cap & Trade & Credit	Baseline & Credit
<b>Tradable Instruments</b>	<ul style="list-style-type: none"> <li>• SO<sub>2</sub> Allowances</li> </ul>	<ul style="list-style-type: none"> <li>• NO<sub>x</sub> Allowances</li> <li>• NO<sub>x</sub> Credits</li> </ul>	<ul style="list-style-type: none"> <li>• Canadian GHG Credits</li> <li>• International GHG Credits</li> </ul>

**Table 2: Type of Trading Activity per Round**

ROUND	State of Emissions Trading Regulation
<b>ROUND 1</b> (2004 - 2006)	<ul style="list-style-type: none"> <li>• Cap and trade systems for SO<sub>2</sub> and NO<sub>x</sub> begin</li> <li>• Speculative GHG trading only</li> <li>• Compliance at end of round</li> </ul>
<b>ROUND 2</b> (2007)	<ul style="list-style-type: none"> <li>• Cap and trade systems for SO<sub>2</sub> and NO<sub>x</sub></li> <li>• Start of mandatory GHG targets</li> <li>• Yearly compliance</li> </ul>
<b>ROUND 3</b> (2008)	<ul style="list-style-type: none"> <li>• SO<sub>2</sub>, NO<sub>x</sub> and GHG regulations continue</li> <li>• Yearly compliance</li> </ul>
<b>ROUND 4</b> (2009)	<ul style="list-style-type: none"> <li>• SO<sub>2</sub>, NO<sub>x</sub> and GHG regulations continue</li> <li>• Yearly compliance</li> </ul>
<b>ROUND 5</b> (2010 - 2012)	<ul style="list-style-type: none"> <li>• SO<sub>2</sub>, NO<sub>x</sub> and GHG regulations continue</li> <li>• Compliance at end of round</li> </ul>
<b>ROUND 6</b> (2013 - 2015)	<ul style="list-style-type: none"> <li>• SO<sub>2</sub>, NO<sub>x</sub> and GHG regulations continue</li> <li>• Compliance at end of round</li> </ul>

### News Events

Participants developed their strategy not only with reference to their overall position but also with market presumptions about the shape of the current and future regulatory environment. These were largely gleaned from 'breaking news stories' (some of which affected positions while others were simply background noise) that were released online to participants during the trading simulation. Examples of these news stories include:

#### **No Bear in Sight for the Canadian Bull**

Despite dire predictions, Canadian economic output in the last year has increased sharply. Corinne Boone, managing director of leading greenhouse gas brokerage firm CO<sub>2</sub>e.com, said, "Our clients are predicting their emissions will increase by between 5 and 15% during each of the next two years."

#### **New SO<sub>2</sub> Targets More Stringent**

In keeping with SO<sub>2</sub> reduction targets in Ontario, Quebec and British Columbia, Alberta announced stricter limits under its SO<sub>2</sub> cap and trade program today. Companies will now have to reduce their emissions to 40 percent below their 2000 levels, increasing their reduction commitments by 10 percent

## Instruments Traded

A variety of compliance instruments were available to participants. The 'gold standard' instruments for the trading simulation were the SO<sub>2</sub> and NO<sub>x</sub> emission allowances. The virtual government issued these to buyers who had caps under the mandatory emissions trading schemes at the beginning of each round. Emission allowances were grandfathered to each company equal to their target emissions levels as described in Table 1. Credits, on the other hand, were generated when companies reduced their emissions to below their baseline. NO<sub>x</sub> and domestic GHG credits generated by emissions reduction projects were rated highly, but were subject to acceptability and early action risks.

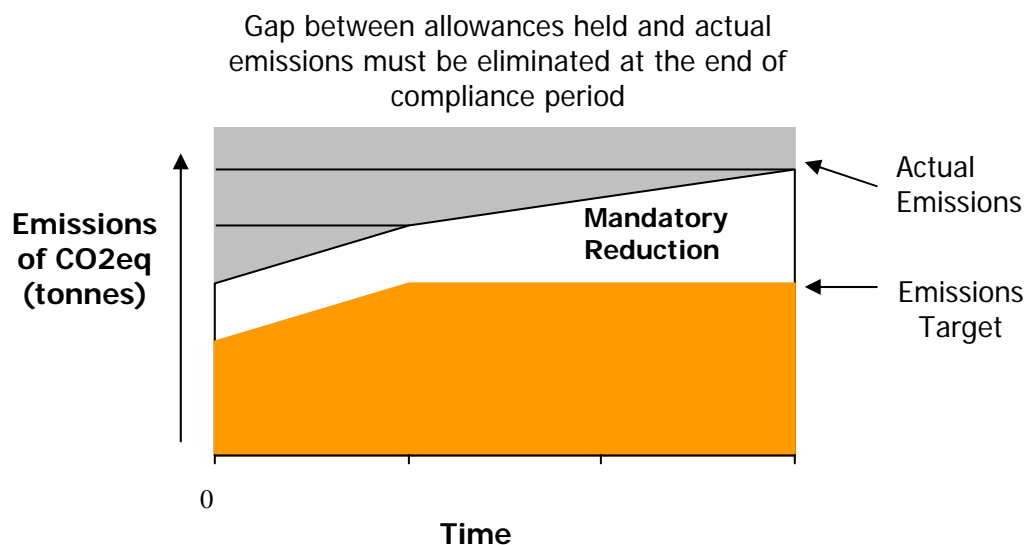
International GHG credits were also available. These instruments were treated with caution due to concerns about their acceptability in the trading scheme. In the end, news events signaling a devaluation of international credits demonstrated that a cautious approach was most profitable.

## Trading Rules

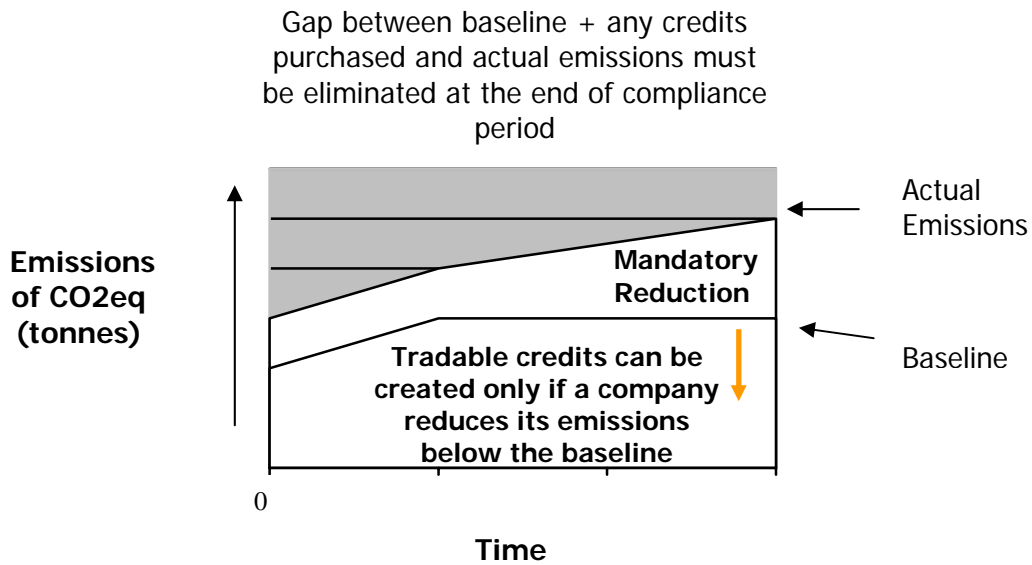
A number of trading rules affected the market activity throughout the Simulation. Participants had to comply in each of the six rounds but compliance meant different things for different markets: compliance in SO<sub>2</sub>/NO<sub>x</sub> markets meant holding instruments equal to or greater than a company's actual emissions; compliance in the GHG market meant holding instruments equal to or greater than gap between actual emissions and a company's GHG limit.

Figures 1 & 2 illustrate the difference between a Cap and Trade and Baseline and Credit market.

**Figure 1. Cap and Trade Market**



**Figure 2. Baseline and Credit Market**



Financial penalties for non-compliance rose throughout the simulation and were accompanied by a carry-over of any shortfall in compliance instruments into the next trading round. Banking was allowed at different levels throughout the simulation but borrowing and short selling were not. Instruments banked at the end of simulation were priced to participants on a marked-to-market basis at the average daily trading price to discourage participants from dumping and crashing prices. This provided a more realistic ending to the simulation, as trading systems are expected to continue over time.

**Table 3: Penalties and Banking Rules per Round**

	SO <sub>2</sub>		NO <sub>x</sub>		GHG	
	Penalty per tonne	Banking	Penalty per tonne	Banking	Penalty per tonne	Banking
Round 1	\$3500	100%	\$5000	100%	--	75%
Round 2	\$4375	100%	\$6250	100%	\$15	100%
Round 3	\$4375	100%	\$6250	70%	\$15	100%
Round 4	\$4375	100%	\$6250	100%	\$15	100%
Round 5	\$5000	60%	\$7000	60%	\$50	100%
Round 6	\$5000	100%	\$7000	100%	3 x Ave Mkt Price	100%

## Real-time Trading Platform

The trading itself took place using an internet-accessed, Java-based applet that utilizes the eSpeed<sup>SM</sup> family of trading technologies. This trading platform allowed all companies to trade in real time, simultaneously. All instruments and all vintages were shown on the same screen, allowing instantaneous comparison of prices.

A screenshot of the trading platform is provided below:

The screenshot displays a trading platform interface with several key components:

- Forward Trading:** A callout box pointing to the 'Round' column of the main table.
- Offers and Bids:** A callout box pointing to the 'Bid' and 'Offer' rows within the table.
- GHG, NOx and SO2 products on one screen:** A callout box pointing to the column headers for 'CanGHG', 'IntGHG', 'NOxAllow', 'NOxCredits', and 'SO2Allow'.
- Real-time stream of all transactions:** A callout box pointing to the 'All Transactions' sub-table in the bottom left.
- Breaking news:** A callout box pointing to the 'News Header' section in the bottom right.

**Main Table Data:**

Round		CanGHG			IntGHG			NOxAllow			NOxCredits			SO2Allow		
		Price	Vol.	Act.	Price	Vol.	Act.	Price	Vol.	Act.	Price	Vol.	Act.	Price	Vol.	Act.
2004-2006	Bid	30.02	21652 *	Sell	30.00	120	Sell				15.07	25125 *	Sell			
	Offer				40.02	1252	Buy	2.00	5 *	Buy				50.00	300	Buy
2007	Bid	20.00	2521 *	Sell										1200.00	3400	Sell
	Offer	26.00	324	Buy												
2008	Bid	31.02	2512 *	Sell				5.00	20	Sell	3.00	380	Sell			
	Offer															
2009	Bid	20.00	2545	Sell	5.00	70	Sell				45.00	654	Sell	25.00	6421	Sell
	Offer							35.00	450	Buy						
2010-2012	Bid	14.00	3323	Sell							25.00	254	Sell			
	Offer	16.25	2521 *	Buy				56.00	56	Buy						
2013-2015	Bid	12.25	2125	Sell												
	Offer	13.25	1254 *	Buy										5.00	34	Buy

*Note: Volumes are in Tonnes. Prices are in \$ / tonne. To hit a bid (sell to the bidder), click SELL. To hit an offer (buy from the supplier), click BUY. To cancel a bid or offer click X. Right click over \* to show the bid/offer stack.*

**Trade Input Engine:**

- Instrument Name: CanGHG
- Year: 2004-2006
- Bid or Offer: BID
- Volume: [ ]
- Price: [ ]
- Transact: **Post Bid/Offer**

**News Header:**

- 11:33 Penalties for Non-Compliance Announced
- 11:20 U.S. - Kyoto Link Stalled

**Real-time stream of all transactions:**

Your Transactions					All Transactions				
Ins	Vol	Price	Time	Yr	Ins	Vol	Price	Time	Yr
CanGHG	5321	22.00	11:33	2009	CanGHG	2210	45.00	11:33	2004-2...
CanGHG	564	33.02	11:26	2008	CanGHG	5	45.00	11:26	2004-2...

**Breaking news:**

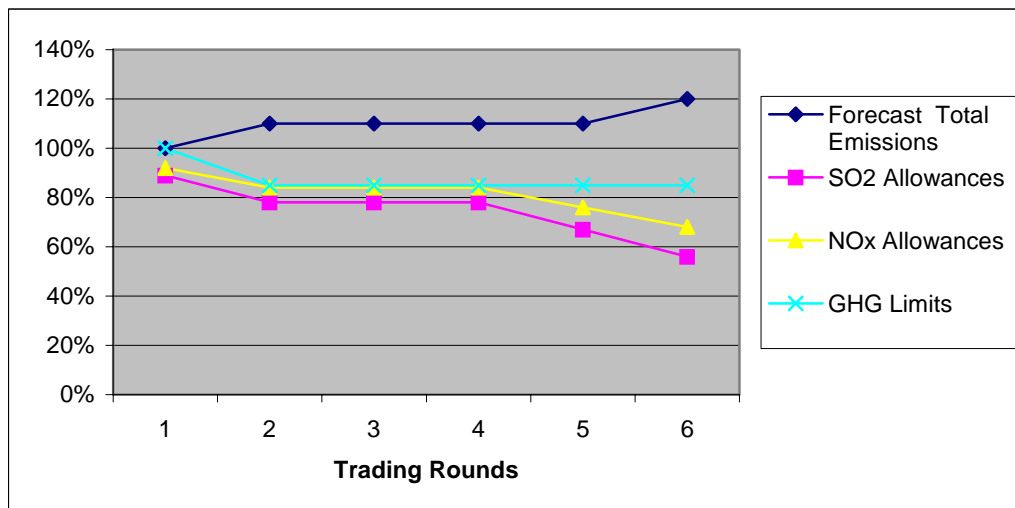
Heads of state from the European Union, Japan, Russia and the U.S. gathered at the end of COP 15 today to report that a plan to link the U.S. and Kyoto systems had been stalled. Negotiators were reportedly unable to reach an agreement on how to resolve differences in the reporting protocols under the two systems. The negotiations will be postponed until the next COP meeting to be held October 3, 2012 in Winnipeg, Canada. "We are determined that these two vibrant markets will converge," said John Prank,

# SIMULATION RESULTS

While realistic data was provided in the simulation it also reflected the uncertainties in Canadian emission markets today. Examples of this uncertainty include a lack of market pricing information, unclear policy regimes for trading environments, uneven emissions trading experience amongst participating firms and changing compliance penalties. Participants noted that uncertainty was one reason for not initially selling their surplus allowances and credits. System familiarity, the desire to experiment and compliance necessity drove many of these hesitant participants into the market in later rounds.

The participating buyer companies were from the cement, chemicals, coal, oil and gas, pipelines, pulp, power generation and government sectors, with suppliers represented by the agriculture, waste and transportation sectors. The level of all forecast emissions for buyers increased over time while, conversely, there was a downward trend in the allocation of emission allowances/limits as a percentage of these emissions. As a consequence, buyers were faced with a situation where they needed to either purchase, or generate internally, increasing volumes of emissions reductions. The chart below illustrates the economy-wide supply-demand positions for each emission type.

**Chart 1: SO<sub>2</sub>/NO<sub>x</sub> Allowances and GHG Limit as Percentage of all Forecast Emissions Over Time**



## Starting Positions

Each company started with emission forecasts for each year of the simulation along with a cash position of \$2,000,000,000. Participants were allocated company specific technologies. These technologies could be implemented in any period and once implemented resulted in a stream of emissions reductions. Once implemented, however, the option to implement that technology was no longer available.

Each company's starting position was unique. Each sector had to reduce their emissions by the same percentage per round, which translated into drastically different company commitments in terms of tonnes. Oil and Gas and Power Generation were the two sectors with the largest shortfalls across each of the three markets. Some sectors were particularly hard hit by one constraint, such as Pipelines under the GHG regulations and the Chemical sector under the NOx cap

The following two tables provide market snapshots for the SO2 and NOx markets. Each table provides a breakdown of the number of participants in each sector and the tonnes of emissions in all periods. The table also shows emissions allowances and shortfalls in that market.

**Table 4: SO2 Market Snapshot**

Sector	Number of Participants	Emissions (tonnes)	Allowances Allocated (tonnes)	Sector Shortfall (tonnes)
Cement	2	80,487	57,374	23,113
Chemicals	3	35,346	25,189	10,157
Coal	1	13	10	3
Oil & Gas	14	4,444,473	3,140,240	1,304,233
Pipelines	4	12,385	8,979	3,406
Pulp	3	16,850	12,209	4,641
Power Generation	8	3,621,920	2,591,019	1,030,901
<b>Total</b>	<b>38</b>	<b>8,211,474</b>	<b>5,835,020</b>	<b>2,376,454</b>

**Table 5: NOx Market Snapshot**

Sector	Number of Participants	Emissions (tonnes)	Allowances Allocated (tonnes)	Sector Shortfall (tonnes)
Cement	2	73,384	58,058	15,326
Chemicals	3	130,921	103,698	27,223
Coal	1	1,427	1,141	286
Oil & Gas	14	1,309,140	1,028,675	280,465
Pipelines	4	125,892	100,068	25,824
Pulp	3	35,185	27,964	7,221
Power Generation	8	1,773,494	1,407,144	366,350
<b>Total</b>	<b>35</b>	<b>3,449,443</b>	<b>2,726,748</b>	<b>722,695</b>

Table 6 provides a market snapshot for the GHG market, including a breakdown of the number of participants and the tonnes of emissions in all periods. The table also shows

emissions baselines and shortfalls. The GHG market differed from the NOx and SO2 markets in that no allowances were allocated. Instead, capped entities in the GHG market had to reduce their emissions to the level of their emissions in 2000 – their baseline level.

**Table 6: GHG Market Snapshot**

Sector	Number of Participants	Emissions (tonnes)	Baseline (maximum allowed emissions)	Sector Shortfall (tonnes)
Cement	2	24,269,208	21,082,800	3,186,408
Chemicals	3	57,209,244	46,259,253	10,949,991
Coal	1	4,404,638	4,366,770	37,868
Oil & Gas	14	1,011,712,442	870,422,524	141,289,918
Pipelines	4	150,809,555	124,841,683	25,967,872
Pulp	3	3,452,435	2,934,570	517,865
Power Generation	8	711,847,732	623,027,335	88,820,397
Government	3	8,144,667	6,696,000	1,448,667
<b>Total</b>	<b>38</b>	<b>1,971,849,921</b>	<b>1,699,630,935</b>	<b>272,218,986</b>

### Internal Abatement Options

Participants were presented with several options to reduce emissions in order to remain in compliance, including internal emission reductions at the source, and the purchase of external emission allowances or credits on the market. In order to make effective decisions between internal and external compliance options, it is necessary to evaluate the costs, benefits and risks of the different compliance scenarios prior to committing to an approach.

The Emissions Simulation Analysis Tool (ESAT), developed for Climate Change Central by ENWEST Inc., was a simulation tool constructed using Microsoft Excel that allowed participants to analyze their emission compliance options. ESAT provided a direct cost comparison between the available internal emission abatement technologies versus the cost of equivalent external market-based reductions (or increases) valued at real time simulated market prices. ESAT also provided a graphical representation of the participant's compliance target, emission levels and the historical instrument prices.

### Trading Activity

Emitters facing caps could either choose to reduce emissions through internal action, purchase allowances, domestic or international credits in the marketplace, or some combination of the two approaches. Alternatively, an emitter could choose to pay a penalty if it failed to hold sufficient compliance instruments.

As simulation participants successfully grasped the mechanics of the trading simulation they actively pursued an array of alternative strategies. Some sought compliance at all

costs, while others looked to maximize trading gains by taking advantage of the risk averseness of others.

Total trading time was 175 minutes over 12 simulated years. Each trading round varied in actual elapsed time (45, 20, 20, 20, 35 and 35 minutes respectively) and in terms of simulated years (between one and three years). The length of each analysis round was variable, and depended on the complexity of the decisions that participants were expected to make during that round.

The price path of the three sets of instruments traded followed broadly similar patterns, but at times exhibited sharply divergent price points, largely in response to the 'breaking news' events. In the summaries presented below some outliers were removed to eliminate trades that occurred well outside the market norms.

### The SO2 Market

In the SO2 market, participants were able to buy and sell allowances of current and future vintage. Table 7 illustrates the trading activity in the SO2 market in all rounds. The average weighted SO2 prices per round increased steadily over time with a significant jump in the last round attributable to the simultaneous 10 percent drop in SO2 allowance allocations and 20 percent increase in forecast SO2 emissions. Participants who had excess SO2 Allowances in Round 6 were able to increase their asking prices significantly as they knew if they did not sell excess allowances in their accounts at the end of Round 6, they would be paid on a marked to market basis.

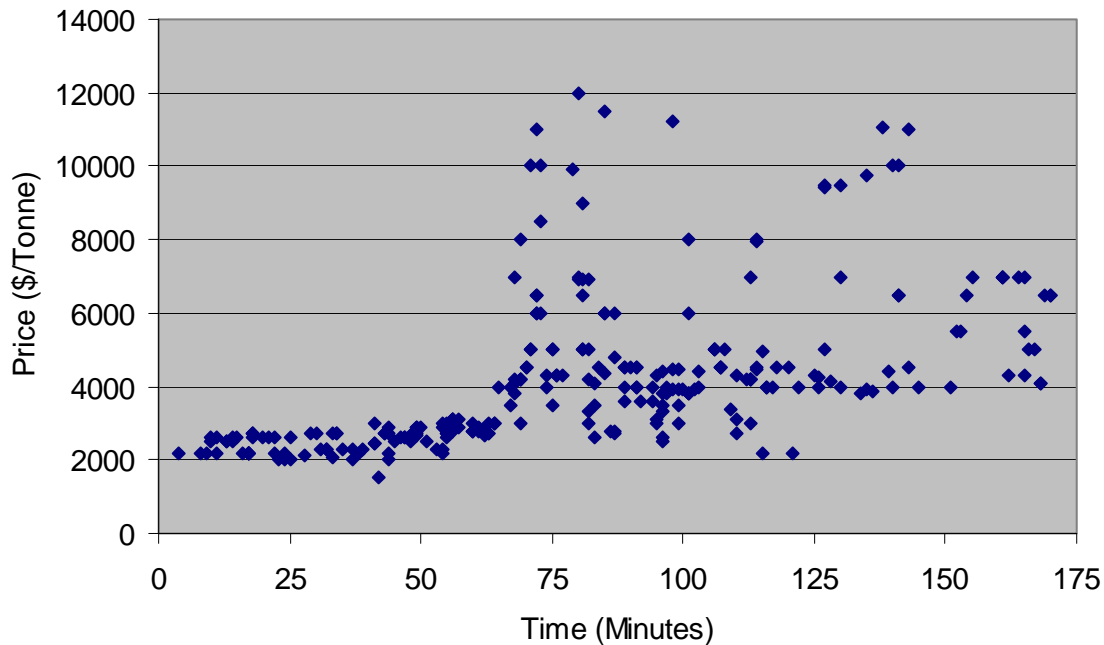
**Table 7: SO2 Trading Activity**

Round	SO2 Trading Activity			
	Weighted Average Price (\$ / tonne) <sup>2</sup>	Maximum Price	Minimum Price	No. of Trades
2004 – 2006	2321.30	3000	1500	56
2007	2684.28	3100	2200	44
2008	4906.74	15000	2600	50
2009	3945.62	13000	2500	49
2010 – 2012	4284.03	9759	2200	44
2013 – 2015	5306.57	11000	4000	30
All	4500.48	15000	1500	273

<sup>2</sup> Weighted average price = Tonnes traded \*price

Chart 2 below shows the price of every individual SO<sub>2</sub> transaction in \$/tonne over time. Each individual point represents one trade.

**Chart 2: SO<sub>2</sub> Transactions**



Exceptional trades, both in terms of volumes and prices, took place sporadically throughout the simulation, most often as a result of inexperience with trading concepts or strategies. These outliers served as useful discussion pieces throughout the simulation as participants learned to monitor not only their internal and external prices, but also the changing compliance penalties and the strategies of their competitors.

### **The NO<sub>x</sub> Market**

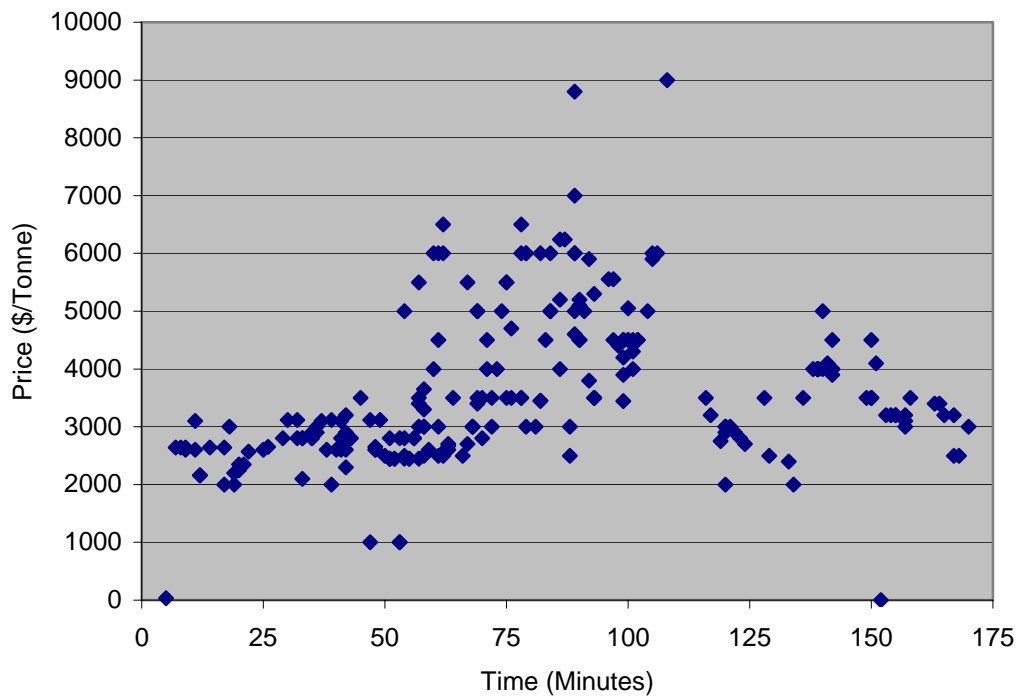
In the NO<sub>x</sub> market, participants were able to buy and sell NO<sub>x</sub> allowances of current and future vintage as well as credits generated from participants that were able to voluntarily reduce their NO<sub>x</sub> emissions from some baseline level. Table 8 illustrates the trading activity in the NO<sub>x</sub> market in all rounds. Again, the weighted average price increased over time. Notably, prices increased significantly in round 4 due to the news item announcing a 30% reduction in NO<sub>x</sub> credits at the end of round 3. Again, participants who had excess NO<sub>x</sub> allowances and credit at the end of round 6 were able to increase asking prices significantly as excess allowances and credits in their accounts were marked to market at the end of the simulation.

**Table 8: NOx Trading Activity**

Round	NOx Trading Activity			
	Weighted Average Price (\$ / tonne) <sup>3</sup>	Maximum Price	Minimum Price	No. of Trades
2004 – 2006	2526.31	3500	2000	47
2007	2670.30	6500	1000	49
2008	3439.33	6500	2500	35
2009	4681.23	8800	2500	43
2010 – 2012	3650.64	9000	2000	21
2013 – 2015	3557.52	5000	2500	39
All	3229.77	9000	1000	234

The chart below shows the price of every individual NOx transaction in \$/tonne over time. Each individual point represents one trade.

**Chart 3: NOx Transactions**



<sup>3</sup> Weighted average price = Tonnes traded \*price

## The GHG Market

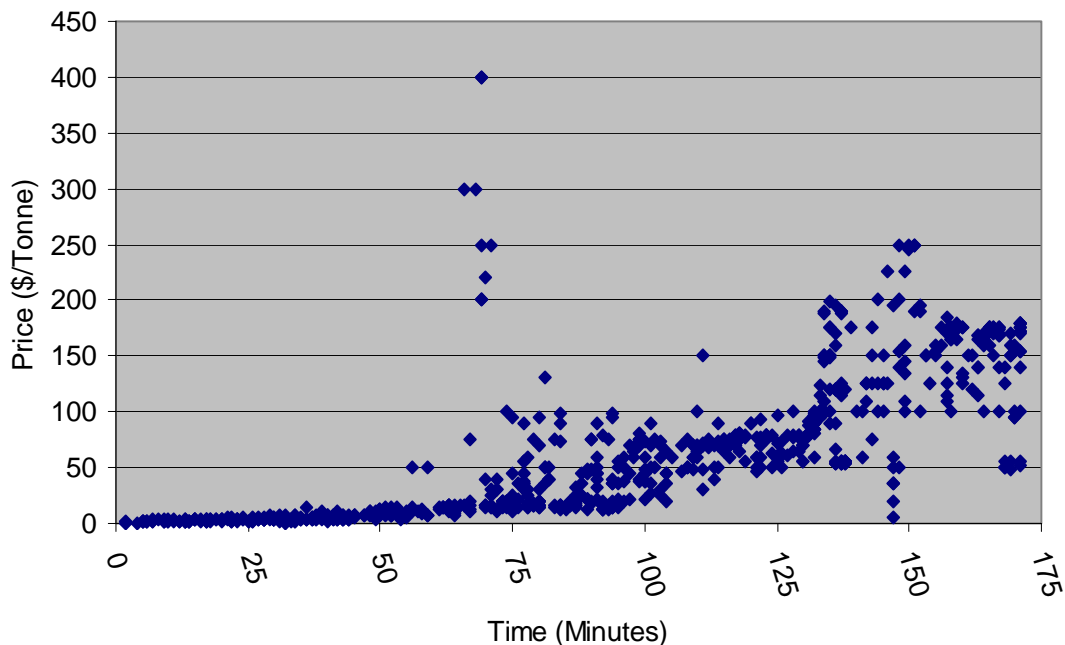
In the GHG market, participants could choose current or future vintage domestic credits or international credits. Prices in the GHG market were held low in the first round as trading was speculative in the run-up to a compliance market. Those who made early investments held 75 percent of them for compliance purposes in Round 2. The sharper rise in prices in the GHG market compared to the gradual increases (specific news impacts aside) in the SO<sub>2</sub> and NO<sub>x</sub> markets are attributable to a relative lack of internal supply options. As participants approached the end of the simulation, less GHG internal projects were available to them and they were forced to seek compliance instruments in the market.

**Table 9: GHG Trading Activity**

Round	GHG Trading Activity – (price in \$ / tonne)			
	Weighted Average	Maximum	Minimum	No. of Trades
2004 – 2006	4.64	15	0.5	209
2007	6.76	50	3	69
2008	29.46	400	10	96
2009	31.55	5000	12	114
2010 – 2012	73.61	199	30	195
2013 – 2015	106.50	250	20	151
All	43.15	5000	0.5	834

The chart below shows the price of every individual GHG transaction in \$/tonne over time. Each individual point represents one trade.

**Chart 4: GHG Transactions**



## Internal Investments

A total of \$4,734,314,212 was spent on internal reductions for all emissions throughout the simulation—including investments from suppliers in the simulated economy who then sold the reductions as credits into the market. The frequency of internal investments was much greater in the earlier rounds when less costly projects were available to participants and the value of the ongoing reductions could be applied to a longer term. The following table breaks down investment in internal projects by round:

**Table 10: Internal Investment Volumes and Frequency**

Round	Internal Investment Activity			
	No. of Investments			\$ Transacted
	SO2	NOx	GHG	
2004 – 2006	31	63	65	1,586,132,718
2007	17	17	36	1,376,207,629
2008	8	7	16	1,079,897,178
2009	4	1	9	410,011,283
2010 – 2012	2	0	14	25,140,372
2013 – 2015	2	0	9	256,925,032
All	64	88	149	4,734,314,212

## Compliance

The lack of binding GHG targets, the abundance of low-cost internal reductions and the long duration of the first round meant that only 3 of the 50 participants failed to comply in one of the markets. In Rounds 2, 3 and 4, as the complexity, pace and volatility (due to new impacts) of trading increased, so did the number of participants who were out-of-compliance: 26, 19, and 16 respectively. By Round 5, those that had been caught out-of-compliance were finding it difficult to overcome the steadily increasing cash penalties as well as the carry-over of their shortfalls in markets where prices were rising steadily while cash allowances remained fixed. With few affordable internal reductions left in Round 5, 14 virtual companies were caught out-of-compliance.

In the last round, the number of virtual companies finishing out-of-compliance increased to 23 as supply became scarce and sellers drove prices up or held onto their excess instruments across all three markets to benefit from marked to market cash deposits in their accounts at the end of the simulation.

Volume in tonnes marked-to-market at the end of the simulation:

SO<sub>2</sub>: 8,677,488,089

NO<sub>x</sub>: 12,544,530,461

GHG: 33,674,514,757

A key learning for future simulations is that uncertainty regarding the future value of excess instruments should be interjected into the later rounds to avoid instrument hoarding.

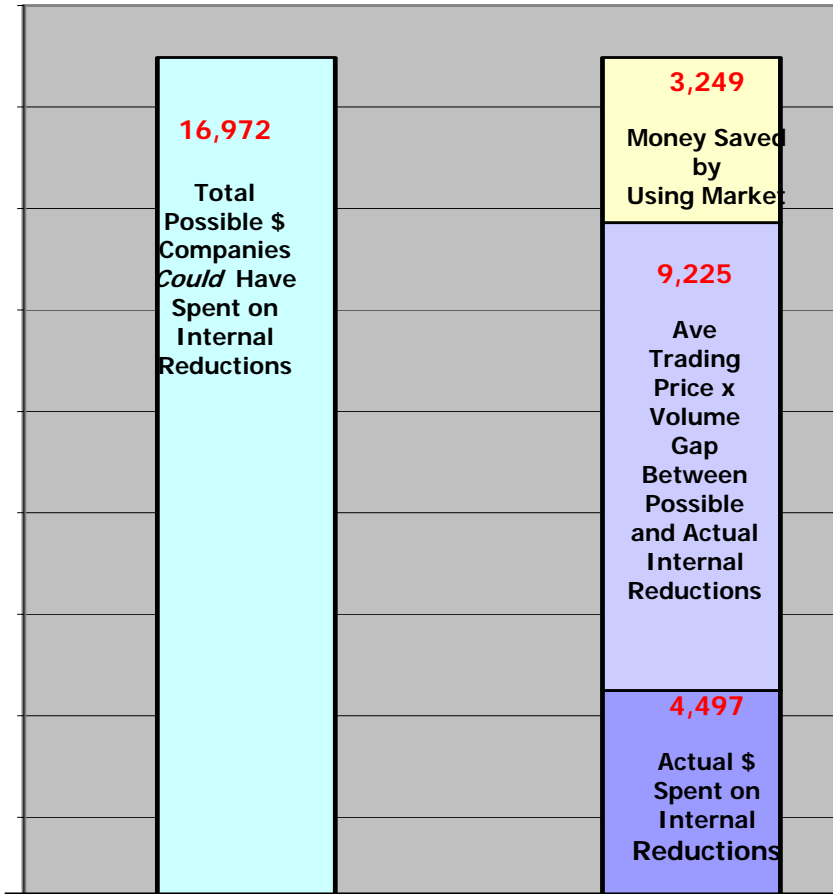
### **Economic Value of Emissions Trading**

Emissions' trading is touted as an efficient policy tool because it is thought to be less costly than more traditional command and control type of policies. A more traditional approach would require firms to reduce their emissions internally to reach some specific reduction target. In order to evaluate whether the simulated trading system was more economically efficient we compared the cost and level of reduction that resulted if firms used all of their internal abatement opportunities with the cost of that same level of reduction in the simulation. Information for this comparison is as follows:

- The total value of all available internal reductions was \$16,972,148,224.
- With access to emissions trading, participant companies actually spent \$4,497,421,964 on internal emission reductions. The remaining volume of compliance instruments needed was purchased in the market. Multiplying that difference in volume by the weighted average market price (\$9,225,888,616) and adding that amount to the money actually spent on internal reductions (\$4,497,421,964) we are left with a total value of \$13,723,310,580 dollars spent to achieve the amount of reductions available to participants through internal action.
- The dollars saved by emissions trading, or the difference between the total dollars that would have been spent on internal actions without trading and the actual dollars spent on the same level of reduction that was achieved by trading is \$3,248,838,645. This represents a savings of 19%.

Chart 5 that follows, illustrates this savings.

**Chart 5: Cash Saved in Simulation from Trading Activity (in millions of \$)**



**Learning by Doing**

Feedback from participants highlighted that the trading simulation provided insight into how various policy decisions impact market behavior. In particular, uncertainty and government interference was reported to have seriously affected the strategies of companies throughout the simulation. Participants also stressed the importance of understanding their own emissions profiles and internal opportunities before going to the market. Those participants who arrived with prior market experience were perceived to have a significant advantage, indicating that the sooner the environmental and trading arms of corporations started building emissions trading capacity, the better prepared they would be when real emissions trading markets were launched.

The 2<sup>nd</sup> Alberta Emissions Trading Simulation allowed participants to experience the viability of emissions trading first-hand. As they deliberated over the interactions between different markets and pollution-abatement technologies and posted their bids and offers on the boards, the participants were making the concept of emissions trading a workable reality. This was the goal CO2e.com together with Climate Change Central, set out to achieve and we thank all participants for making the trading simulation both highly successful and highly enjoyable.

## Further Information

For more information on the 2<sup>nd</sup> Alberta Emissions Trading Simulation or about Climate Change Central please contact:

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