Background:

- The first online carbon market simulation was run over the course of three weeks between December 4 and 22, 2017. In total, 80 people are actively participated in this exercise.
- The second online carbon market simulation was run over the course of six weeks between January 29 and March 9, 2018. In total, 88 participants engaged in this exercise.
- This bulletin contains results of this simulation. It includes:
  - The parameters of this second simulation for reference.
  - The results up to the sixth and last year of this simulation of each of the three teams, including notes on market behavior
  - Recommendations for the participants to consider for the participation in the forthcoming third simulation exercise.
  - A comparative table of results on this simulation exercise for the three teams with notes.
  - **Total marginal compliance costs (for the 6 years) for each participant and comparison with the costs of compliance of each facility when run by an AI "bot". Only the virtual company names are presented.**

THE RESULTS OF THIS SIMULATION WILL BE DISCUSSED ON MARCH 15.

Simulation parameters for Teams A, B and C Second online simulation exercise	
Initial cap	355,850,000 tons
Emission reduction goal (see Figure 1 below)	3%/year in years 1 – 3 (a total of 9% over three years) 4%/year in years 4 – 6 (a total of 21% over six years)
BAU emissions	Year 1 + 2 to 6%/year
Free allowances	80%
ETS duration and schedule	6 virtual years (each virtual year from Mon at 10:00 AM to Friday at 10:00 AM).
Regulated companies in ETS[1]	242 (27 – 33 human and ~ 209 - 215 AI bots)[2]
Banking limit	100% of current year compliance obligation
Maximum offsets	10% of compliance obligation
Auction floor and ceiling price limits	$40 - 300/ton
Auctions	4/virtual year - 1/actual day. Offering current & future year EAs
Fine for each missing allowance	$300 + 1 allowance (from next year)
Exchange and OTC volatility limit	Maximum bid/offer price deviation of 10% from last trade

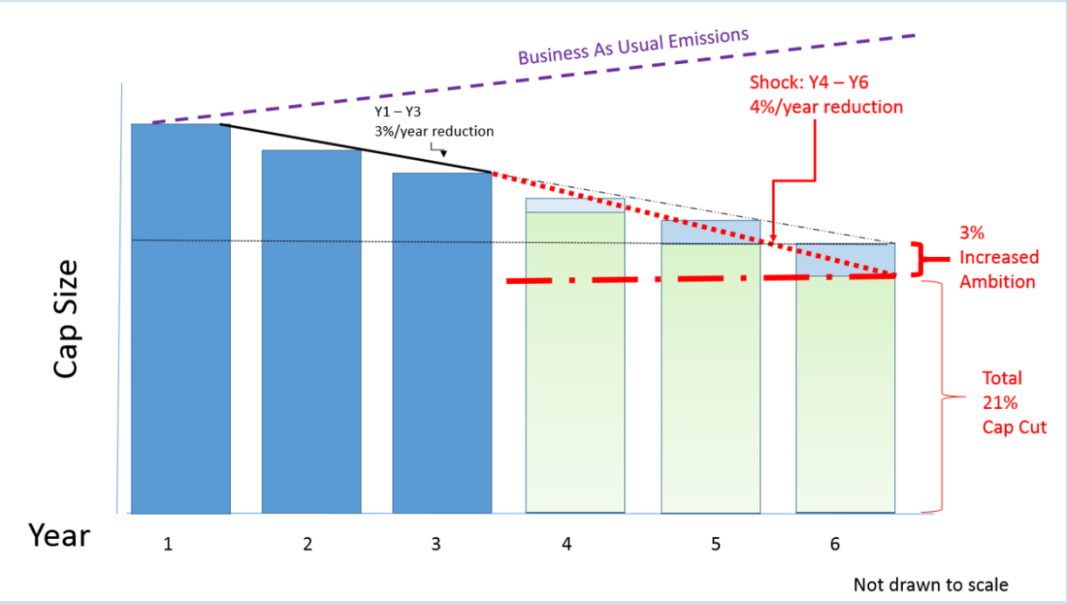

Figure 1 Carbon Management Challenge Inclusive of Year 4 Shock

CO_2 Market Simulation Exercise
2nd Simulation Year 6/6 Results
Group A

Parameters: Market shock introduced on year 4, cap reduction rate increased from 3% to 4%
90% allocation ● -3%/year reduction ● +2-5%/year BAU ● 10% offsets ● 10% volatility ● 100% banking limit ● frugal budget

Highlights and Recommendations

- 88% human compliance in Y6. 522.8 M tons reductions in aggregate. $(-39.40) - $109.63 overall marginal cost of compliance.
- Current year average EA price of $68.40 ($55.58 overall) and offset price of $73.65 ($52.68)
- Exchange: EAs and Offsets trades were quite volatile this year. Y6 EAs opened at $66, traded as high as $238 (perhaps driven by one human seller and a host of AI bot buyers), and closed at $72. After closing Y5 at $79 offsets did not trade.
- Auctions Y6 EAs were nearly fully subscribed (100% for A1, 3, 4 and 95% for A2). Prices ranged from $40.5 (A2) to $120 (A1).
- In this 6th year, likely owing to prior year over abatements, purchases, an overall long market, and banking limits, 13 participants (35%) forfeited a total of more than 13.9 million tons of EAs. The resulting forfeitures served to increase participant's overall marginal cost of compliance.

System Totals	This Year	FINAL
Forecast Emissions for all Economic Sectors	428,685,320 tCO2e	2,347,749,089 tCO2e
Allowances Sold by Government	13,881,408 tCO2e	165,119,311 tCO2e
Allowances Surrendered to Government	211,281,512 tCO2e	1,458,427,822 tCO2e
Auction Revenue Collected by Government	$949,462,194.86	$9,177,830,221.88
Average Allowance Sale Price	$68.40/tCO2e	$55.58/tCO2e
Offsets Surrendered to Government	2,516,335 tCO2e	20,732,768 tCO2e
Average Offsets Sale Price	$73.65/tCO2e	$52.68/tCO2e
Abatement Undertaken	110,939,494 tCO2e	502,108,977 tCO2e
Emission Reduced	113,455,829 tCO2e	522,841,745 tCO2e
Forecast emissions less abatement undertaken	315,229,491 tCO2e	1,824,907,344 tCO2e
Number of Compliance Penalties applied	7 unit(s)	60 unit(s)
Value of Govt. Penalties Applied	$648,241,800.00	$4,599,967,800.00
Overall Marginal cost of compliance range	$(-39.40) - $109.63	

Sim 2 – Exchange and Auction / OTC Snapshot

Team A Auction Results

Year	Auction #	Vintage	Volume Offered	Price ($/ton)	Total Sold	Percent Sold
Year 6	#4	YEAR 6	3,514,024	59	3,514,024	100
Year 6	#3	YEAR 6	3,514,018	53	3,514,018	100
Year 6	#2	YEAR 6	3,514,018	40.50	3,339,348	95
Year 6	#1	YEAR 6	3,514,018	120	3,514,018	100
Year 5	#4	YEAR 5	3,669,704	40	424,502	12
Year 5	#3	YEAR 5	3,669,703	40	429,574	12
Year 5	#2	YEAR 5	3,669,703	85	3,669,703	100
Year 5	#1	YEAR 5	3,669,703	80	3,669,703	100
Year 5	#1	YEAR 6	3,514,018	130	3,514,018	100
Year 4	#4	YEAR 4	4,364,008	40	1,169,813	27
Year 4	#3	YEAR 4	4,373,182	40	404,909	9
Year 4	#2	YEAR 4	4,373,182	40	1,311,679	30
Year 4	#2	YEAR 6	3,514,018	40.39	3,514,018	100
Year 4	#1	YEAR 4	4,373,182	40	3,488,727	80
Year 4	#1	YEAR 5	3,669,703	40	3,669,703	100
Year 3	#4	YEAR 3	5,391,665	69.61	5,391,665	100
Year 3	#3	YEAR 3	5,398,137	40	4,458,638	83
Year 3	#3	YEAR 6	3,647,462	40	3,647,462	100
Year 3	#2	YEAR 3	5,398,137	40	1,181,000	22
Year 3	#2	YEAR 5	3,780,906	42.59	3,780,906	100
Year 3	#1	YEAR 3	5,398,137	40	4,114,333	76
Year 3	#1	YEAR 4	4,474,884	43.85	4,474,884	100
Year 2	#4	YEAR 2	6,689,980	78.05	6,689,980	100
Year 2	#4	YEAR 6	3,647,462	42.9	3,647,462	100
Year 2	#3	YEAR 2	6,689,980	40	6,689,980	100
Year 2	#3	YEAR 5	3,780,906	45.05	3,780,906	100
Year 2	#2	YEAR 2	6,689,980	46.9	6,689,980	100
Year 2	#2	YEAR 4	4,474,884	53.99	4,474,884	100
Year 2	#1	YEAR 2	6,689,980	56.4	6,689,980	100
Year 2	#1	YEAR 3	5,398,137	53.06	5,398,137	100
Year 1	#4	YEAR 1	8,629,364	82.61	8,629,364	100
Year 1	#4	YEAR 5	3,780,906	43.23	3,780,906	100
Year 1	#3	YEAR 1	8,629,362	77.54	8,629,362	100
Year 1	#3	YEAR 4	4,474,884	42.37	4,474,884	100
Year 1	#2	YEAR 1	8,629,362	44.74	8,629,362	100
Year 1	#2	YEAR 3	5,398,137	42.31	5,398,137	100
Year 1	#1	YEAR 1	8,629,362	41.96	8,629,362	100
Year 1	#1	YEAR 2	6,689,980	40	6,689,980	100

The total volume of allowances offered through Y6 auctions was **14.1 million EAs** of which 13.9 **(99%)** were sold. The price range at the actions was $**41 - 120**. Curiously, auction interest (as measured by subscription rate) was much higher than in those that were run in Years 3 – 5 (though interest in Y6 EAs has remained strong throughout the simulation.

CO_2 Market Simulation Exercise
2nd Simulation Year 6/6 Results
Group B

Parameters: Market shock introduced on year 4, cap reduction rate increased from 3% to 4%

90% allocation ● -3%/year reduction ● +2-5%/year BAU ● 10% offsets ● 10% volatility ● 100% banking limit ● $10B budget

Highlights and Recommendations

- 82% human compliance in Y6. 556.6 M tons reductions in aggregate. $(-9.38) – 110.28 overall marginal cost of compliance.
- Current year average EA price of $40.01 ($60.80 overall) and offset price of $50.31 ($60.23).
- Y6 EAs opened at $54, rose to $56, then fell sharply to $42 before recovering to $51, the same price at which they closed the year. Offsets traded at $50.
- Auctions 1, 2, and 4 were fully-subscribed. Auction 1 was 36% subscribed. EAs traded at $40 in all four auctions.
- In this 6th year, likely owing to prior year over abatements, purchases, an overall long market, and banking limits, 2 participants (6%) forfeited a total of more than 1 million tons of EAs. The resulting forfeitures served to increase participant's overall marginal cost of compliance.

System Totals	This Year	FINAL
Forecast Emissions for all Economic Sectors	429,739,805 tCO2e	2,351,049,270 tCO2e
Allowances Sold by Government	11,819,586 tCO2e	149,351,010 tCO2e
Allowances Surrendered to Government	223,426,416 tCO2e	1,499,758,011 tCO2e
Auction Revenue Collected by Government	$472,853,720.42	$9,080,077,907.34
Average Allowance Sale Price	$40.01/tCO2e	$60.80/tCO2e
Offsets Surrendered to Government	2,661,952 tCO2e	10,158,481 tCO2e
Average Offsets Sale Price	$50.31/tCO2e	$60.23/tCO2e
Abatement Undertaken	120,039,060 tCO2e	546,432,330 tCO2e
Emission Reduced	122,701,012 tCO2e	556,590,811 tCO2e
Forecast emissions less abatement undertaken	307,038,793 tCO2e	1,794,458,459 tCO2e
Number of Compliance Penalties applied	6 unit(s)	56 unit(s)
Value of Govt. Penalties Applied	$5,095,288,200.00	$10,366,001,700.00
Marginal cost of compliance range	$(-9.38) – 110.28	

Sim 2 – Exchange and Auction / OTC Snapshot

Team B Auction Results

Year	Auction #	Vintage	Volume Offered	Price ($/ton)	Total Sold	Percent Sold
Year 6	#4	YEAR 6	3,514,024	40.01	3,514,024	100
Year 6	#3	YEAR 6	3,514,018	40	1,277,526	36
Year 6	#2	YEAR 6	3,514,018	40.01	3,514,018	100
Year 6	#1	YEAR 6	3,514,018	40	3,514,018	100
Year 5	#4	YEAR 5	3,669,704	95	769,270	21
Year 5	#3	YEAR 5	3,669,703	40	148,930	4
Year 5	#2	YEAR 5	3,669,703	40	2,075,900	57
Year 5	#1	YEAR 5	3,669,703	40	3,669,703	100
Year 5	#1	YEAR 6	3,514,018	53	3,514,018	100
Year 4	#4	YEAR 4	4,364,008	40	803,677	18
Year 4	#3	YEAR 4	4,373,182	40	159,496	4
Year 4	#2	YEAR 4	4,373,182	40	687,765	16
Year 4	#2	YEAR 6	3,514,018	40.39	3,514,018	100
Year 4	#1	YEAR 4	4,373,182	40	1,381,882	32
Year 4	#1	YEAR 5	3,669,703	40	3,669,703	100
Year 3	#4	YEAR 3	5,391,665	61.69	5,391,665	100
Year 3	#3	YEAR 3	5,398,137	40	663,766	12
Year 3	#3	YEAR 6	3,647,462	40	3,647,462	100
Year 3	#2	YEAR 3	5,398,137	40	105,779	2
Year 3	#2	YEAR 5	3,780,906	40	3,780,906	100
Year 3	#1	YEAR 3	5,398,137	40	1,481,878	27
Year 3	#1	YEAR 4	4,474,884	49.77	4,474,884	100
Year 2	#4	YEAR 2	6,689,980	82.18	6,689,980	100
Year 2	#4	YEAR 6	3,647,462	46.06	3,647,462	100
Year 2	#3	YEAR 2	6,689,980	40	5,358,036	80
Year 2	#3	YEAR 5	3,780,906	42.22	3,780,906	100
Year 2	#2	YEAR 2	6,689,980	40.01	6,689,980	100
Year 2	#2	YEAR 4	4,474,884	101.56	4,474,884	100
Year 2	#1	YEAR 2	6,689,980	111.10	6,689,980	100
Year 2	#1	YEAR 3	5,398,137	113.44	5,398,137	100
Year 1	#4	YEAR 1	8,629,364	121.39	8,629,364	100
Year 1	#4	YEAR 5	3,780,906	60.71	3,780,906	100
Year 1	#3	YEAR 1	8,629,362	94.33	8,629,362	100
Year 1	#3	YEAR 4	4,474,884	51.48	4,474,884	100
Year 1	#2	YEAR 1	8,629,362	49.25	8,629,362	100
Year 1	#2	YEAR 3	5,398,137	57.24	5,398,137	100
Year 1	#1	YEAR 1	8,629,362	40	8,629,362	100
Year 1	#1	YEAR 2	6,689,980	40.53	6,689,980	100

The total volume of allowances offered through Y6 auctions was 14.1 million EAs of which 11.8 (84%) were sold. All EAs sold for $40. Curiously, auction interest (as measured by subscription rate) was much higher than in those that were run in Years 2 – 5 (though interest in Y6 EAs has remained strong throughout the simulation.

CO_2 Market Simulation Exercise
2nd Simulation Year 6/6 Results
Group C

Parameters: Market shock introduced on year 4, cap reduction rate increased from 3% to 4%
90% allocation ● -3%/year reduction ● +2-5%/year BAU ● 10% offsets ● 10% volatility ● 100% banking limit ● $10 B budget

Highlights and Recommendations

- 100% human compliance in Y4. 1.12 B tons reductions in aggregate. $(-18.60) – 143.62 overall marginal cost of compliance.
- Current year average EA price of $49.41 ($139.35 overall) and offset price of $49.41 ($135.82 overall).
- Exchange Y6 EAs opened as $47, dropped to $17, rose to $25, and closed at $6. Offsets traded at $52.
- Auction 1 was fully subscribed while Auctions 2 – 4 were lightly subscribed (between 2 and 18%) All EAs traded between $40 and $42.
- In this 6th year, likely owing to prior year over abatements, purchases, an overall long market, and banking limits, 18 participants (53%) forfeited a total of more than 57.8 million tons of EAs. The resulting forfeitures served to increase participant's overall marginal cost of compliance.

System Totals	This Year	FINAL
Forecast Emissions for all Economic Sectors	429,426,934 tCO2e	2,349,632,329 tCO2e
Allowances Sold by Government	4,403,300 tCO2e	119,299,157 tCO2e
Allowances Surrendered to Government	60,965,458 tCO2e	750,229,341 tCO2e
Auction Revenue Collected by Government	$183,160,036.00	$16,624,010,371.58
Average Allowance Sale Price	$41.60/tCO2e	$139.35/tCO2e
Offsets Surrendered to Government	791,034 tCO2e	10,139,021 tCO2e
Average Offsets Sale Price	$49.41/tCO2e	$135.82/tCO2e
Abatement Undertaken	229,225,451 tCO2e	1,107,560,275 tCO2e
Emission Reduced	230,016,485 tCO2e	1,117,699,296 tCO2e
Forecast emissions less abatement undertaken	199,410,449 tCO2e	1,231,933,033 tCO2e
Number of Compliance Penalties applied	0 unit(s)	14 unit(s)
Value of Govt. Penalties Applied	$0.00	$789,349,200.00
Marginal cost of compliance range	$(-18.60) – 143.62	

Sim 2 – Exchange and Auction / OTC Snapshot

Team C Auction Results

Year	Auction #	Vintage	Volume Offered	Price ($/ton)	Total Sold	Percent Sold
Year 6	#4	YEAR 6	3,514,024	40	640,023	18
Year 6	#3	YEAR 6	3,514,018	40	65,015	2
Year 6	#2	YEAR 6	3,514,018	40	184,244	5
Year 6	#1	YEAR 6	3,514,018	42	3,514,018	100
Year 5	#4	YEAR 5	3,669,704	95	3,000	0
Year 5	#3	YEAR 5	3,669,703	40.10	110,000	3
Year 5	#2	YEAR 5	3,669,703	40	475,679	13
Year 5	#1	YEAR 5	3,669,703	40	3,669,703	100
Year 5	#1	YEAR 6	3,514,018	52.85	3,514,018	100
Year 4	#4	YEAR 4	4,364,008	0	0	0
Year 4	#3	YEAR 4	4,373,182	40	80,120	2
Year 4	#2	YEAR 4	4,373,182	40	164,374	4
Year 4	#2	YEAR 6	3,514,018	54.23	3,514,018	100
Year 4	#1	YEAR 4	4,373,182	40	3,705,254	85
Year 4	#1	YEAR 5	3,669,703	40	3,669,703	100
Year 3	#4	YEAR 3	5,391,665	65.74	3,414,524	63
Year 3	#3	YEAR 3	5,398,137	40	317,700	6
Year 3	#3	YEAR 6	3,647,462	57.13	3,647,462	100
Year 3	#2	YEAR 3	5,398,137	40	12,036	0
Year 3	#2	YEAR 5	3,780,906	45.16	3,780,906	100
Year 3	#1	YEAR 3	5,398,137	40	1,373,992	25
Year 3	#1	YEAR 4	4,474,884	110.33	4,474,884	100
Year 2	#4	YEAR 2	6,689,980	82.45	2,121,761	32
Year 2	#4	YEAR 6	3,647,462	118.09	3,647,462	100
Year 2	#3	YEAR 2	6,689,980	40	477,107	7
Year 2	#3	YEAR 5	3,780,906	147.08	3,780,906	100
Year 2	#2	YEAR 2	6,689,980	45	2,758,165	41
Year 2	#2	YEAR 4	4,474,884	224.77	4,474,884	100
Year 2	#1	YEAR 2	6,689,980	40	1,448,705	22
Year 2	#1	YEAR 3	5,398,137	256.55	5,398,137	100
Year 1	#4	YEAR 1	8,629,364	300	8,629,364	100
Year 1	#4	YEAR 5	3,780,906	206.52	3,780,906	100
Year 1	#3	YEAR 1	8,629,362	300	8,629,362	100
Year 1	#3	YEAR 4	4,474,884	203.92	4,474,884	100
Year 1	#2	YEAR 1	8,629,362	231.94	8,629,362	100
Year 1	#2	YEAR 3	5,398,137	216.16	5,398,137	100
Year 1	#1	YEAR 1	8,629,362	42.11	8,629,362	100
Year 1	#1	YEAR 2	6,689,980	40	6,689,980	100

The total volume of allowances offered through Y6 auctions was 14.1 million EAs of which 4.4 (31%) were sold. All EAs sold for $40. Auction interest (as measured by subscription rate) was consistent with that for Years 3 – 5.

b

Team A, B, and C Comparison				
Metric	System To Date (Y1 – Y6 totals)			Average
	A	B	C	
Forecast Emissions for all Economic Sectors	2,347,749,089	2,351,049,270	2,349,632,329	2,349,476,896
Allowances Sold by Government	165,119,311	149,351,010	119,299,157	144,589,826
Allowances Surrendered to Government	1,458,427,822	1,499,758,011	750,229,341	1,236,138,391
Auction Revenue Collected by Government	$9,177,830,222	$9,080,077,907	$16,624,010,372	11,627,306,167
Average Allowance Sale Price	$55.58	$60.80	$139.35	85
Offsets Surrendered to Government	20,732,768	10,158,481	10,139,021	13,676,757
Average Offsets Sale Price (This system)	$52.68	$60.23	$135.82	83
Abatement Undertaken	502,108,977	546,432,330	1,107,560,275	718,700,527
Emission Reduced	522,841,745	556,590,811	1,117,699,296	732,377,284
Forecast emissions less abatement undertaken	1,824,907,344	1,794,458,459	1,231,933,033	1,617,099,612
Number of Compliance Penalties applied	60	56	14	43
Value of Govt. Penalties Applied	$4,599,967,800	$10,366,001,700	$789,349,200	5,251,772,900
Average Year 1 Abatements Undertaken	2.4	2.3	4.2	2.9
Range of Overall Marginal Cost of Compliance ($/)	$(-39.40) - $109.63	$(-9.38) – 110.28	$(-18.60) – 143.62	

Market Color:

1. The above table synthesizes the Y1 – Y6 results of the three teams. Marked differences are noted with yellow highlight.
2. Table 1 facilitates a comparison of companies between teams and an exercise that was run entirely on artificial intelligence (e.g., without human participants).
3. Over the course of the entire simulation, Team A and B posted results that were markedly different than those for Team C. A contributing factor, no doubt, is the relatively frugal Team A and B budgets and the overly generous budgets that were provided to Team C players. Differences of note included the following:
   a. Resources spent in allowance auctions (Team C spent the least, A the most)
   b. Allowance and offset unit prices (Team C more than 2X A and B).
   c. Abatements undertaken (C implemented nearly 2X more abatements than A and B)
   d. Non-compliance (Teams A and B, overall, had nearly 4X more violations that did Team C)
4. Government auction revenues and allowance prices were nearly 2X greater for Team C as compared to Teams A than B.
5. Team C participants paid more than 2X greater prices for offset than did Team A and B participants.
6. Team C participants reduced more than 2X more emissions.
7. The range of compliance costs was widest for Team C (~$480), followed by those for Teams A and B.
8. The differences in marginal costs of compliance – both within and between the teams – are quite significant.
   a. While many participants implemented strategies that were below the prevailing market price, some implemented strategies that both reduce costs (e.g., fuel) as well as provide an opportunity to free up allowances which are sold at a premium to the monies spent on the abatement strategy.
   b. In contrast, other participants implemented strategies that produced costs that well above market prices which suggests that a superior performance could have been realized had participants elected to implement different strategies.
9. From the second year of the simulation, a number of participants ended the year with a surplus quantity of allowances. Owing to banking limits, a large volume of allowances were forfeited. This forfeiture benefited by the air (by removing EAs from circulation) but also served to increase the cost of compliance (as participants could not gain a return by liquidating the allowances. Owing to the large number of abetments implemented and large volumes of allowances purchased at auction, Team C suffered the largest volume of forfeited allowances.
10. Faced with an identical challenge participants in the three teams have implemented carbon portfolio management strategies with different results.
11. Those that ended the year short paid a dear price -- $300 per missing ton - in contrast to the Y6 prices, which closed out at prices as low as $5 (Team C) to $40 (Teams A and B). Team B paid the most penalties ($10.3 B) and Team A the least ($4.6B).

TABLE 1 - OVERALL MARGINAL COST OF COMPLIANCE COMPARISON BETWEEN TEAMS A - C AND AI ($/ton)[3]					
Company Name	Unit #	AI	A	B	C
BAJA CALIFORNIA POWER CO.	1	$8.49	($10.30)	$8.55	$59.26
CEMENTO MEXCENTURY	2	($2.03)	($1.30)	($9.04)	($10.43)
CHIAPAS ELECTRICIDAD	3	$3.56	($1.79)	($5.05)	$60.42
CHIHUAHUA GAS NATURAL Y ELECTRICIDAD	4	$2.56	($1.61)	$54.92	$58.19
COAHUILA POWER COMPANY	5	$12.33	$0.05	$11.77	$48.31
COLIMA GAS COMPANY	6	($20.46)	($39.40)	($7.98)	($11.54)
DURANGO ELECTRICITY HOLDINGS	7	$9.54	$15.32	$21.05	$58.85
ELECTICIDAD DE OAXACA Y ASOCIADOS	8	$2.27	($2.45)	$0.44	$2.32
ELECTRICIDAD MEXICANA	9	$12.65	$13.92	$29.68	$6.73
GAS Y ENERGÍA DE SALTILLO	10	$5.41	($13.46)	($9.38)	$7.96
GRUPO DE ELECTRICIDAD MICHOACÁN 1	11	$2.55	$7.27	$5.93	$4.79
GRUPO DE ELECTRICIDAD MICHOACÁN 2	12	$8.71	$4.54	$5.35	$37.70
GRUPO DE ELECTRICIDAD MICHOACÁN 3	13	$2.24	($17.14)	($0.52)	$49.19
GRUPO DE ELECTRICIDAD SONORA	14	$1.76	$1.46	$1.45	$47.21
GRUPO DE LEÓN ELECTRICIDAD 1	15	$9.09	$13.77	$9.69	$50.62
GRUPO DE LEÓN ELECTRICIDAD 2	16	$7.29	$1.51	$9.68	$85.08
GRUPO DE LEÓN ELECTRICIDAD 3	17	$2.74	$2.55	$2.05	$63.10
GRUPO DE LEÓN ELECTRICIDAD 4	18	($10.31)	$14.94	($3.16)	($4.88)
GRUPO ELÉCTRICO DE SINALOA	19	$10.17	($16.12)	$5.89	$59.85
JALISCO ELECTRICIDAD	20	$17.95	$15.85	$18.12	$12.86
LUZ Y GAS DE LA REPÚBLICA	21	$3.54	$11.35	($8.00)	($4.46)
MÉRIDA ELECTRICIDAD	22	$1.79	$1.77	$11.63	($18.60)
MEXICALI UNIDO GAS Y LUZ	23	$11.13	$3.35	$54.97	$31.30
MEXICAN IRON AND STEEL CO.	24	($2.75)	($2.56)	$79.97	$0.90
MEXPETROCHEM SA DE CV 1	25	$16.81	$11.02	($2.80)	$18.07
MEXPETROCHEM SA DE CV 2	26	$4.18	($2.47)	$3.61	$23.58
MORELOS ELECTRICITY	27	$11.37	$35.64	$110.28	$69.91
NAYARIT POWER PLANT	28	$11.77	$8.80	$3.08	$143.62
PETRÓLEOS MONTERREY	29	$24.16	$18.96	$23.74	$66.78
PLANTA DE ENERGÍA DE CANCÚN	30	$20.48	$109.63	$9.98	$14.42
PODER FEDERAL	31	($0.29)	$0.73	$40.00	$10.83
QUINTANA ROO ELECTRICIDAD	32	$18.77	$47.85	($4.32)	$20.23
SINALOA ELECTRICITY HOLDING	33	$14.34	$6.00	($5.86)	$54.95
SONORA GAS Y LUZ	34	$12.96	$7.29	$5.62	$4.94
ZAPOPAN ENERGY LTD. CO. 1	35	$3.51	$5.93	$37.60	$33.90
ZAPOPAN ENERGY LTD. CO. 2	36	$14.62	$5.80	$6.53	$64.98
ZAPOPAN ENERGY LTD. CO. 3	37	$6.97	$0.24	$2.59	($0.88)
ZAPOPAN ENERGY LTD. CO. 4	38	($2.15)	($10.74)	($1.92)	$14.18

[3] Note Those in yellow reflect participants that performed relatively better than their AI-bot counterparts. Teams A – C and the artificial intelligence (AI) / bot-only simulation were run using similar parameters - 6 year term, 80% free allowances, 21% total emission reduction (inclusive of a shock in years 4 – 6). However, where the Teams A – C simulation ran over an elapsed time of 6 weeks, the AI sim was run over an hour and 12 minutes. Owing to the peculiarities of the actions of participants within each simulation, we caution participants against reading too much into the comparisons. Also, for the AI Overall Marginal Cost of Compliance (OMCC) was run using a frugal budget similar to that used in Teams A and B. As such, caution should be exercised when comparing Team C OMCC vs the AI results.

Recommendations for teams A, B and C

The recommendations provided here should be considered by those who wish to participate in the next simulation exercise (details about which will be provided in the coming days). Some will be familiar to participants that engaged in the first simulation exercise. Reflecting on this second simulation, participants should give consideration to the following:

1. Remember that the objective is to implement a carbon portfolio management strategy that results in annual compliance at the lowest possible cost. To meet this primary objective - comply at the lowest possible cost - implement a strategy that includes the following elements:
   - Before doing any abatements or trades, write down the expected shortfall in Y1, Y2…Y6. Understand that the shortfall is a function of the initial gap between:
     - The forecast compliance obligation and the initial allocation
     - Y1 emissions and BAU. And next year's (Yn) BAU (emissions equals the prior year (Yp) emissions plus 2 – 5% of Yp emissions).
   - In the absence of any actions, you will be short by at least this amount at the beginning of the next year.
   - Abate early in year 1. Select those abatements that can be implemented in a timeframe that allows you to build, operate, and generate a profit from the implementation of the abatement such that your forecast compliance obligation will be profitably reduced during the course of the simulation. After implementing abatements in Y1, do not implement additional abatements, at least not without an economically sound reason to do so.
   - Use AutoTrade sparingly. Some participants who turned on AutoTrade after making smart (and frugal) abatements decisions in year 1 returned to find that a number of ADDITIONAL abatements were implemented (thanks to AutoTrade) even into the second year of the simulation.
   - Temper abatement decisions with the understanding that abatements, unlike allowance transactions, are irreversible and require the expenditure of a significant amount of capital (initially and for ongoing O&M). In contrast, allowances and offsets can be secured in discrete increments. Further, whereas investments made in allowances and offsets can generally be recovered (by offering and then reselling the products into the market), the same cannot be said for capital investments in abatements (there is no means to recover the scrap value of capital invested in an abatement).
   - When implementing abatements, take into account banking limits which prevent participants from carrying forward more than a defined quantity (in this simulation, 100% of participant's forecast compliance obligation).
   - Actively manage and adjust your long/short positions using all of the markets. Participate in auctions that frequently have clearing prices lower to those found in the secondary market.
2. Understand and act as if markets -- and prices -- move. Know that at times there is a balanced market, with a healthy supply and demand. At other times, there will be an imbalance -- e.g., with great demand but little supply, or vice versa. As such, in the absence of market certainty, give careful consideration to the prudency of making large moves that have the consequence of producing large surpluses or shortfalls. Instead, it may be prudent to make marginal adjustments that have the effect of resolving shortfalls and surpluses. While participants may be tempted to resolve long/short positions in single trades, it can risky doing so, especially if the market moves.
3. Given the difference in markets participants may wish to (a) look for arbitrage opportunities where they buy low in one market and sell high in another and (b) avoid out of market unfavorable transactions (e.g., buyers paying more or sellers selling for less, than the market price).
4. Given the severe noncompliance cost ($300 plus a 1 ton debit from the next year's allocation) and the opportunity to resolve compliance shortfalls at prices that are significantly discounted, never end the year short.
5. Be careful when using market orders, especially when buying product. While market orders are convenient, participants should give consideration to the use of stop loss and limit orders. Such orders provide participants with a measure of control that is not available with market orders.
6. Where offsets are less expensive – and so long as the offset limit has not been reached, give strong consideration to purchasing and using offsets.