



Cap and Trade Modeling Results – TWG Call #6

The presentation this week includes several simulations on expanded geographical configurations of Midwestern and Western states, plus an adjustment of the target for the Midwestern states to a cap of 22.5% below Year 2005 levels:

1. For the Midwestern states, we ran simulations for two geographical configurations: 1) Midwestern regional C&T partner states (including Manitoba) and 2) All Midwestern regional C&T partners and observers. Please note that we did not include North Dakota in any of the simulations this week, since it is not an observer of the Midwestern regional C&T alignment. However, we include the marginal cost curve of North Dakota in the attached figures. From the figures we see that North Dakota has a higher marginal cost curve than the average level of the Midwestern states. Thus, including North Dakota would increase the permit price of Midwestern states trading.
2. For the Western Climate Initiative, we also ran simulations for two geographical configurations: 1) WCI partners (including the two Canadian Provinces — British Columbia and Manitoba) and 2) All WCI partners and observers.
3. We ran simulations that join the expanded Midwestern and Western states together for both economy-wide and power sector only scenarios.
4. Please note that a new column is added to the end of the results tables. The last column now presents the emission reduction goals (caps before trading) expressed as percentages of the 2020 business-as-usual (BAU) emission levels.
5. For power sector only scenarios, we developed the marginal cost curves following the most conservative strategy — including only the options that are directly designed for power sector emission reduction. Therefore, our simulation results for power sector only cases yield upper-bound estimations of mitigation compliance costs.
6. Again, we have very limited data on mitigation/sequestration options for most states at this time. Currently, we only have primary cost data for Arizona, New Mexico, Colorado, and Montana. Better data will yield more accurate results.

Economy-wide Cap and Trade Simulations

Option No.	Policy Option ¹	Permit Price ²	Largest Seller	Largest Buyer	MN Gain	MN GHG Reductions	MN Cost-Effectiveness ³
		(\$/tCO ₂ e)	(million tCO ₂)	(million tCO ₂)	(%)	(MMtCO ₂ e)	(\$/tCO ₂ e)
		2020	2020	2020	2020	2020	2020
C&T-1 Cap & Trade	WCI Partners C&T (All Sectors)	10.52	CA 37.57	AZ 14.61	-	-	-
	WCI Partners+Observers C&T (All Sectors)	15.04	CA 74.86	CO 35.94	-	-	-
	Midwestern Partners C&T (All Sectors)	11.97	IL 24.01	MN 12.28	67.36	54.11	-5.30
	Midwestern Partners+Observers C&T (All Sectors)	13.29	IL 28.98	MN 10.46	49.37	55.93	-4.72
	Midwestern Partners plus WCI Partners C&T (All Sectors)	11.08	CA 42.39	AZ 14.22	81.16	52.87	-5.70
	Midwestern Partners plus WCI Partners+Observers C&T (All Sectors)	13.70	CA 64.18	CO 36.35	44.48	56.47	-4.54
	Midwestern Partners+Observers plus WCI Partners+Observers C&T (All Sectors)	14.11	CA 67.55	CO 36.22	39.65	57.04	-4.36

¹ WCI partners include Arizona, California, New Mexico, Oregon, Utah, Washington, British Columbia, and Manitoba; WCI observers include Colorado, Idaho, Montana, Nevada, and Wyoming; Midwestern C&T partners include Iowa, Illinois, Kansas, Michigan, Minnesota, Wisconsin, and Manitoba; Midwestern C&T observers include Indiana, Ohio, and South Dakota. The emission cap for WCI is 15% below the 2005 level in Year 2020. The emission cap for Midwestern states is 22.5% below the 2005 level in Year 2020 (as an average of Minnesota's 2015 and 2025 emission caps).

² This represents the marginal cost of the last tCO₂e mitigated/sequestered, and applies to all states involved in a trading arrangement.

³ This represents the average cost per tCO₂e mitigated/sequestered for Minnesota.

Power Sector Cap and Trade Simulations

Option No.	Policy Option ¹	Permit Price ²	Largest Seller	Largest Buyer	MN Gain	MN GHG Reductions	MN Cost-Effectiveness ³
		(\$/tCO ₂ e)	(million tCO ₂)	(million tCO ₂)	(%)	(MMtCO ₂ e)	(\$/tCO ₂ e)
		2020	2020	2020	2020	2020	2020
C&T-1 Cap & Trade	WCI Partners C&T (Power Sector)	7.91	CA 31.04	AZ 14.60	-	-	-
	WCI Partners+Observers C&T (Power Sector)	11.14	CA 44.74	AZ 13.15	-	-	-
	Midwestern Partners C&T (Power Sector)	10.68	IL 14.57	MN 10.86	34.28	16.40	1.82
	Midwestern Partners+Observers C&T (Power Sector)	11.42	IL 16.32	MN 10.25	30.75	17.02	2.16
	Midwestern Partners plus WCI Partners C&T (Power Sector)	9.32	CA 37.41	AZ 13.96	41.28	15.25	1.20
	Midwestern Partners plus WCI Partners+Observers C&T (Power Sector)	10.90	CA 43.84	AZ 13.26	33.20	16.59	1.92
	Midwestern Partners+Observers plus WCI Partners+Observers C&T (Power Sector)	11.30	CA 45.36	AZ 13.08	31.31	16.92	2.10

¹ WCI partners include Arizona, California, New Mexico, Oregon, Utah, Washington, British Columbia, and Manitoba; WCI observers include Colorado, Idaho, Montana, Nevada, and Wyoming; Midwestern C&T partners include Iowa, Illinois, Kansas, Michigan, Minnesota, Wisconsin, and Manitoba; Midwestern C&T observers include Indiana, Ohio, and South Dakota. The emission cap for WCI is 15% below the 2005 level in Year 2020. The emission cap for Midwestern states is 22.5% below the 2005 level in Year 2020 (as an average of Minnesota's 2015 and 2025 emission caps).

² This represents the marginal cost of the last tCO₂e mitigated/sequestered, and applies to all states involved in a trading arrangement.

³ This represents the average cost per tCO₂e mitigated/sequestered for Minnesota.

Summary of simulation findings of November 28, 2007:

1. In this week's simulations, we applied a new emission mitigation cap for Midwestern states in 2020. Since Minnesota has state GHG mitigation goal (cap) of 15% below its 2005 emission level by 2015, and 30% by 2025, we assume an emission cap of 22.5% below the 2005 level in year 2020 for Minnesota to replace the cap of 15% below the 2005 level in 2020 that we used previously. This cap is also applied to the other Midwestern states in the simulations. Because of the increase in the emission cap, permit prices for Midwestern states under a trading arrangement increased. With the higher emission cap, the permit price in the Midwestern states trading market is now higher than the permit price of the trading among WCI partners.
2. Even with the change in emission cap, permit purchasing and selling states in Midwest remain the same as before. Minnesota is a permit buyer in both simulations with or without the observer states. Kansas, a new state included in the Midwestern trading, is also a permit buyer.
3. For all the economy-wide simulations, the total cost of achieving the carbon emission caps is negative for almost all the states. This means that compliance with the caps will result in an overall cost saving to these states. This result is due to the existence of an extensive range of cost-saving options such as improvements in energy efficiency. Though not included in this week's presentation, simulations that use a set of "upper-bound" cost estimates, which include only half as many cost-saving options as the base case, indicate positive costs of compliance. Note that the factors that have the greatest influence on all simulations are the absolute levels and the relative levels of the marginal mitigation/sequestration cost curves. The former has the greatest influence on the potential for cost savings, while the latter has the greatest influence on the variation across states, including whether each state is a permit buyer or seller.
4. For both the economy-wide and power sector only scenarios, the permit price is lowest for the case of trading among WCI partners. The equilibrium permit price increases in the following order: trading among Midwestern partners, trading among Midwestern partners plus observers, trading among WCI partners plus observers.
5. The power sector scenario indicates a lower per unit cost of compliance compared with the economy-wide scenario for both Midwestern and WCI trading configurations. This is reflected in relatively lower permit prices of trading in power sector only simulations. One possible explanation is that economies of scale in mitigation of carbon in the electric power are greater than found in other sectors for these states.
6. Minnesota is a permit buyer in the simulations of all the geographic configurations. The biggest seller in the WCI simulations is California. The biggest seller in the Midwestern States simulations is Illinois. California is also the biggest seller in the simulations that include both WCI and Midwestern States. Minnesota is the biggest buyer among Midwestern states. Without WCI observers, the biggest buyer in the Western States simulations is Arizona. Colorado is the biggest buyer if the simulation includes the five WCI observers. It is also the biggest buyer in a comprehensive simulation that covers all WCI states and Midwestern states (including observers).

7. The simulation results indicate that the Midwestern states have overall higher mitigation/sequestration costs than the WCI partners, but lower costs than the WCI partners plus observers. As a permit buyer, Minnesota would be better off joining the WCI trading market with only the eight partners because it can buy permits at a lower price than in other configurations. Note that including the three observers — IN, OH, and SD in the Midwestern trading will increase the compliance costs of Minnesota, since on average the observers have higher mitigation costs compared with the Midwestern partner states.
8. Since Manitoba is a partner in both WCI and Midwestern trading coalitions, it is interesting to compare the simulation results and evaluate which group is the best for this province to join. The results show that Manitoba is slightly better off joining the WCI than joining the Midwestern states in trading. However, the gains are only minimal.

TABLE IM1. ECONOMY-WIDE EMISSION TRADING SIMULATION AMONG SIX MIDWESTERN STATES PLUS MANITOBA IN YEAR 2020

(million dollars or otherwise specified)

State	Before Trading	After Trading ^a			Cost Saving	Permits Traded	Emission Reduction After Trading		Emission Reduction Cap
	Mitigation Cost	Mitigation Cost	Trading Cost	Net Cost		(million tCO ₂ e)	(million tCO ₂ e)	(percent from BAU)	(percent from BAU)
IA	-191	-351	99	-252	61	8.27	30.29	26.01	33.11
IL	-276	-61	-287	-349	73	-24.01	112.34	36.54	28.73
KS	-202	-380	103	-278	75	8.58	28.44	25.44	33.11
MI	-368	-308	-67	-375	7	-5.60	80.36	30.88	28.73
MN	-83	-287	147	-140	56	12.28	54.11	29.44	36.12
WI	-258	-246	-12	-258	0	-0.99	45.74	29.37	28.73
MB	-47	-73	18	-56	9	1.48	6.66	26.22	32.03
Total	-1,425	-1,706	0	-1,706	281	30.60 ^b	358	30.83	30.83

^a Permit Price = \$11.97/tonCO₂e. This is the price of the last permit sold, which is also equal to the price of the last ton of CO₂e mitigated (its *marginal* mitigation cost). It is the same for each state for a given case. The *average* mitigation cost per unit of CO₂ equivalent in this simulation differs for each state. For MN, for example, it is -\$5.30/tonCO₂e. Please note that the average mitigation cost is related to mitigation level of a state, which for this case is 29.44% below the baseline level in 2020 for MN. Multiplying the average mitigation cost by the number of tons of CO₂ mitigated will equal the *total* mitigation cost for each state.

^b Represents number of permits bought or sold.

TABLE IM2. ECONOMY-WIDE EMISSION TRADING SIMULATION AMONG
NINE MIDWESTERN STATES PLUS MANITOBA IN YEAR 2020

(million dollars or otherwise specified)

State	Before Trading	After Trading ^a			Cost Saving	Permits Traded	Emission Reduction After Trading		Emission Reduction Cap
	Mitigation Cost	Mitigation Cost	Trading Cost	Net Cost		(million tCO ₂ e)	(million tCO ₂ e)	(percent from BAU)	(percent from BAU)
IA	-191	-341	100	-241	51	7.50	31.05	26.67	33.11
IL	-276	2	-385	-384	108	-28.98	117.31	38.16	28.73
KS	-202	-372	105	-267	64	7.91	29.10	26.03	33.11
MI	-368	-271	-113	-384	16	-8.52	83.28	32.00	28.73
MN	-83	-264	139	-125	41	10.46	55.93	30.43	36.12
WI	-258	-227	-34	-260	3	-2.52	47.27	30.35	28.73
MB	-47	-71	17	-54	7	1.31	6.83	26.89	32.03
IN	-903	-1,050	117	-933	30	8.79	77.68	25.81	28.73
OH	-685	-657	-29	-686	1	-2.18	108.70	29.32	28.73
SD	25	-158	83	-75	100	6.23	12.09	25.95	39.33
Total	-2,988	-3,408	0	-3,408	421	42.20 ^b	569.23	30.29	30.29

^a Permit Price = \$13.29/tonCO₂e. This is the price of the last permit sold, which is also equal to the price of the last ton of CO₂e mitigated (its *marginal* mitigation cost). It is the same for each state for a given case. The *average* mitigation cost per unit of CO₂ equivalent in this simulation differs for each state. For MN, for example, it is -\$4.72/tonCO₂e. Please note that the average mitigation cost is related to mitigation level of a state, which for this case is 30.43% below the baseline level in 2020 for MN. Multiplying the average mitigation cost by the number of tons of CO₂ mitigated will equal the *total* mitigation cost for each state.

^b Represents number of permits bought or sold.

TABLE IW1. ECONOMY-WIDE EMISSION TRADING SIMULATION AMONG SIX WESTERN STATES AND TWO CANADIAN PROVINCES IN YEAR 2020

(million dollars or otherwise specified)

State	Before Trading	After Trading ^a			Cost Saving	Permits Traded	Emission Reduction After Trading		Emission Reduction Cap
	Mitigation Cost	Mitigation Cost	Trading Cost	Net Cost		(million tCO ₂ e)	(million tCO ₂ e)	(percent from BAU)	(percent from BAU)
AZ	-1,348	-1,663	154	-1,510	162	14.61	61.88	38.35	47.41
CA	-394	-77	-395	-473	79	-37.57	223.05	36.94	30.72
NM	-279	-491	88	-403	125	8.36	21.41	23.22	32.28
OR	-90	-146	43	-103	13	4.12	24.20	28.26	33.06
UT	30	-219	125	-94	124	11.89	25.70	26.74	39.12
WA	-84	-54	-34	-88	4	-3.25	39.90	34.30	31.51
BC	-165	-167	2	-165	0	0.18	20.75	26.99	27.23
MB	-47	-75	18	-58	11	1.67	6.47	25.47	32.03
Total	-2,377	-2,894	0	-2,894	517	40.82 ^b	423.36	33.66	33.66

^a Permit Price = \$10.52/tonCO₂e. This is the price of the last permit sold, which is also equal to the price of the last ton of CO₂e mitigated (its *marginal* mitigation cost). It is the same for each state for a given case. The *average* mitigation cost per unit of CO₂ equivalent in this simulation differs for each state. For CA, for example, it is -\$0.35/tonCO₂e. Please note that the average mitigation cost is related to mitigation level of a state, which for this case is 36.94% below the baseline level in 2020 for CA. Multiplying the average mitigation cost by the number of tons of CO₂ mitigated will equal the *total* mitigation cost for each state.

^b Represents number of permits bought or sold.

TABLE IW2. ECONOMY-WIDE EMISSION TRADING SIMULATION AMONG ELEVEN WESTERN STATES AND TWO CANADIAN PROVINCES IN YEAR 2020

(million dollars or otherwise specified)

State	Before Trading	After Trading ^a			Cost Saving	Permits Traded	Emission Reduction After Trading		Emission Reduction Cap
	Mitigation Cost	Mitigation Cost	Trading Cost	Net Cost		(million tCO ₂ e)	(million tCO ₂ e)	(percent from BAU)	(percent from BAU)
AZ	-1,348	-1,624	173	-1,451	103	11.52	64.96	40.27	47.41
CA	-394	398	-1,126	-728	334	-74.86	260.34	43.12	30.72
NM	-279	-475	106	-369	90	7.05	22.72	24.63	32.28
OR	-90	-110	19	-91	1	1.25	27.07	31.60	33.06
UT	30	-185	139	-47	77	9.22	28.38	29.53	39.12
WA	-84	26	-143	-117	33	-9.51	46.16	39.68	31.51
BC	-165	-139	-31	-169	4	-2.03	22.96	29.87	27.23
MB	-47	-68	16	-52	5	1.08	7.05	27.77	32.03
CO	1,555	-1,344	540	-803	2,358	35.94	35.39	22.48	45.31
ID	-110	-106	-4	-111	0	-0.29	12.49	28.33	27.67
MT	-165	-164	-77	-242	77	-5.15	10.92	26.24	13.86
NV	291	-119	201	82	209	13.37	21.95	30.37	48.87
WY	188	-761	187	-574	763	12.41	15.42	22.23	40.12
Total	-618	-4,670	0	-4,670	4,052	91.84 ^b	575.81	35.06	35.06

^a Permit Price = \$15.04/tonCO₂e. This is the price of the last permit sold, which is also equal to the price of the last ton of CO₂e mitigated (its *marginal* mitigation cost). It is the same for each state for a given case. The *average* mitigation cost per unit of CO₂ equivalent in this simulation differs for each state. For CA, for example, it is \$1.53/tonCO₂e. Please note that the average mitigation cost is related to mitigation level of a state, which for this case is 43.12% below the baseline level in 2020 for CA. Multiplying the average mitigation cost by the number of tons of CO₂ mitigated will equal the *total* mitigation cost for each state.

^b Represents number of permits bought or sold.

TABLE IM1W1. ECONOMY-WIDE EMISSION TRADING SIMULATION AMONG SIX MIDWESTERN STATES, SIX WESTERN STATES, AND TWO CANADIAN PROVINCES IN YEAR 2020

(million dollars or otherwise specified)

State	Before Trading	After Trading ^a			Cost Saving	Permits Traded (million tCO ₂ e)	Emission Reduction After Trading		Emission Reduction Cap
	Mitigation Cost	Mitigation Cost	Trading Cost	Net Cost			(million tCO ₂ e)	(percent from BAU)	(percent from BAU)
AZ	-1,348	-1,659	158	-1,501	154	14.22	62.26	38.59	47.41
CA	-394	-25	-470	-495	101	-42.39	227.87	37.74	30.72
NM	-279	-489	91	-399	120	8.19	21.57	23.39	32.28
OR	-90	-143	42	-101	11	3.75	24.56	28.68	33.06
UT	30	-216	128	-88	118	11.56	26.03	27.09	39.12
WA	-84	-45	-45	-90	6	-4.05	40.70	34.99	31.51
BC	-165	-164	-1	-165	0	-0.10	21.03	27.36	27.23
IA	-191	-357	97	-259	69	8.78	29.77	25.57	33.11
IL	-276	-101	-228	-329	53	-20.58	108.91	35.42	28.73
KS	-202	-386	100	-286	83	9.03	27.98	25.03	33.11
MI	-368	-331	-40	-371	3	-3.59	78.36	30.11	28.73
MN	-83	-301	150	-151	68	13.52	52.87	28.76	36.12
WI	-258	-258	1	-258	0	0.05	44.69	28.70	28.73
MB	-47	-75	18	-57	10	1.59	6.54	25.76	32.03
Total	-3,755	-4,549	0	-4,549	794	70.71 ^b	773.15	32.31	32.31

^a Permit Price = \$11.08/tonCO₂e. This is the price of the last permit sold, which is also equal to the price of the last ton of CO₂e mitigated (its *marginal* mitigation cost). It is the same for each state for a given case. The *average* mitigation cost per unit of CO₂ equivalent in this simulation differs for each state. For MN, for example, it is -\$5.70/tonCO₂e. Please note that the average mitigation cost is related to mitigation level of a state, which for this case is 28.76% below the baseline level in 2020 for MN. Multiplying the average mitigation cost by the number of tons of CO₂ mitigated will equal the *total* mitigation cost for each state.

^b Represents number of permits bought or sold.

TABLE IM1W2. ECONOMY-WIDE EMISSION TRADING SIMULATION AMONG SIX
MIDWESTERN STATES, ELEVEN WESTERN STATES, AND TWO CANADIAN PROVINCES
IN YEAR 2020

(million dollars or otherwise specified)

State	Before Trading	After Trading ^a			Cost Saving	Permits Traded (million tCO ₂ e)	Emission Reduction After Trading		Emission Reduction Cap
	Mitigation Cost	Mitigation Cost	Trading Cost	Net Cost			(million tCO ₂ e)	(percent from BAU)	(percent from BAU)
AZ	-1,348	-1,637	170	-1,467	119	12.43	64.06	39.71	47.41
CA	-394	244	-879	-635	241	-64.18	249.66	41.35	30.72
NM	-279	-480	102	-378	100	7.44	22.33	24.22	32.28
OR	-90	-122	29	-93	4	2.09	26.23	30.62	33.06
UT	30	-196	137	-59	89	10.00	27.59	28.71	39.12
WA	-84	0	-106	-105	21	-7.70	44.35	38.13	31.51
BC	-165	-148	-19	-167	2	-1.38	22.32	29.03	27.23
CO	1,555	-1,350	498	-852	2,406	36.35	34.98	22.22	45.31
ID	-110	-111	0	-110	0	0.03	12.18	27.61	27.67
MT	-165	-167	-68	-235	70	-4.93	10.70	25.71	13.86
NV	291	-128	192	64	227	14.01	21.31	29.49	48.87
WY	188	-763	172	-591	780	12.56	15.27	22.02	40.12
IA	-191	-338	100	-238	48	7.27	31.28	26.86	33.11
IL	-276	22	-417	-396	120	-30.46	118.79	38.64	28.73
KS	-202	-369	106	-264	61	7.71	29.30	26.21	33.11
MI	-368	-259	-129	-388	20	-9.40	84.16	32.34	28.73
MN	-83	-256	136	-121	37	9.92	56.47	30.72	36.12
WI	-258	-221	-41	-262	4	-2.98	47.73	30.65	28.73
MB	-47	-70	17	-53	6	1.25	6.88	27.09	32.03
Total	-1,995	-6,349	0	-6,349	4,354	121.05 ^b	926.60	33.32	33.32

^a Permit Price = \$13.70/tonCO₂e. This is the price of the last permit sold, which is also equal to the price of the last ton of CO₂e mitigated (its *marginal* mitigation cost). It is the same for each state for a given case. The *average* mitigation cost per unit of CO₂ equivalent in this simulation differs for each state. For MN, for example, it is -\$4.54/tonCO₂e. Please note that the average mitigation cost is related to mitigation level of a state, which for this case is 30.72% below the baseline level in 2020 for MN. Multiplying the average mitigation cost by the number of tons of CO₂ mitigated will equal the *total* mitigation cost for each state.

^b Represents number of permits bought or sold.

TABLE IM2W2. ECONOMY-WIDE EMISSION TRADING SIMULATION AMONG NINE
MIDWESTERN STATES, ELEVEN WESTERN STATES, AND TWO CANADIAN PROVINCES
IN YEAR 2020

(million dollars or otherwise specified)

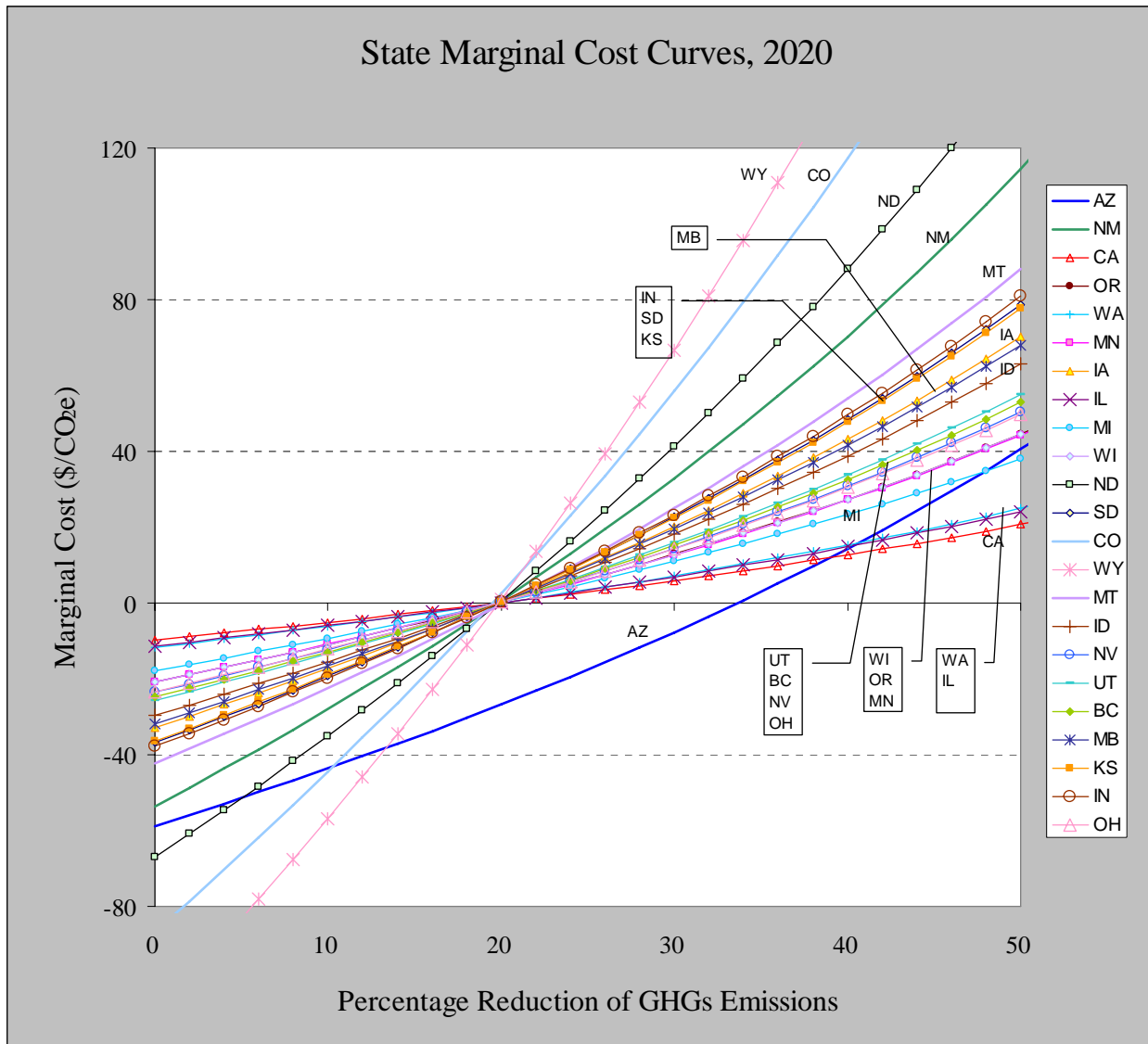
State	Before Trading	After Trading ^a			Cost Saving	Permits Traded (million tCO ₂ e)	Emission Reduction After Trading		Emission Reduction Cap
	Mitigation Cost	Mitigation Cost	Trading Cost	Net Cost			(million tCO ₂ e)	(percent from BAU)	(percent from BAU)
AZ	-1,348	-1,633	171	-1,461	114	12.15	64.34	39.88	47.41
CA	-394	291	-953	-662	268	-67.55	253.02	41.91	30.72
NM	-279	-478	103	-375	97	7.32	22.45	24.35	32.28
OR	-90	-118	26	-93	3	1.83	26.49	30.93	33.06
UT	30	-193	138	-55	85	9.75	27.84	28.97	39.12
WA	-84	8	-117	-109	24	-8.27	44.92	38.62	31.51
BC	-165	-145	-22	-168	3	-1.59	22.52	29.29	27.23
CO	1,555	-1,348	511	-837	2,391	36.22	35.11	22.30	45.31
ID	-110	-109	-1	-110	0	-0.07	12.28	27.84	27.67
MT	-165	-166	-71	-237	72	-5.00	10.77	25.87	13.86
NV	291	-125	195	70	221	13.81	21.51	29.76	48.87
WY	188	-763	177	-586	774	12.51	15.32	22.08	40.12
IA	-191	-334	99	-235	45	7.04	31.52	27.07	33.11
IL	-276	43	-452	-409	133	-32.00	120.33	39.14	28.73
KS	-202	-366	106	-260	58	7.50	29.51	26.40	33.11
MI	-368	-246	-145	-392	24	-10.31	85.07	32.69	28.73
MN	-83	-249	132	-117	33	9.35	57.04	31.03	36.12
WI	-258	-214	-49	-263	5	-3.46	48.20	30.95	28.73
MB	-47	-70	17	-53	6	1.20	6.94	27.30	32.03
IN	-903	-1,035	109	-926	23	7.73	78.74	26.16	28.73
OH	-685	-629	-59	-689	4	-4.21	110.72	29.86	28.73
SD	25	-155	86	-70	95	6.06	12.25	26.31	39.33
Total	-3,558	-8,036	0	-8,036	4,478	132.45 ^b	1,136.90	32.52	32.52

^a Permit Price = \$14.11/tonCO₂e. This is the price of the last permit sold, which is also equal to the price of the last ton of CO₂e mitigated (its *marginal* mitigation cost). It is the same for each state for a given case. The *average* mitigation cost per unit of CO₂ equivalent in this simulation differs for each state. For MN, for example, it is -\$4.36/tonCO₂e. Please note that the average mitigation cost is related to mitigation level of a state, which for this case is 31.03% below the baseline level in 2020 for MN. Multiplying the average mitigation cost by the number of tons of CO₂ mitigated will equal the *total* mitigation cost for each state.

^b Represents number of permits bought or sold.

DATA TABLE

State	Cap: 15% (for WCI) and 22.5% (for Midwestern) Below 2005 Emissions in 2020 (million tCO ₂ e)	2020 BAU Gross Emissions (Consumption-based) (million tCO ₂ e)	GHG Mitigation Goal in 2020 (relative to BAU emissions)	Autarkic Marginal Mitigation Cost (dollars per tCO ₂ e)	Gross State Product in 2020 (million 2000 dollars)
AZ	84.8	161.3	47.41%	33.3	343,077
CA	418.3	603.8	30.72%	6.4	2,646,412
NM	62.5	92.2	32.28%	41.0	72,944
OR	57.3	85.7	33.06%	17.1	173,774
UT	58.5	96.1	39.12%	32.1	158,412
WA	79.7	116.3	31.51%	8.3	422,766
BC	55.9	76.9	27.23%	10.9	131,513
CO	86.1	157.4	45.31%	154.3	376,326
ID	31.9	44.1	27.67%	13.8	63,226
MT	35.9	41.6	13.86%	-14.1	30,675
NV	37.0	72.3	48.87%	47.9	130,218
WY	41.5	69.4	40.12%	143.6	27,075
IA	77.9	116.4	33.11%	27.0	150,136
IL	219.1	307.5	28.73%	6.0	1,152,878
KS	74.8	111.8	33.11%	29.9	130,301
MI	185.5	260.2	28.73%	9.5	619,495
MN	117.4	183.8	36.12%	21.3	376,731
WI	111.0	155.7	28.73%	11.1	316,708
MB	17.3	25.4	32.03%	23.8	33,872
IN	214.5	301.0	28.73%	20.2	337,599
OH	264.2	370.8	28.73%	12.4	675,223
SD	28.3	46.6	39.33%	46.6	53,541
Total	2,359.3	3,496.2	32.52%	0.0	8,422,903



Note: Marginal cost curves other than for AZ, CO, and MT are developed based on NM curve. These marginal cost curves are presented for a range of mitigation levels, including those much higher than required to meet the cap in year 2020. We anticipate that there will be technology innovations in the future, i.e., the marginal cost curves will shift downward over time before higher levels of mitigation are necessary.

TABLE IM1P. POWER SECTOR EMISSION TRADING SIMULATION AMONG
SIX MIDWESTERN STATES PLUS MANITOBA IN YEAR 2020

(million dollars or otherwise specified)

State	Before Trading	After Trading ^a			Cost Saving	Permits Traded	Emission Reduction After Trading		Emission Reduction Cap
	Mitigation Cost	Mitigation Cost	Trading Cost	Net Cost		(million tCO ₂ e)	(million tCO ₂ e)	(percent from BAU)	(percent from BAU)
IA	82	15	47	61	21	4.36	9.62	23.58	34.27
IL	54	171	-156	15	39	-14.57	45.76	55.80	38.03
KS	30	17	11	29	1	1.04	8.85	25.43	28.42
MI	40	106	-82	24	16	-7.68	30.42	42.49	31.77
MN	222	30	116	146	76	10.86	16.40	24.70	41.06
WI	118	34	63	97	22	5.87	15.75	26.38	36.21
MB	3	0	1	2	1	0.11	0.12	28.78	57.50
Total	550	373	0	373	176	22.25 ^b	126.92	35.68	35.68

^a Permit Price = \$10.68/tonCO₂e. This is the price of the last permit sold, which is also equal to the price of the last ton of CO₂e mitigated (its *marginal* mitigation cost). It is the same for each state for a given case. The *average* mitigation cost per unit of CO₂ equivalent in this simulation differs for each state. For MN, for example, it is \$1.82/tonCO₂e. Please note that the average mitigation cost is related to mitigation level of a state, which for this case is 24.70% below the baseline level in 2020 for MN. Multiplying the average mitigation cost by the number of tons of CO₂ mitigated will equal the *total* mitigation cost for each state.

^b Represents number of permits bought or sold.

TABLE IM2P. POWER SECTOR EMISSION TRADING SIMULATION AMONG NINE MIDWESTERN STATES PLUS MANITOBA IN YEAR 2020

(million dollars or otherwise specified)

State	Before Trading	After Trading ^a			Cost Saving	Permits Traded	Emission Reduction After Trading		Emission Reduction Cap
	Mitigation Cost	Mitigation Cost	Trading Cost	Net Cost		(million tCO ₂ e)	(million tCO ₂ e)	(percent from BAU)	(percent from BAU)
IA	82	19	46	65	18	4.01	9.97	24.44	34.27
IL	54	190	-186	4	50	-16.32	47.50	57.93	38.03
KS	30	21	8	29	1	0.70	9.19	26.40	28.42
MI	40	120	-102	18	22	-8.94	31.69	44.25	31.77
MN	222	37	117	154	68	10.25	17.02	25.63	41.06
WI	118	41	60	101	18	5.26	16.36	27.40	36.21
MB	3	0	1	2	1	0.11	0.12	29.93	57.50
IN	113	53	52	105	8	4.56	26.01	25.01	29.39
OH	117	117	0	117	0	0.03	41.94	29.37	29.39
SD	13	8	4	12	0	0.35	2.66	31.72	35.84
Total	792	605	0	605	187	25.26 ^b	202.46	33.14	33.14

^a Permit Price = \$11.42/tonCO₂e. This is the price of the last permit sold, which is also equal to the price of the last ton of CO₂e mitigated (its *marginal* mitigation cost). It is the same for each state for a given case. The *average* mitigation cost per unit of CO₂ equivalent in this simulation differs for each state. For MN, for example, it is \$2.16/tonCO₂e. Please note that the average mitigation cost is related to mitigation level of a state, which for this case is 25.63% below the baseline level in 2020 for MN. Multiplying the average mitigation cost by the number of tons of CO₂ mitigated will equal the *total* mitigation cost for each state.

^b Represents number of permits bought or sold.

TABLE IW1P. POWER SECTOR EMISSION TRADING SIMULATION AMONG SIX WESTERN STATES AND TWO CANADIAN PROVINCES IN YEAR 2020

(million dollars or otherwise specified)

State	Before Trading	After Trading ^a			Cost Saving	Permits Traded	Emission Reduction After Trading		Emission Reduction Cap
	Mitigation Cost	Mitigation Cost	Trading Cost	Net Cost		(million tCO ₂ e)	(million tCO ₂ e)	(percent from BAU)	(percent from BAU)
AZ	-35	-413	115	-297	262	14.60	25.57	34.93	54.88
CA	13	169	-245	-76	89	-31.04	62.94	48.01	24.33
NM	90	-4	41	37	53	5.16	5.08	17.84	35.94
OR	56	4	32	36	20	4.00	6.76	21.34	33.97
UT	159	-4	64	60	99	8.12	6.68	18.26	40.44
WA	11	17	-6	11	0	-0.73	7.54	32.91	29.70
BC	0	0	-2	-2	2	-0.25	0.25	22.32	0.00
MB	3	0	1	1	2	0.13	0.10	24.30	57.50
Total	297	-230	0	-230	527	32.02 ^b	114.91	35.30	35.30

^a Permit Price = \$7.91/tonCO₂e. This is the price of the last permit sold, which is also equal to the price of the last ton of CO₂e mitigated (its *marginal* mitigation cost). It is the same for each state for a given case. The *average* mitigation cost per unit of CO₂ equivalent in this simulation differs for each state. For CA, for example, it is \$2.69/tonCO₂e. Please note that the average mitigation cost is related to mitigation level of a state, which for this case is 48.01% below the baseline level in 2020 for CA. Multiplying the average mitigation cost by the number of tons of CO₂ mitigated will equal the *total* mitigation cost for each state.

^b Represents number of permits bought or sold.

TABLE IW2P. POWER SECTOR EMISSION TRADING SIMULATION AMONG ELEVEN WESTERN STATES AND TWO CANADIAN PROVINCES IN YEAR 2020

(million dollars or otherwise specified)

State	Before Trading	After Trading ^a			Cost Saving	Permits Traded	Emission Reduction After Trading		Emission Reduction Cap
	Mitigation Cost	Mitigation Cost	Trading Cost	Net Cost		(million tCO ₂ e)	(million tCO ₂ e)	(percent from BAU)	(percent from BAU)
AZ	-35	-399	146	-252	217	13.15	27.02	36.91	54.88
CA	13	299	-498	-199	212	-44.74	76.64	58.46	24.33
NM	90	4	48	52	38	4.30	5.95	20.86	35.94
OR	56	17	30	47	9	2.66	8.11	25.57	33.97
UT	159	7	77	85	75	6.96	7.84	21.43	40.44
WA	11	33	-28	5	6	-2.48	9.28	40.51	29.70
BC	0	1	-3	-3	3	-0.30	0.30	26.87	0.00
MB	3	0	1	2	1	0.11	0.12	29.49	57.50
CO	571	-94	140	46	525	12.56	7.97	13.98	36.02
ID	3	9	-8	1	2	-0.73	2.61	40.76	29.40
MT	19	6	10	15	4	0.88	1.65	15.01	22.99
NV	57	14	31	45	12	2.78	6.91	25.24	35.37
WY	120	3	54	56	64	4.84	4.65	20.58	42.01
Total	1,067	-100	0	-100	1,167	48.24	159.04	35.35	35.35

^a Permit Price = \$11.14/tonCO₂e. This is the price of the last permit sold, which is also equal to the price of the last ton of CO₂e mitigated (its *marginal* mitigation cost). It is the same for each state for a given case. The *average* mitigation cost per unit of CO₂ equivalent in this simulation differs for each state. For CA, for example, it is \$3.90/tonCO₂e. Please note that the average mitigation cost is related to mitigation level of a state, which for this case is 58.46% below the baseline level in 2020 for CA. Multiplying the average mitigation cost by the number of tons of CO₂ mitigated will equal the *total* mitigation cost for each state.

^b Represents number of permits bought or sold.

TABLE IM1W1P. POWER SECTOR EMISSION TRADING SIMULATION AMONG SIX MIDWESTERN STATES, SIX WESTERN STATES, AND TWO CANADIAN PROVINCES IN YEAR 2020

(million dollars or otherwise specified)

State	Before Trading	After Trading ^a			Cost Saving	Permits Traded	Emission Reduction After Trading		Emission Reduction Cap
	Mitigation Cost	Mitigation Cost	Trading Cost	Net Cost		(million tCO ₂ e)	(million tCO ₂ e)	(percent from BAU)	(percent from BAU)
AZ	-35	-407	130	-277	242	13.96	26.21	35.80	54.88
CA	13	224	-349	-124	137	-37.41	69.31	52.87	24.33
NM	90	-1	45	44	46	4.78	5.46	19.17	35.94
OR	56	9	32	41	15	3.41	7.36	23.22	33.97
UT	159	1	71	71	88	7.60	7.20	19.66	40.44
WA	11	23	-14	9	2	-1.52	8.32	36.35	29.70
BC	0	0	-2	-2	2	-0.27	0.27	24.34	0.00
IA	82	8	47	55	27	5.02	8.96	21.96	34.27
IL	54	136	-104	33	22	-11.14	42.32	51.61	38.03
KS	30	11	16	27	3	1.67	8.22	23.61	28.42
MI	40	82	-49	33	7	-5.26	28.01	39.11	31.77
MN	222	18	112	130	92	12.02	15.25	22.96	41.06
WI	118	23	65	88	30	7.01	14.61	24.47	36.21
MB	3	0	1	1	1	0.12	0.11	26.62	57.50
Total	844	129	0	129	715	55.60 ^b	241.60	35.49	35.49

^a Permit Price = \$9.32/tonCO₂e. This is the price of the last permit sold, which is also equal to the price of the last ton of CO₂e mitigated (its *marginal* mitigation cost). It is the same for each state for a given case. The *average* mitigation cost per unit of CO₂ equivalent in this simulation differs for each state. For MN, for example, it is \$1.20/tonCO₂e. Please note that the average mitigation cost is related to mitigation level of a state, which for this case is 22.96% below the baseline level in 2020 for MN. Multiplying the average mitigation cost by the number of tons of CO₂ mitigated will equal the *total* mitigation cost for each state.

^b Represents number of permits bought or sold.

TABLE IM1W2P. POWER SECTOR EMISSION TRADING SIMULATION AMONG SIX
MIDWESTERN STATES, ELEVEN WESTERN STATES, AND TWO CANADIAN PROVINCES
IN YEAR 2020

(million dollars or otherwise specified)

State	Before Trading	After Trading ^a			Cost Saving	Permits Traded (million tCO ₂ e)	Emission Reduction After Trading		Emission Reduction Cap
	Mitigation Cost	Mitigation Cost	Trading Cost	Net Cost			(million tCO ₂ e)	(percent from BAU)	(percent from BAU)
AZ	-35	-400	144	-256	221	13.26	26.91	36.77	54.88
CA	13	289	-478	-189	202	-43.84	75.73	57.77	24.33
NM	90	3	48	51	39	4.36	5.88	20.64	35.94
OR	56	16	30	46	10	2.76	8.01	25.27	33.97
UT	159	6	77	83	77	7.04	7.76	21.21	40.44
WA	11	32	-26	6	5	-2.36	9.16	39.99	29.70
BC	0	1	-3	-3	3	-0.29	0.29	26.55	0.00
CO	571	-94	137	43	528	12.60	7.93	13.91	36.02
ID	3	9	-8	1	2	-0.69	2.57	40.23	29.40
MT	19	5	10	15	4	0.90	1.63	14.79	22.99
NV	57	13	31	44	12	2.86	6.83	24.94	35.37
WY	120	2	53	55	65	4.89	4.60	20.37	42.01
IA	82	16	46	62	20	4.26	9.73	23.84	34.27
IL	54	176	-165	12	42	-15.10	46.29	56.45	38.03
KS	30	19	10	29	1	0.94	8.95	25.72	28.42
MI	40	110	-88	22	18	-8.06	30.81	43.02	31.77
MN	222	32	116	148	74	10.68	16.59	24.98	41.06
WI	118	36	62	98	20	5.68	15.93	26.69	36.21
MB	3	0	1	2	1	0.11	0.12	29.12	57.50
Total	1,614	271	0	271	1,342	70.34 ^b	285.73	35.49	35.49

^a Permit Price = \$10.90/tonCO₂e. This is the price of the last permit sold, which is also equal to the price of the last ton of CO₂e mitigated (its *marginal* mitigation cost). It is the same for each state for a given case. The *average* mitigation cost per unit of CO₂ equivalent in this simulation differs for each state. For MN, for example, it is \$1.92/tonCO₂e. Please note that the average mitigation cost is related to mitigation level of a state, which for this case is 24.98% below the baseline level in 2020 for MN. Multiplying the average mitigation cost by the number of tons of CO₂ mitigated will equal the *total* mitigation cost for each state.

^b Represents number of permits bought or sold.

TABLE IM2W2P. POWER SECTOR EMISSION TRADING SIMULATION AMONG NINE
MIDWESTERN STATES, ELEVEN WESTERN STATES, AND TWO CANADIAN PROVINCES
IN YEAR 2020

(million dollars or otherwise specified)

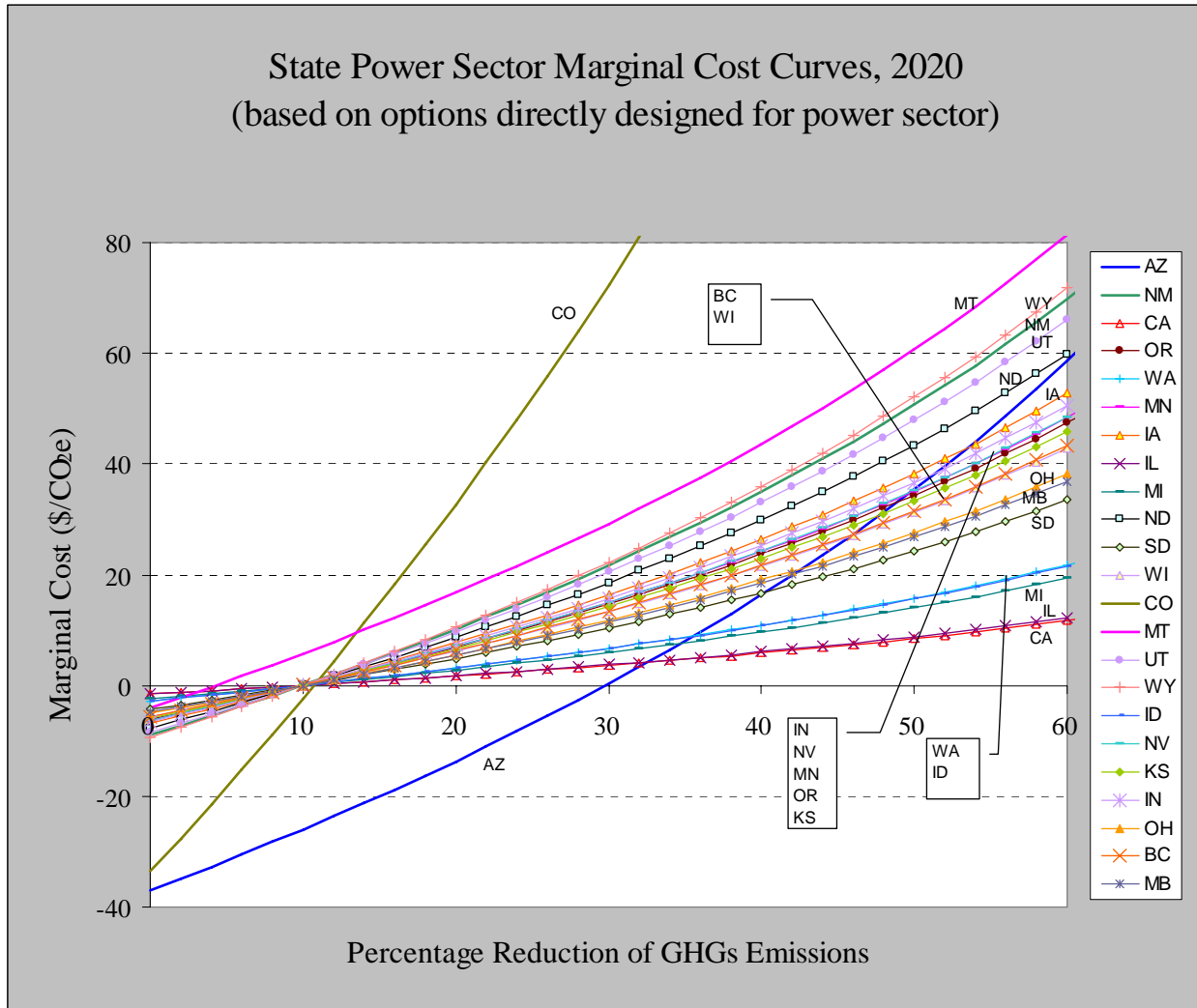
State	Before Trading	After Trading ^a			Cost Saving	Permits Traded	Emission Reduction After Trading		Emission Reduction Cap
	Mitigation Cost	Mitigation Cost	Trading Cost	Net Cost		(million tCO ₂ e)	(million tCO ₂ e)	(percent from BAU)	(percent from BAU)
AZ	-35	-398	148	-250	215	13.08	27.09	37.01	54.88
CA	13	306	-512	-207	220	-45.36	77.25	58.93	24.33
NM	90	4	48	53	37	4.25	5.99	21.01	35.94
OR	56	18	29	47	9	2.60	8.17	25.78	33.97
UT	159	8	78	86	74	6.90	7.90	21.59	40.44
WA	11	34	-29	5	6	-2.56	9.36	40.87	29.70
BC	0	1	-3	-3	3	-0.30	0.30	27.10	0.00
CO	571	-94	142	48	523	12.54	8.00	14.03	36.02
ID	3	10	-8	1	2	-0.75	2.63	41.12	29.40
MT	19	6	10	15	4	0.86	1.67	15.15	22.99
NV	57	15	31	45	11	2.72	6.97	25.44	35.37
WY	120	3	54	57	63	4.81	4.69	20.73	42.01
IA	82	18	46	64	18	4.07	9.92	24.31	34.27
IL	54	187	-181	6	49	-16.04	47.23	57.60	38.03
KS	30	21	9	29	1	0.76	9.13	26.24	28.42
MI	40	118	-99	19	21	-8.74	31.49	43.98	31.77
MN	222	36	117	152	69	10.34	16.92	25.48	41.06
WI	118	40	60	100	18	5.35	16.26	27.24	36.21
MB	3	0	1	2	1	0.11	0.12	29.74	57.50
IN	113	51	53	104	9	4.71	25.86	24.86	29.39
OH	117	114	3	117	0	0.28	41.69	29.19	29.39
SD	13	8	4	12	0	0.36	2.65	31.52	35.84
Total	1,856	503	0	503	1,353	73.75 ^b	361.27	34.07	34.07

^a Permit Price = \$11.30/tonCO₂e. This is the price of the last permit sold, which is also equal to the price of the last ton of CO₂e mitigated (its *marginal* mitigation cost). It is the same for each state for a given case. The *average* mitigation cost per unit of CO₂ equivalent in this simulation differs for each state. For MN, for example, it is \$2.10/tonCO₂e. Please note that the average mitigation cost is related to mitigation level of a state, which for this case is 25.48% below the baseline level in 2020 for MN. Multiplying the average mitigation cost by the number of tons of CO₂ mitigated will equal the *total* mitigation cost for each state.

^b Represents number of permits bought or sold.

DATA TABLE
(for Power Sector)

State	Cap: 15% (for WCI) and 22.5% (for Midwestern) Below 2005 Emissions in 2020 (million tCO ₂ e)	2020 BAU Gross Emissions (Consumption-based) (million tCO ₂ e)	GHG Mitigation Goal in 2020 (relative to BAU emissions)	Autarkic Marginal Mitigation Cost (dollars per tCO ₂ e)	Gross State Product in 2020 (million 2000 dollars)
AZ	33.0	73.2	54.88%	46.2	6,219
CA	99.2	131.1	24.33%	2.5	43,086
NM	18.3	28.5	35.94%	29.3	1,568
OR	20.9	31.7	33.97%	18.1	2,564
UT	21.8	36.6	40.44%	33.7	2,123
WA	16.1	22.9	29.70%	6.7	4,030
BC	1.1	1.1	0.00%	-5.6	2,040
CO	36.5	57.0	36.02%	99.0	5,935
ID	4.5	6.4	29.40%	6.5	1,144
MT	8.5	11.0	22.99%	20.3	1,121
NV	17.7	27.4	35.37%	19.8	2,166
WY	13.1	22.6	42.01%	38.9	1,210
IA	26.8	40.8	34.27%	20.5	2,968
IL	50.8	82.0	38.03%	5.6	25,856
KS	24.9	34.8	28.42%	13.0	2,909
MI	48.9	71.6	31.77%	6.6	14,234
MN	39.1	66.4	41.06%	25.3	5,267
WI	38.1	59.7	36.21%	18.3	5,337
MB	0.2	0.4	57.50%	0.0	948
IN	73.4	104.0	29.39%	34.2	7,888
OH	100.8	142.8	29.39%	15.2	14,377
SD	5.4	8.4	29.39%	11.4	964
SD			35.84%	14.0	
Total	699.1	1,060.4	34.07%		153,953



Note: Marginal cost curves other than for AZ, CO, and MT are developed based on NM curve. These marginal cost curves are presented for a range of mitigation levels, including those much higher than required to meet the cap in year 2020. We anticipate that there will be technology innovations in the future, i.e., the marginal cost curves will shift downward over time before higher levels of mitigation are necessary.



Cap and Trade among WCI and Midwestern States

1. The assumptions we adopted in our simulation model are summarized as follows:

Geographical Configurations:

- W1: WCI partners — Arizona, California, New Mexico, Oregon, Utah, Washington, British Columbia, and Manitoba
- W2: WCI partners and five observers — Arizona, California, New Mexico, Oregon, Utah, Washington, British Columbia, and Manitoba plus Colorado, Idaho, Montana, Nevada, and Wyoming
- M1: Midwestern C&T partners — Iowa, Illinois, Kansas, Michigan, Minnesota, Wisconsin, and Manitoba
- M2: Midwestern C&T partners and observers — Iowa, Illinois, Kansas, Michigan, Minnesota, Wisconsin, and Manitoba plus Indiana, Ohio, and South Dakota

Economy Wide Cap and Trade Cases:

Case I: Base Case Mitigation Cost:

- the simulation target year is 2020
- all sectors are included in the emission accounting and mitigation effort
- all GHG emissions are considered
- all gross emissions (excluding sinks) are considered
- all emissions are consumption-based
- emission data for WCI states (and provinces) come from CCS inventories and forecasts studies for respective states
- emission projections in 2020 for Midwestern states are calculated based on EIA regional projected emission growth rates: Iowa, Kansas, Minnesota, and South Dakotas belong to West North Central Region; Indiana, Illinois, Ohio, Michigan, and Wisconsin belong to East North Central Region.
- emission projections in 2020 for the two Canadian provinces come from *Canada's Energy Outlook 2006* by Natural Resources Canada
- offsets are not included
- no safety valve (permit price limit) is included
- we did not include auction costs/revenues in this week's simulations; if we need to include auction payments, the maximum payment for each state would be associated with a case where the amount of permits auctioned would be equal to each state's cap. Also, the price per permit would be set at the equilibrium permit price.
- marginal cost curves embody direct mitigation costs only
- marginal cost curves do not include various transactions costs
- marginal cost curves do not distinguish between producer vs. consumer allocation of permits

- marginal cost curves of Arizona, New Mexico, Colorado, and Montana are developed based on mitigation costs of individual policy options presented in CCS reports of the respective State Climate Change Action Plans
- marginal cost curves of other WCI states (provinces) and all the Midwestern states are developed by a parametric shift method using New Mexico's marginal cost curve as a reference; the parametric shift rule assumes a direct relationship between the slope of the marginal cost and the carbon intensity of a state.
- emission caps for WCI states (provinces) are 15% below 2005 levels by year 2020
- Minnesota has state GHG mitigation goal (cap) of 15% below its 2005 emission level by 2015, 30% by 2025, and 80% by 2050, we assume an emission cap of 22.5% below the 2005 level for Minnesota in 2020 (an average of its 2015 and 2025 emission caps). This emission cap is also applied to other Midwestern states.

Case II: Upper-bound Mitigation Cost (did not include in this week's runs):

- same assumptions as for Case I, except:
- assumes half the cost-saving mitigation level for each state, i.e., the marginal cost curves are shifted upward so that the zero marginal cost level occurs at half the emission reduction level of Case I; this represents the worst-case condition, or upper-bound cost estimate, for each state to join the cap and trade mechanism

Power sector only Cap and Trade Cases:

- same assumptions as for Economy Wide runs, except:
- emission caps are for power sector only, i.e., only power sector is committed to reduce 2020 baseline emission to 15% (WCI) or 22.5% (Midwestern) below the 2005 level.
- power sector marginal cost curves of Arizona, Colorado, Montana, and New Mexico are developed based on policy options directly designed for electricity sector; marginal cost curves for other states are developed using New Mexico's curve as a reference. We used an average curve of WCI partners for British Columbia and an average curve of Midwestern partners for Manitoba.
- emission projections in 2020 for Midwestern states are calculated based on EIA regional projected emission growth rates. Iowa, Minnesota, South Dakotas belong to MAPP region (Mid Continent Area Power Pool). Illinois belongs to MAIN region (Mid-America Interconnected Network). Indiana and Ohio belong to ECAR region (East Central Area Reliability Coordination Agreement). Kansas belongs to Southwest Power Pool region (SPP). Part of Michigan belongs to ECAR region and part in MAIN. Part of Wisconsin is in MAIN and part in MAPP. Weighted average regional growth rates are applied for Michigan and Wisconsin.

2. The model yields the following general results:

- GHG emission reductions for each state before and after permit trading
- Cost of GHG emission reductions for each state before and after trading
- Auction value of permits (some cases)
- Number of permits traded (bought and sold) by each state
- Equilibrium permit price
- Cost savings for each state of joining the Cap and Trade mechanism