Report of the Cap-and-Trade Technical Work Group
August 6, 2008

During the fourth Action Team meeting, the Cap-and-Trade (C&T) Technical Work Group (TWG) presented the status of the TWG's deliberations, the plan for completing the task, and preliminary modeling results for Florida joining the Regional Greenhouse Gas Initiative (RGGI) of the Northeast.

In the last month, the TWG has received a briefing on carbon credit offsets and cost control mechanisms from Kate Zyla of the World Resources Institute. In addition, the TWG has received preliminary modeling results for Florida joining the Western Climate Initiative (WCI), which will be summarized for the Action Team during its fifth meeting.

While considering the geographic scope question through the modeling results, the C&T TWG has begun deliberations on the issues of use of allowance value and purposes of offsets. For allowance value, the following are the priority purposes selected by the TWG:

- Promote energy efficiency investments,
- Mitigate impacts on ratepayers and/or consumers,
- Promote renewable or non-carbon technologies,
- Mitigate impacts on low-income or disadvantaged consumers or communities, and
- Mitigate impacts of climate change (i.e., fund adaptation strategies).

This list has not been prioritized and is not in any particular order. The TWG members on the teleconference call on June 30thunanimously agreed to recommend that all of these purposes should be supported by the design of the program.

The TWG has scheduled an in-person meeting on Friday August 8th in Orlando to formulate as many specific policy recommendations as possible in response to the major questions regarding the cap-and-trade program design for Florida. Following that meeting, the TWG will review, revise, and approve a first set of draft recommendations that includes a discussion of the rationale for each recommendation and the policy objective(s) each is designed to address. This first set of recommendations will be presented for consideration at the Action Team meeting on August 22 in St. Petersburg, while the TWG continues its work on remaining key recommendations for Action Team consideration in early September.

The Action Team will receive a summary briefing on the preliminary Florida/WCI modeling results on August sixth. The following summary, tables, and figure contain the statistical results that will be presented.

Preliminary Cap-and-Trade Simulation of Florida Joining WCI

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This summary presents the preliminary simulation results of Florida joining the cap-and-trade program of WCI. For the detailed specification of our cap-and-trade model, the methodology we used to develop the marginal cost curves of states/provinces, and the general assumptions we adopted in the modeling, please refer to the summary "Modeling of Cap-and-Trade Program" by Adam Rose and Dan Wei.

The 10 WCI partners include 7 U.S. states (Arizona, California, Montana, New Mexico, Oregon, Utah, and Washington) and 3 Canadian provinces (British Columbia, Manitoba, and Quebec). The WCI cap-and-trade program has broad sectoral coverage that includes the electric sector, residential/commercial fuel uses, large stationary combustion sources, industrial process emissions, fossil fuel production and processing, and transportation fuels—basically all sectors except agriculture, forestry, and waste management (AFW). The WCI 2020 regional reduction target is 15% below its 2005 greenhouse gas (GHG) emissions level. This regional target is applied to each of the 10 WCI partners in our analysis. In addition, the cap is based on consumption-based gross emissions.

We first simulated the cap-and-trade among the current 10 WCI partners (see Table 1). The simulation assumes that the permits are distributed to sources on the basis of a formula (e.g., historical emissions and benchmarking) at no charge. The second column in the table shows the mitigation cost for each partner to achieve the reduction target before it enters the cap-and-trade program, i.e., the cost of each state's own mitigation activities to achieve the reduction goal. Negative numbers in this column indicate overall cost savings. Columns 3 to 5 show the mitigation cost, trading cost, and net cost (the sum of mitigation cost and trading cost) after the partners enter the cap-and-trade program. Partners that have relatively high mitigation costs will accomplish only part of their reduction obligation by their own mitigation activities and will purchase the remaining permits in the market. Partners that have relatively low costs will have the incentive to mitigate more than their reduction targets indicate, so that they can sell their surplus permits to other partners at a profit. In the Trading Cost column, negative numbers represent revenues from selling permits. Next, the difference in the net cost between the before trading and after trading conditions is presented in the Cost Saving column (column 6). Columns 7 and 8 show the permits purchased/sold by each partner and the emissions reduced by in-state mitigation activities in terms of quantity. The last two columns (columns 9 and 10) show and compare the emission reductions as percentages with and without trading for each partner, respectively.

Table 2 presents the simulation results for Florida joining the WCI cap-and-trade program.

Table 3 presents the 2020 baseline emissions, the emission budget (capped emissions), and reduction target in percent for the WCI partners and Florida in the first three numerical columns, respectively. Please note that the 2020 emission budget for Florida is computed by interpolating the state's 2017 goal (to return to 2000 levels) and 2025 goal (to return to 1990 levels). The last column in this table shows the autarkic (own) marginal mitigation cost level for each state/province to meet the emission budget.

Figure 1 shows the marginal cost curves for all the states and provinces included in this study.

Below is a summary of the findings from the preliminary simulations:

1. The factors that have the greatest influence on all simulations are the absolute levels and the relative levels of the marginal mitigation cost curves. The former has the greatest influence on the potential for cost savings, while the latter has the greatest influence on the extent of permit trading across trading states/provinces, including whether each state/province is a permit buyer or seller.

2. For many WCI partners, the total cost of achieving the carbon emission caps is negative. This means that compliance with the caps will result in overall cost savings. This result is due to the existence of an extensive range of cost-saving options, such as improvements in energy efficiency.

3. Before Florida "joins" the WCI, the permit price of the cap-and-trade program among the 10 WCI partners is $\$114.48/tCO_2e$. California is the biggest permit buyer in the market, followed by Washington. New Mexico is the biggest permit seller, followed by Arizona.

4. Because Florida has a marginal cost curve steeper than the WCI average level, when it joins the WCI, the permit price increases to $\$128.15/tCO_2e$. Florida becomes the biggest permit buyer in the market, followed by California and Washington. New Mexico and Arizona are still the biggest permit sellers.

5. In both simulation cases, if we compare the net cost of each state/province after trading with the corresponding element in the column before trading, we find that all states/provinces are better off as a result of participating in trading, since all the post-trading net costs are smaller than the pre-trading costs. The cost saving amount is shown in the Cost Savings column in Table 1 and Table 2. Compared with the pre-trading condition, Florida can save $286 million in 2020 by joining WCI, a cost saving of around 6.6%.

Please note these are the preliminary simulation results. They are subject to change after we obtain Florida-specific cost data and any updated data from WCI partners.

Table 1. Emission Trading Simulation Among WCI Partners In Year 2020[a]

(million dollars or otherwise specified)

State	Before Trading	After Trading			Cost Saving ($)	Permits Traded	Emission Reduction with Trading		Emission Reduction Goal
	Mitigation Cost ($)	Mitigation Cost ($)	Trading Cost[b] ($)	Net Cost ($)		($MMtCO_2e$)	($MMtCO_2e$)	(percent from BAU)	(percent from BAU)
AZ	–416	396	–922	–526	110	–8.06	83.72	54.10	48.89
CA	–14,380	–17,321	2,280	–15,042	662	19.91	154.61	27.68	31.25
MT	–190	277	–798	–522	332	–6.97	16.13	48.13	27.33
NM	–279	988	–2,013	–1,026	747	–17.58	45.07	54.65	33.33
OR	1,232	104	794	898	334	6.94	17.83	22.74	31.59
UT	124	702	–685	17	107	–5.98	38.65	44.78	37.85
WA	2,905	–41	1,717	1,676	1,230	15.00	24.51	21.52	34.68
BC	–245	–25	–250	–275	30	–2.18	20.81	30.38	27.20
MB	–330	–174	–246	–420	90	–2.15	8.21	48.05	35.49
QC	–3,677	–3,818	123	–3,695	18	1.08	21.45	25.87	27.17
Total	**–15,255**	**–18,914**	**0**	**–18,914**	**3,658**	**42.92[c]**	**431.01**	**33.77**	**33.77**

$MMtCO_2e$ = million metric tons of carbon dioxide equivalent; BAU = business as usual.

[a] Sector coverage: electric sector (consumption-based) + residential/commercial fuel use + large stationary combustion sources + industrial process emissions + fossil fuel production and processing + transportation fuels. The agriculture, forestry, and waste management (AFW) sector is excluded from the sector coverage.

[b] Permit Price = $\$114.48/tCO_2e$.

[c] Represents the number of permits bought or sold.

Table 2. Emission Trading Simulation Among WCI Partners and Florida in Year 2020[a]

(million dollars or otherwise specified)

State	Before Trading	After Trading			Cost Saving ($)	Permits Traded	Emission Reduction with/ Trading		Emission Reduction Goal
	Mitigation Cost ($)	Mitigation Cost ($)	Trading Cost[b] ($)	Net Cost ($)		($MMtCO_2e$)	($MMtCO_2e$)	(percent from BAU)	(percent from BAU)
AZ	–416	855	–1,518	–662	246	–11.84	87.51	56.54	48.89
CA	–14,380	–16,819	2,021	–14,798	418	15.77	158.75	28.43	31.25
MT	–190	382	–1,004	–623	433	–7.84	17.00	50.71	27.33
NM	–279	1,277	–2,560	–1,282	1,004	–19.97	47.46	57.55	33.33
OR	1,232	227	758	986	246	5.92	18.85	24.04	31.59
UT	124	964	–1,043	–79	203	–8.14	40.80	47.28	37.85
WA	2,905	119	1,753	1,871	1,034	13.68	25.83	22.67	34.68
BC	–245	105	–416	–312	67	–3.25	21.88	31.94	27.20
MB	–330	–136	–316	–452	122	–2.47	8.53	49.92	35.49
QC	–3,677	–3,764	81	–3,683	6	0.63	21.90	26.41	27.17
FL	4,354	1,824	2,244	4,068	286	17.51	148.22	35.18	39.34
Total	**–10,901**	**–14,966**	**0**	**–14,966**	**4,065**	**53.51[c]**	**596.73**	**35.15**	**35.15**

MM tCO_2e = million metric tons of carbon dioxide equivalent; BAU = business as usual.

[a] Sector coverage: electric sector (consumption-based) + residential/commercial fuel use + large stationary combustion sources + industrial process emissions + fossil fuel production and processing + transportation fuels. The agriculture, forestry, and waste management (AFW) sector is excluded from the sector coverage.

[b] Permit Price = \$128.15/tCO_2e. This is the price of the last permit sold, which is also equal to the price of the last ton of CO_2e mitigated (its marginal mitigation cost). It is the same for each state/province for a given case. The average mitigation cost per unit of CO_2e in the simulation differs for each state/province. For Florida, for example, it is \$12.31/tCO_2e. Please note that the average mitigation cost is related to mitigation level of a state/province, which for this case is 35.18% below the baseline level in 2020 for Florida. Multiplying the average mitigation cost by the number of tons of CO_2e mitigated will equal the total mitigation cost for each state/province shown in column 3.

[c] Represents the number of permits bought or sold.

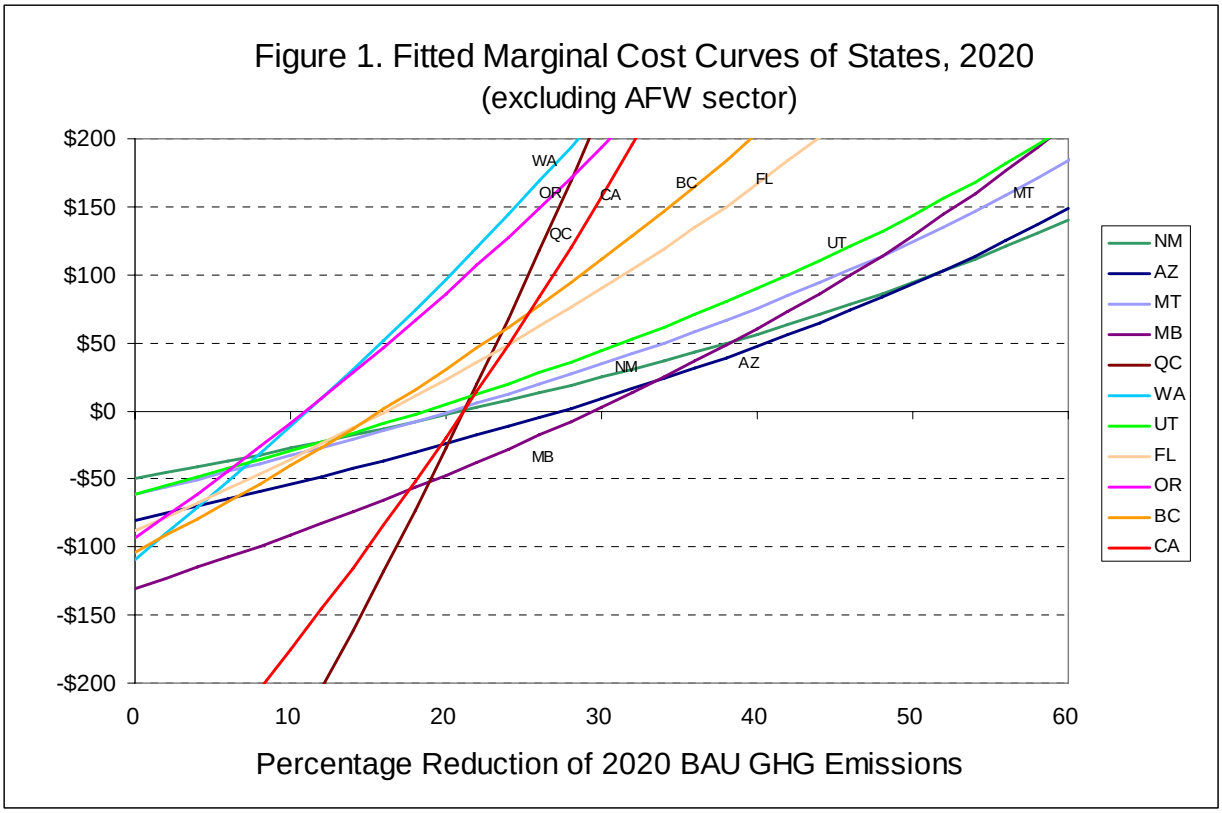
Table 3. Data Table

State	2020 BAU Gross Emissions (consumption-based)[a] ($MMtCO_2e$)	Emissions Cap in 2020[b] ($MMtCO_2e$)	GHG Mitigation Goal in 2020 (relative to BAU emissions)	Autarkic Marginal Mitigation Cost ($/tCO_2e$)
AZ	154.8	79.1	48.89%	87.6
CA	558.5	384.0	31.25%	181.5
MT	33.5	24.4	27.33%	24.3
NM	82.5	55.0	33.33%	34.7
OR	78.4	53.6	31.59%	212.7
UT	86.3	53.6	37.85%	79.6
WA	113.9	74.4	34.68%	283.7
BC	68.5	49.9	27.20%	87.5
MB	17.1	11.0	35.49%	33.5
QC	82.9	60.4	27.17%	147.4
FL	421.3	255.5	39.34%	161.2
Total	**1,697.6**	**1,100.9**	**35.15%**	

BAU = business as usual; $MMtCO_2e$ = million metric tons of carbon dioxide equivalent; GHG = greenhouse gas; $/tCO_2e$ = dollars per metric ton of carbon dioxide equivalent..

[a] Sector coverage: electric sector (consumption-based) + residential/commercial fuel use + large stationary combustion sources + industrial process emissions + fossil fuel production and processing + transportation fuels. The agriculture, forestry, and waste management (AFW) sector is excluded from the sector coverage.

[b] The cap for WCI partners is 15% below the 2005 level by year 2020. The 2020 cap for Florida is computed by interpolating the state's 2017 goal (to return to 2000 levels) and 2025 goal (to return to 1990 levels).



AFW = agriculture, forestry, and waste management; BAU = business as usual; GHG = greenhouse gas.

Notes:

1. Marginal cost curves of AZ, CA, MT, NM, and WA are developed based on mitigation options data of these states (from state final or draft climate action plans).

2. Marginal cost curves of OR, BC, MB, QC, and FL are developed based on WA, WA, MN, CT, and SC 2020 curves, respectively. UT has mitigation options data available only for the residential/commercial/industrial sector and the transportation sector. The state emission mitigation potentials and costs for the energy supply sector are approximated from New Mexico data.

3. The following assumptions are adopted when the cost curve for one state is developed on the basis of data from one of its adjacent states. We assume that the list of mitigation options for the adjacent state (state A) is applicable to the state without direct data (state B). Second, for state B, the estimated cost or cost savings per unit GHG removed for each option is assumed to be at the same level as that of state A. Third, the mitigation potentials of each option are assumed to be proportional to the total mitigation potential in each state; this requires that each option be adjusted by the ratio of emissions from the relevant sector of the two states. For example, if the emissions from the power sector are 50 $MMtCO_2e$ and 100 $MMtCO_2e$ in state A and state B, respectively, the mitigation potentials of the energy supply (ES) options for state A are multiplied by a factor of 2 (100/50 = 2) for application to state B.

Data Sources

GHG Mitigation Options Data

Arizona Climate Change Advisory Group. 2006. *Climate Change Action Plan.* http://www.azclimatechange.gov/

California Air Resources Board. 2008. *Climate Change Draft Scoping Plan (June 2008 Discussion Draft).* http://www.arb.ca.gov/cc/scopingplan/document/draftscopingplan.pdf

Montana Climate Change Advisory Committee. 2007. *Montana Climate Change Action Plan*. http://www.mtclimatechange.us/CCAC.cfm

New Mexico Climate Change Advisory Group. 2006. *NM Climate Change Action Plan*. http://www.nmclimatechange.us/

Washington Climate Advisory Team. 2008. *2008 Climate Change Interim Report—Leading the Way on Climate Change: The Challenge of Our Time*. http://www.ecy.wa.gov/climatechange/interimreport.htm

Geller, H., Baldwin, S., Case P., Emerson, K., Langer, T., and Wright, S. 2007. *Utah Energy Efficiency Strategy: Policy Options*. http://www.swenergy.org/pubs/UT_Energy_Efficiency_Strategy.pdf

South Carolina Climate, Energy & Commerce Advisory Committee. 2008. Draft South Carolina *Climate Change Action Plan*. http://www.scclimatechange.us/plenarygroup.cfm

Emissions Inventory and Forecast Data

For WCI Partners: Williams and Roe. 2008. "Task 0 State-Provincial GHG Summaries Tech Memo 1-31-08.doc" and associated Excel workbooks (including data from Western State GHG plans and WRAP database), as updated by Partner feedback through June 19, 2008.

For Florida: Draft Florida Inventory and Forecast Analysis by CCS.