Caiazza Initial Comments on Third Program Review September 2021

Introduction

I have been involved in the RGGI program process since it was first proposed prior to 2008. I follow and write about the details of the RGGI program in my retirement because its implementation affects whether I will be able to continue to be able to afford to live in New York. I have extensive experience with air pollution control theory, implementation, and evaluation of results having worked on every cap-and-trade program affecting electric generating facilities in New York including the Acid Rain Program, Regional Greenhouse Gas Initiative (RGGI) and several Nitrogen Oxide programs. The opinions expressed in these comments do not reflect the position of any of my previous employers or any other company I have been associated with, these comments are mine alone.

General Comments

My overall recommendation for the Third Program Review is to make no changes and see how the RGGI allowance market plays out the transition to the unprecedented emissions trading situation in which the majority of the RGGI allowances are held by entities who purchased allowances for investment rather than compliance purposes. No one knows how the market and the compliance strategies will react so it is best to make no changes at this time.

I have prepared a simple analysis that projects the margin between allowances available and emissions (Table 1) for a first cut estimate of the RGGI allowance market and compliance requirements. I downloaded CO2 mass, heat input, and primary fuel use data from the EPA Clean Air Markets Division database from 2009 to 2020 for Acid Rain Program units rather than RGGI program units so that I could include data from New Jersey and Virginia.

While Table 1 lists totals for five categories of fuel use: natural gas, coal, residual oil, diesel oil, and other fuels, it is instructive to look at a breakdown of the fuels over time. Table 2 lists the CO2 mass, heat input and calculated CO2 rate (lbs/hr) by fuel category for the combined nine states that have been in RGGI since 2009, New Jersey and Virginia. The final row lists the percentage change between the first three years of RGGI and the latest three years. In nine-state RGGI CO2 mass is down 39%, heat input is down 28% and the CO2 rate is down 16%. However, the fact that the CO2 rates for New Jersey and Virginia are down more than the RGGI states indicates that the economics of fuel switching to natural gas is the primary reason that CO2 emissions have decreased as observed in the RGGI region.

Table 1 lists the allowance cap and adjusted cap from 2009 to 2030 in the first three data columns. The observed CO2 mass and heat input totals for the five fuel categories are in the last columns. Starting in 2021, the estimated total allowances available expected at the end

Table 1: Eleven-State RGGI Projected Emissions and Allowance Margin - Assumed coal, residual and diesel oil all go to zero by 2030 and natural gas and all other fuels stay constant

	RGGI							Natural Gas		Coal		Residual Oil		Diesel Oil		Other Fuel	
Year	Cap	Adjusted Cap	Allowances	Margin	Total CO2	Total Heat	CO2 Rate	CO2 Mass	Heat Input	CO2 Mass	Heat Input	CO2 Mass	Heat Input	CO2 Mass	Heat Input	CO2 Mass	Heat Input
2009	188,000,000				143,931,449	1,778,994,996	162	50,946,509	854,999,154	82,769,459	769,844,224	7,269,650	106,209,329	1,481,932	32,030,253	1,463,900	15,912,036
2010	188,000,000				158,235,700	2,003,844,395	158	60,987,355	1,024,151,817	85,938,933	794,621,388	9,083,874	140,974,689	868,633	29,066,308	1,356,905	15,030,192
2011	188,000,000				137,418,025	1,826,714,324	150	65,577,227	1,102,754,743	64,004,675	594,789,557	5,542,306	87,013,085	1,064,165	27,753,165	1,229,653	14,403,775
2012	165,000,000				125,270,347	1,802,832,274	139	72,481,131	1,219,996,168	42,645,065	404,229,950	7,112,583	116,243,277	1,417,930	43,300,710	1,613,637	19,062,169
2013	165,000,000				124,966,079	1,713,044,367	146	64,646,591	1,085,700,403	52,434,894	499,441,571	5,166,004	81,569,135	1,310,423	31,216,800	1,408,167	15,116,457
2014	91,000,000	82,792,336			128,404,612	1,757,560,272	146	66,902,681	1,117,493,984	51,696,201	488,582,183	5,635,442	84,523,356	1,063,406	35,757,765	3,106,882	31,202,985
2015	88,725,000	66,833,592			128,429,155	1,879,313,289	137	78,838,694	1,320,329,969	39,222,867	374,319,574	5,895,295	87,676,834	1,085,199	63,191,253	3,387,100	33,795,660
2016	86,506,875	64,615,467			130,043,806	1,940,543,497	134	85,878,071	1,442,238,693	36,711,850	354,649,894	2,671,785	42,221,681	1,040,916	64,482,784	3,741,184	36,950,443
2017	84,344,203	62,452,795			109,295,893	1,669,655,559	131	80,015,172	1,356,110,444	23,650,941	231,047,998	1,391,736	20,928,871	1,001,069	29,677,802	3,236,976	31,890,444
2018	82,235,598	60,344,190			117,898,067	1,794,955,724	131	88,564,592	1,482,631,982	22,609,485	220,278,546	2,431,378	35,320,965	877,328	22,778,649	3,415,284	33,945,583
2019	80,179,708	58,288,301			104,324,207	1,654,916,344	126	88,212,415	1,482,557,083	11,378,563	111,588,123	1,003,954	15,876,564	443,980	12,364,799	3,285,295	32,529,775
2020	96,175,215	74,283,807			101,984,179	1,644,890,862	124	90,315,394	1,519,167,755	8,004,551	78,086,114	508,076	7,660,405	611,983	14,548,092	2,544,174	25,428,496
2021	119,767,784	100,677,454	188,600,000	87,528,282	101,071,718	1,634,861,401	124	90,315,394	1,519,167,755	7,204,096	70,277,503	457,268	6,894,364	550,785	13,093,282	2,544,174	25,428,496
2022	116,112,784	97,022,454	184,550,736	84,391,480	100,159,257	1,624,831,940	123	90,315,394	1,519,167,755	6,403,641	62,468,891	406,461	6,128,324	489,587	11,638,473	2,544,174	25,428,496
2023	112,457,784	93,367,454	177,758,934	78,512,138	99,246,795	1,614,802,479	123	90,315,394	1,519,167,755	5,603,186	54,660,280	355,653	5,362,283	428,388	10,183,664	2,544,174	25,428,496
2024	108,802,784	89,712,454	168,224,592	69,890,258	98,334,334	1,604,773,018	123	90,315,394	1,519,167,755	4,802,731	46,851,669	304,846	4,596,243	367,190	8,728,855	2,544,174	25,428,496
2025	105,147,784	86,057,454	155,947,712	58,525,839	97,421,873	1,594,743,556	122	90,315,394	1,519,167,755	4,002,275	39,043,057	254,038	3,830,202	305,992	7,274,046	2,544,174	25,428,496
2026	101,492,784		160,018,623	63,509,210	96,509,412	1,584,714,095	122	90,315,394	1,519,167,755	3,201,820	31,234,446	203,230	3,064,162	244,793	5,819,237	2,544,174	25,428,496
2027	97,837,784		161,346,994	65,750,043	95,596,951	1,574,684,634	121	90,315,394	1,519,167,755	2,401,365	23,425,834	152,423	2,298,121	183,595	4,364,427	2,544,174	25,428,496
2028	94,182,784		159,932,827	65,248,337	94,684,490	1,564,655,173	121	90,315,394	1,519,167,755	1,600,910	15,617,223	101,615	1,532,081	122,397	2,909,618	2,544,174	25,428,496
2029	90,527,784		155,776,121	62,004,091	93,772,029	1,554,625,712	121	90,315,394	1,519,167,755	800,455	7,808,611	50,808	766,040	61,198	1,454,809	2,544,174	25,428,496
2030	86,872,784		148,876,875	56,017,307	92,859,568	1,544,596,251	120	90,315,394	1,519,167,755	0	0	0	0	0	0	2,544,174	25,428,496

Table 2: Change in CO2 Emissions (short tons) and Heat Input (mmBtu) Since t2009 for Eeleven RGGI States

	9-State RGGI			New Jersey			Virginia		
Year	**CO2 Mass**	**Heat Input**	**CO2 Rate**	**CO2 Mass**	**Heat Input**	**CO2 Rate**	**CO2 Mass**	**Heat Input**	**CO2 Rate**
2009	101,851,337	1,320,901,495	154.2	11,732,094	133,162,146	176.2	30,348,018	324,931,355	186.8
2010	110,999,074	1,475,264,860	150.5	14,638,010	162,725,807	179.9	32,598,616	365,853,728	178.2
2011	97,966,177	1,357,363,544	144.3	12,929,819	166,834,334	155.0	26,522,029	302,516,447	175.3
2012	89,075,182	1,322,290,671	134.7	12,398,785	188,108,982	131.8	23,796,380	292,432,620	162.7
2013	83,084,255	1,188,386,327	139.8	11,602,351	175,518,653	132.2	30,279,472	349,139,387	173.5
2014	84,252,729	1,205,811,480	139.7	13,888,228	206,366,297	134.6	30,263,655	345,382,496	175.2
2015	81,506,825	1,239,868,758	131.5	16,033,840	255,712,231	125.4	30,888,490	383,732,300	161.0
2016	78,123,445	1,207,049,686	129.4	17,939,043	295,415,524	121.4	33,981,318	438,078,287	155.1
2017	63,486,878	983,446,926	129.1	14,625,018	245,345,532	119.2	31,183,997	440,863,101	141.5
2018	70,079,586	1,076,068,159	130.3	14,858,628	248,924,697	119.4	32,959,853	469,962,867	140.3
2019	59,083,901	936,117,707	126.2	15,288,729	257,101,506	118.9	29,951,577	461,697,131	129.7
2020	59,314,769	966,639,494	122.7	11,133,280	187,276,840	118.9	31,536,130	490,974,528	128.5
Delta	-39%	-28%	-16%	5%	50%	-30%	6%	43%	-26%

	Nine - State RGGI									
	Natural Gas		Coal		Residual Oil		Diesel Oil		Other Fuel	
Year	CO2 Mass	Heat Input	CO2 Mass	Heat Input	CO2 Mass	Heat Input	CO2 Mass	Heat Input	CO2 Mass	Heat Input
2009	39,179,889	658,047,581	52,946,094	514,844,704	6,798,589	100,301,906	1,462,864	31,795,267	1,463,900	15,912,036
2010	45,444,345	763,617,250	55,081,939	537,257,669	8,291,840	130,842,948	824,044	28,516,801	1,356,905	15,030,192
2011	49,744,574	836,536,763	40,755,097	396,579,889	5,199,909	82,425,385	1,036,945	27,417,733	1,229,653	14,403,775
2012	52,985,873	891,639,950	26,249,055	256,134,001	6,870,732	112,918,496	1,355,885	42,536,055	1,613,637	19,062,169
2013	46,658,008	783,325,821	28,721,977	279,477,082	5,022,709	79,706,507	1,273,393	30,760,460	1,408,167	15,116,457
2014	47,398,125	791,755,327	28,761,226	279,796,897	5,271,028	80,021,165	940,208	34,239,472	1,882,144	19,998,619
2015	51,983,116	869,882,508	21,166,533	205,885,822	5,323,396	80,611,135	976,283	61,848,987	2,057,497	21,640,307
2016	53,194,349	892,690,825	19,210,932	187,599,651	2,440,791	39,367,731	953,652	63,407,334	2,323,721	23,984,145
2017	47,800,455	801,748,007	11,595,839	113,917,244	1,256,674	19,260,178	937,177	28,890,373	1,896,733	19,631,124
2018	52,566,146	878,882,184	12,579,769	122,697,201	2,151,926	31,868,360	787,643	21,673,377	1,994,103	20,947,038
2019	48,941,350	822,064,941	6,861,005	66,928,465	907,388	14,683,515	428,719	12,176,727	1,945,439	20,264,060
2020	53,186,304	894,529,271	3,627,707	35,448,907	425,838	6,644,335	591,226	14,292,268	1,483,694	15,724,713
Delta	15%	15%	-84%	-84%	-83%	-83%	-46%	-45%	34%	26%

	New Jersey									
	Natural Gas		Coal		Residual Oil		Diesel Oil		Other Fuel	
Year	CO2 Mass	Heat Input	CO2 Mass	Heat Input	CO2 Mass	Heat Input	CO2 Mass	Heat Input	CO2 Mass	Heat Input
2009	7,645,631	128,336,859	4,029,105	4,029,105	57,359	796,182	0	0	0	0
2010	9,282,384	155,929,714	5,259,263	5,259,263	96,363	1,536,829	0	0	0	0
2011	9,625,402	162,044,520	3,205,078	3,205,078	99,339	1,584,737	0	0	0	0
2012	11,003,699	185,494,459	1,317,346	1,317,346	77,740	1,297,178	0	0	0	0
2013	10,342,424	173,844,019	1,231,530	1,231,530	28,398	443,104	0	0	0	0
2014	12,208,085	204,517,739	1,665,293	1,665,293	14,850	183,265	0	0	0	0
2015	15,173,366	254,724,507	849,261	849,261	11,213	138,464	0	0	0	0
2016	17,537,183	294,989,281	399,709	399,709	2,150	26,534	0	0	0	0
2017	14,586,222	245,306,735	38,796	38,796	0	0	0	0	0	0
2018	14,840,979	248,907,049	17,648	17,648	0	0	0	0	0	0
2019	15,288,729	257,101,506	0	0	0	0	0	0	0	0
2020	11,133,280	187,276,840	0	0	0	0	0	0	0	0
Delta	55%	55%	-100%	-100%	-100%	-100%				

	Virginia									
	Natural Gas		Coal		Residual Oil		Diesel Oil		Other Fuel	
Year	CO2 Mass	Heat Input	CO2 Mass	Heat Input	CO2 Mass	Heat Input	CO2 Mass	Heat Input	CO2 Mass	Heat Input
2009	4,120,988	68,614,713	25,794,260	250,970,416	413,702	5,111,240	19,067	234,986	0	0
2010	6,260,626	104,604,853	25,597,731	252,104,456	695,672	8,594,911	44,589	549,507	0	0
2011	6,207,251	104,173,460	20,044,500	195,004,590	243,059	3,002,964	27,220	335,432	0	0
2012	8,491,560	142,861,759	15,078,664	146,778,604	164,110	2,027,603	62,046	764,655	0	0
2013	7,646,158	128,530,563	22,481,387	218,732,959	114,897	1,419,524	37,030	456,341	0	0
2014	7,296,471	121,220,918	21,269,682	207,119,993	349,564	4,318,926	123,198	1,518,293	1,224,739	11,204,366
2015	11,682,212	195,722,954	17,207,073	167,584,491	560,686	6,927,235	108,916	1,342,266	1,329,603	12,155,353
2016	15,146,539	254,558,587	17,101,208	166,650,534	228,844	2,827,417	87,264	1,075,451	1,417,463	12,966,298
2017	17,628,496	309,055,701	12,016,305	117,091,957	135,061	1,668,693	63,892	787,429	1,340,242	12,259,321
2018	21,157,467	354,842,749	10,012,068	97,563,696	279,452	3,452,605	89,684	1,105,272	1,421,181	12,998,545
2019	23,982,337	403,390,636	4,517,558	44,659,658	96,565	1,193,049	15,261	188,073	1,339,857	12,265,715
2020	25,995,810	437,361,645	4,376,844	42,637,207	82,238	1,016,070	20,758	255,824	1,060,480	9,703,783
Delta	329%	331%	-74%	-74%	-66%	-66%	38%	38%		

of each year are listed. The 2021 value is based on the latest Potomac Economics report on the secondary market report. From a compliance standpoint the key parameter is the margin between the allowances available and the emissions. For each year subsequent to 2021 the allowances available equals the previous year allowances minus that year's emissions plus the allowances from the adjusted cap through 2025 and unadjusted cap through 2030.

Based on the observation that fuel switching is the primary CO2 reduction methodology to date, the emission projection forces coal, residual oil and diesel oil to go to zero by 2030. The projected emissions are summed and the margin (difference between allowances available and emissions) is calculated. Using these assumptions, the allowance bank and the margin continue to decrease suggesting that there will be no major upheavals in compliance strategies or allowance prices. Of course, projecting future emissions is fraught with difficulties and uncertainties but this approach is probably conservative and actual reductions will likely be greater.

It is also appropriate to review the emission reduction results of RGGI relative the Social Cost of Carbon (SCC) cost-effectiveness parameter. I believe that the only reductions from RGGI that can be traced to the program are the reductions that result from direct investments of the RGGI auction proceeds. Information necessary to evaluate the performance of the RGGI investments is provided in the RGGI annual Investments of Proceeds updates. In order to determine reduction efficiency, I had to sum the values in the previous reports because the reports only report lifetime benefits. In order to account for future emission reductions against historical levels and to compare values with the SCC parameter, the annual reduction parameter must be used. Table 3, Accumulated Annual RGGI Benefits, lists the sum of the annual avoided CO2 emissions generated by the RGGI investments from previous reports. The total of the annual reductions is 2,818,775 tons while the difference between the baseline of 2006 to 2008 compared to 2019 emissions is 72,908,206 tons. Therefore, the RGGI investments are only directly responsible for less than 5% of the total observed reductions since RGGI began in 2009.

In order to argue that RGGI emission reduction programs are a good investment relative to the expected societal cost of CO2 emissions the Social Cost of Carbon parameter can be used. SCC values range widely depending on assumptions, but if you use a discount rate of 3% and consider global benefits like the Obama-era Environmental Protection Agency (EPA) did then the 2020 SCC value is $50. Table 3 lists the data needed to calculate the RGGI CO2 reduction cost per ton. From the start of the program in 2009 through 2019 RGGI has invested $2,795,539,789 and reduced annual CO2 emissions 3,259,203 tons. The result, $857 per ton reduced, is 17 times higher than the current EPA SCC value. Therefore, I conclude that RGGI investments are not cost effective relative to societal impacts contained in the SCC.

Table 3: Accumulated Annual Regional Greenhouse Gas Initiative Benefits Through 2019

Time Period	RGGI Investments ($)	Avoided CO2 (Short tons)
Cumulative (2008-2014)	$1,365,479,615	1,700,000
2015	$ 410,158,329	298,410
2016	$ 436,397,471	382,266
2017	$ 315,600,000	438,099
2018	$ 248,000,000	273,217
2019	$ 217,000,000	167,211
Cumulative Annual Totals	$2,795,539,789	3,259,203
	Cost Efficiency	($/ton)
Cumulative (2008-2014)		$ 803.22
2015		$ 1,374.48
2016		$ 1,141.61
2017		$ 720.39
2018		$ 907.70
2019		$ 1,297.76
Annual Total		$ 857.74

Based on comments in previous program reviews there will undoubtedly be calls to make the allowance cap "binding" that is to say force emission reductions to meet a particular emission reduction trajectory. While the projections above do not reduce emissions as much as the arbitrary 3% reduction target from the previous program review, there are potential consequences if a more stringent reduction is mandated.

The most important consideration to keep in mind is that CO2 control is different than other pollutants because there are no cost-effective controls available for existing facilities. As the data show, fuel switching is the primary reason for the observed emission reductions but once the facility has changed to a lower emitting fuel the only options at a power plant is to become more efficient and burn less fuel or stop operating all together. It is imperative that RGGI never tighten the cap so low that affected sources are unable to operate because allowances are unavailable to operate because that could threaten reliability.

Theory suggests that as the market gets tighter that the allowance price will rise. If the allowance price exceeds the Cost Containment Reserve trigger price, then allowances equal to 10% of the cap will be released to the market. Because that is greater than the 3% reduction target, that suggests that discouraging a tight market supports greater emission reductions.

It appears to me that the goal of RGGI should be to balance the cap with emissions so that the allowance bank is only used for year-to-year variations in weather-related excess emissions. Over time as RGGI investments fund zero-emission energy sources it may become necessary to adjust the emission reduction trajectory but that should be based on observations and not model projections.

Specific Comments

The RGGI states requested feedback on the following topics.

The RGGI states seek comment on the RGGI cap, including comment on the trajectory of the cap before and after 2030.

Based on the conclusions of my general comments no changes should be made before 2030. In five years RGGI program review planning should consider an appropriate post-2030 trajectory.

The RGGI states seek comment on how or whether to address or adjust for a bank of CO_2 allowances into the future if a bank of surplus allowances remains in circulation post-2025.

If the emissions match the annual allowance cap, then the size of the allowance bank does not matter. The allowance bank provides important compliance certainty to deal with unexpected weather-related emissions variability and any other factors affecting operations. Moreover, when emissions match the allowance cap then compliance entities will not be required to purchase allowance from investors. Profits made by investors have to be paid for by ratepayers without receiving any benefits from auction proceed investments.

The RGGI states seek comment on how states can further address environmental justice and other equity concerns, including through program design and/or the use ofRGGI auction proceeds to support underserved and/or otherwise affected communities. Sample topics for consideration may include, but are not limited to, inclusive and expanded public participation, just transition and workforce development, and air quality monitoring, among other topics.

RGGI is ostensibly a greenhouse gas emissions reduction program. Given that emission reductions have not been cost effective relative to the SCC it is important that funding environmental justice and other equity concerns not further dilute emission reduction cost effectiveness. On the other hand, direct financial assistance to reduce energy use in disadvantaged concerns may not be cost-effective as an emission reduction policy but it is entirely appropriate in this context because any additional costs due to RGGI impact those who are least able to afford them the most.

The RGGI states seek comment on how the CCR has worked to date and the current design of the CCR, including the quantity of CCR allowances and the established trigger prices.

There are no apparent problems with the CCR so it should be left as is.

The RGGI states seek comment on how the ECR has worked to date and the currentdesign of the ECR, including the quantity of ECR allowances and the established trigger prices.

There are no apparent problems with the ECR so it should be left as is.

The RGGI states seek comment on how the minimum reserve price has worked to date, the current level of the minimum reserve price, and the methodology for setting the minimum reserve price annually.

There are no apparent problems with the minimum reserve price so it should be left as is.

The RGGI states seek comment on how the three-year control period and interim control period compliance structure has worked to date and on any potential changesto the compliance requirements, including whether it would be preferable to change the percentage of emissions for which allowances are required to be surrendered as part of each interim compliance period.

There are no apparent problems with the existing control structure so it should be left as is.

The RGGI states seek comment on any potential changes to the types of offset project categories and/or specific provisions. The RGGI states seek comment on any potential changes to the limit on the use of offset allowances for compliance.

No comment.

The RGGI states seek input on the objectives of this Program Review and any additional topics and questions that should be included. In addition, the RGGI states seek input on the Program Review process, schedule, and logistics, including suggestions to make the process accessible, productive, and open to public participation.

In order to better track the status of the allowances and emissions it would be very useful if RGGI were to provide a quarterly update to the number of allowances in circulation. These data are necessary in order to assess the cap trajectory and allowance bank.

September 30, 2021
Roger Caiazza
Liverpool, NY