Analysis Supporting Offsets Limit Recommendation

Overview

This memorandum outlines the Staff Working Group (SWG) analysis supporting the determination of a quantitative limit for offsets during the negotiation of the RGGI Memorandum of Understanding (MOU), as well as subsequent analysis by the SWG based on the specific provisions agreed to in the MOU. It is provided as an accompaniment to the spreadsheet, “RGGI Offsets Limit Analysis”, available at http://www.rggi.org/docs/offsets_limit_5_1_06.xls .

Background

The SWG recommended that a quantitative limit be set on offsets, and that the limit be set at a level that approximated an amount of offsets equivalent to 50% of the projected avoided emissions that would need to be achieved to meet the RGGI cap requirements. This recommendation followed the principle that at least half of the avoided emissions achieved through RGGI should come from within the capped sector. Avoided emissions were defined as the difference between projected business-as-usual (BAU) emissions (a scenario absent the RGGI cap) and the RGGI cap schedule itself (Figure 1). Using this principle as a guide, the SWG estimated the avoided emissions that would need to be achieved to comply with the RGGI cap over time, and calculated an amount of offsets equivalent to 50% of this requirement.

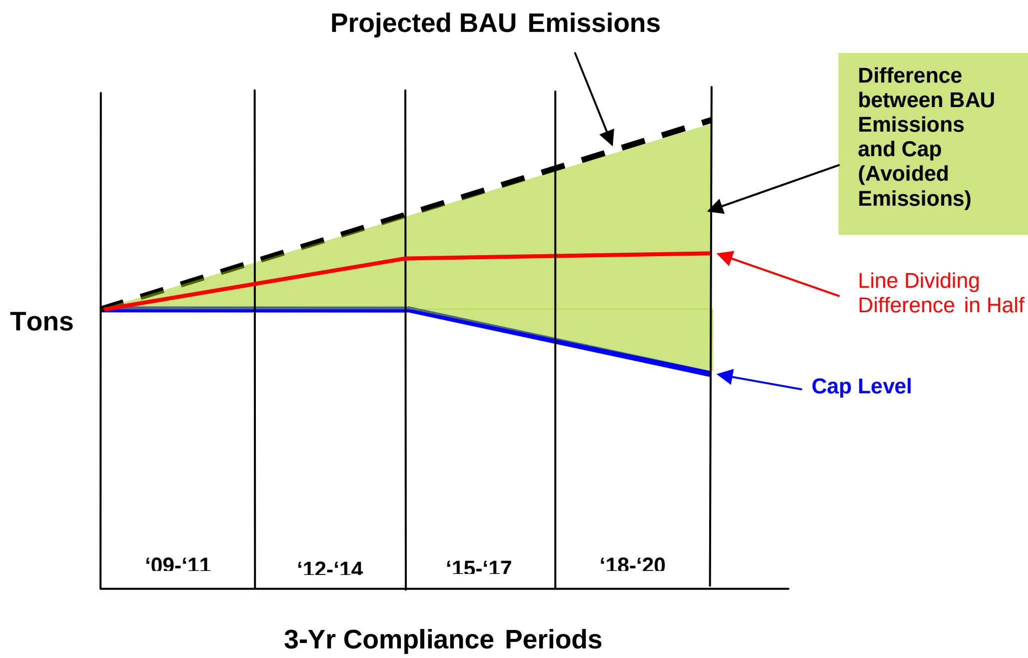

Figure 1. Explanation of the 50% Approach for Applying Offsets Limit

This approach was endorsed by agency heads, while also acknowledging that such an approach is based on emissions projections and requires application of IPM modeling data to the RGGI emissions inventory or the RGGI cap targets.[1] This exercise therefore is subject to a level of uncertainty. As a result, the limit ultimately employed was not intended to be an exact representation of 50% of avoided emissions to be achieved through the program. However, the 50% approach was used as a guide to inform discussions of an appropriate offsets limit, and provide a quantitative basis for arriving at a specified limit.[2]

SWG Analysis

The accompanying spreadsheet provides the SWG analysis used to inform this decision. The spreadsheet compares the emissions trajectory from the IPM BAU reference case to the RGGI cap schedule, and determines the difference between the two for individual years and as averaged across the timeframe of the RGGI program. Three different scenarios are presented [3, 4]:

- Scenario A: Application of the IPM BAU emissions trajectory at current emissions (*IPM 2006 emissions assumed equivalent to avg. 2000-2004 RGGI unit emissions*).

- Scenario B: Application of the IPM BAU emissions trajectory at the August 2005, SWG package proposal cap start point (*IPM 2009 emissions assumed equivalent to 2009 cap start point*).

- Scenario C: Application of the IPM BAU emissions trajectory at the December 2005 MOU cap start point, which includes revisions in cap timing from the August, 2005, SWG package proposal (*IPM 2009 emissions assumed equivalent to 2009 cap start point*).

Scenario B was used to recommend the 3.3% limit on offsets included in the MOU. In this scenario, this is equivalent to 50% of the average difference between projected BAU emissions and the RGGI cap, represented as a

[1] See descriptions of scenarios A-C.
[2] It should also be noted that the offsets limit is not applied as an aggregate limit on the amount of offsets that can be approved by regulators, but is instead applied as a limit on the amount of offsets that can be used by individual regulated sources during each compliance period. The limit is applied as a percentage of a regulated source's reported emissions in each compliance period. This was done to create an open and competitive offsets market. As a result, the actual offsets limit would be somewhat dynamic, and could vary in aggregate tonnage terms based on reported emissions during a compliance period.
[3] Scenario B applied the IPM BAU trajectory by shifting the trajectory up by a constant number of tons so that the IPM output in 2009 equaled the cap start point of 150 million tons. Scenarios A and C apply an annual percentage growth rate equivalent to that demonstrated by the unadjusted IPM BAU trajectory. The application of this growth rate begins at the applicable start point for each scenario (either average 2000-2004 emissions or the MOU 2009 cap start point). Scenario A has been updated slightly from that used in the initial SWG analysis, based on the cap schedule agreed to in the MOU and using average 2000-2004 emissions as a reference point. Minor modifications were also made to how the IPM trajectory was applied in Scenario A to match how the trajectory was applied in the new Scenario C, which follows the cap schedule agreed to in the MOU.
[4] Note that IPM output is reported in "run years" that represent three-year increments (e.g., 2006 run year presents results for the 2005-2007 period).

percentage of the cap averaged over the course of the program. This scenario assumes that actual emissions are equivalent to the cap start point at the start of the program. As presented for comparison in the spreadsheet for each of the scenarios, average 2000-2004 emissions were approximately 143.3 million tons, below the initial cap start point in 2009.

Scenario A assumes that emissions in 2006 are equivalent to average emissions during the period from 2000-2004. This results in a lower derived offsets limit.

Scenario C is a revised scenario based on the specific cap start point and emissions reduction schedule agreed to in the December 2005, MOU. Changes were made to the initial cap start point and the schedule of emissions reductions during the negotiation of the MOU. This results in a higher derived offsets limit.

Addressing Uncertainty

The goal of this exercise was to provide a quantitative basis to inform a policy decision on setting a quantitative limit for offsets. The SWG analysis provided a context for this decision that is generally consistent with the principle that at least 50% of avoided emissions should come from within the capped sector. As a result, the 50% metric was used as a guide for making this policy decision, but was not seen as a formula for implementing an exact 50% limit.

Types of Uncertainty

Two key variables impact the derived offsets limit, and introduce a level of uncertainty and imprecision to deriving an offsets limit that is an exact representation of the 50% goal. These key variables are the BAU emissions trajectory and the point where this trajectory is applied.

Determining a quantitative limit on offsets required the use of modeling projections. Modeling projections are subject to inherent uncertainty, and are therefore used to evaluate directionality and cause and effect, rather than predict the future. Differing BAU emissions trajectories produce different derived offsets limits due to a larger or smaller difference between assumed BAU emissions and the cap. This analysis used the standard reference case emissions trajectory.[5]

There is also uncertainty as to the level of actual emissions that will be realized during the 2005-2008 timeframe, which will determine where emissions are relative to the cap start point in 2009. Recent changes in fuels markets may result in a deviation in system emissions from recent historical trends.[6] This relationship between assumed future emissions and the cap start point impacts

[5] Carbon cap scenarios run against the standard reference case have been referred to during the RGGI process as the “package scenario”, while the comparison of the RGGI carbon policy package to other reference case scenarios has been referred to by the identifier of the reference case sensitivity, such as “high emissions package scenario”.

[6] There is the possibility that emissions in this timeframe may depart from recent trends given the significant increase in natural gas prices during the past year. While dispatch of the electric power system is subject to variables such as weather, an increase in natural gas prices would be expected to result in a reduction in the dispatch of natural gas-fired electric generation units, leading to an increase in system-wide emissions.

the derived offsets limit. For example, Scenario A results in a smaller derived limit on offsets than Scenario B, due to the gap between the assumed level of emissions at the start of the program. In contrast, scenario B and C assume that emissions at the start point of the program are equal to the 2009 emissions budget, which results in a larger derived limit. To inform this issue, the SWG will continue to track emissions from RGGI-applicable units prior to the start of the program.

Addressing Uncertainty through Program Design

When making a recommendation on the 3.3% offsets limit, the SWG considered these issues. The SWG believes that the 3.3% limit represents a valid marker, in keeping with the 50% principle, while acknowledging a level of uncertainty and imprecision involved in specifying a level. Given the range of the derived offsets limits across the scenarios, the SWG believes that the 3.3% level remains valid, and notes that the median of the range of limits derived in Scenarios A and C is 3.2%.

This measure of uncertainty and imprecision is also one reason the program allows for the use of greater amounts of offsets under specified market conditions and also provides for a full program evaluation in 2012. This program review would allow for consideration of midcourse corrections to the offsets limit as needed.

The price triggers employed in RGGI design provide for an expansion of offsets under certain market conditions characterized by higher allowance prices than currently projected for the program. Higher allowance prices may be viewed as a proxy for what would have been higher BAU emissions, a scenario that would lead to a higher derived percentage limit on offsets.[7] Providing for an increase in offsets limits under higher than projected allowance prices is therefore consistent with the SWG approach used to derive a recommended offsets limit.

Calibration of IPM Model Emissions Output with RGGI Emissions Data

As part of the RGGI modeling analysis, the SWG attempted to calibrate IPM modeled CO_2 emissions results to the RGGI emissions inventory.[8] Certain adjustments to IPM emissions data were necessary in order to directly compare IPM emissions output with RGGI emissions inventory data. These adjustments

[7] In simple terms, allowance prices reported in the IPM model are a result of the difference between the aggregate costs of operating the power system under a BAU emissions reference case and the aggregate costs of operating the system under a carbon constraint. A larger cost differential between scenarios demonstrates higher marginal abatement costs. One of the primary factors impacting these costs is reference case emissions, which determine the level of adjustment in emissions the system must make to comply with the cap. This level of adjustment has a significant impact on the cost differential demonstrated between scenarios.

[8] This calibration did not directly factor into the process for deriving an offset limit, but bears explanation here, since the IPM trajectory was applied to different start points that represent actual 2000-2004 average emissions or the cap start point, depending on the scenario.

result in a positive adjustment to IPM emissions output of about 13.9 million tons for each model run year.

Disparities between the IPM emissions output and the RGGI emissions inventory are due to three factors:

- Representation of co-generation power plants in IPM
- IPM method for deriving power plant CO_2 emissions
- Modeled near-term IPM outcomes in the post 2004 timeframe

- *IPM Representation of Cogeneration Units*
  IPM represents only the "grid-dispatchable" portion of cogeneration units in its power plant data set, on a capacity basis. IPM does not account for the capacity that is used to serve on-site electricity load. As a result, the cogeneration capacity represented in IPM does not match the capacity in the RGGI emissions inventory data set. IPM represents approximately 12,000 MW of grid-dispatchable cogeneration capacity in the RGGI region in this fashion. To account for this discrepancy, IPM CO_2 emissions output from cogeneration units was adjusted up based on the way these units are represented in IPM.

- *Continuous Emissions Monitor (CEM) Adjustment*
  The IPM model derives CO_2 emissions based on fuel usage. By comparison, the majority of RGGI emissions are from Acid Rain units that use continuous emissions monitors (CEMs) to report emissions. CEMs tend to report emissions that are 3%-5% higher than emissions derived by applying an emissions factor to fuel usage. As a result, IPM CO_2 emissions output was adjusted up to approximate this average differential.

- *Modeled 2006 Outcomes: Explaining the Remaining Difference between RGGI 2000-2004 Average Emissions and IPM 2006 Emissions Projection*
  Even after adjustments, IPM is projecting lower emissions in 2006 than RGGI unit emissions for 2000-2004. A significant portion of this differential is explained by new power plant builds and retirements that were hardwired into the model, as well as capacity projected to be built to meet RPS targets in the RGGI region. In 2006, IPM is projecting that approximately 1,600 MW of new renewable energy capacity is added in the nine-state RGGI region, as well as 400 MW of nuclear up-rates. There is also an addition of more than 3,000 MW of new natural gas combined cycle capacity, consisting of firm builds specified by the SWG and hardwired into the model. Specified firm retirements of units total more than 2,500 MW, representing older less efficient units.