Memorandum

To: EAAC Members

From: Cal/EPA and ARB EAAC Policy Team

RE: Factors Affecting Allowance Value

Date: October 6, 2009

1. Objective

This memo summarizes the factors likely to affect the value of emission allowances in California's cap-and-trade program. Because the total value of allowances is the product of the quantity of allowances (the "allowance budget") and the allowance price, this memo describes:

- the approach for setting the allowance budget that is under consideration; and
- the factors affecting allowance price, including both program design options and exogenous influences.

The information in this memo may be used by the EAAC to assess factors that will affect the magnitude of allowance value within the California program.

While the cap-and-trade program is designed to be an enduring policy tool for reducing GHG emissions through 2050 and beyond, to date the California and WCI program designs have focused on 2012 to 2020. This period may be considered a transition during which the program becomes well established and the price of carbon becomes internalized throughout the economy. Consequently, this memo focuses on the 2012-2020 period.

2. Setting the Allowance Budget

2.1 Program Coverage by Compliance Period

The first nine years of the cap-and-trade program are divided into three compliance periods of three years each: 2012-2014; 2015-2017; and 2018-2020.

2012-2014: During the first compliance period, the program covers direct GHG emissions from the generation of all electricity delivered for consumption in California and direct GHG emissions from stationary source facilities (industrial facilities) with emissions of 25,000 metric tons per year or greater.[1] Emissions from the generation of electricity that is consumed in California are included whether the electricity was generated in California or imported for consumption in California from another state or province.[2] Direct emissions include emissions from fuel combustion and processes. The six Kyoto Protocol gases are included.[3]

[1] Some process emissions currently cannot be quantified at the facility level with sufficient precision to be included in the cap-and-trade program. For example, an emissions quantification protocol for oil and gas exploration and production fields remains under development. This emissions source is not currently in: California's mandatory reporting requirements; the reporting requirements recommended by WCI; nor the recently finalized U.S. EPA mandatory reporting rule. Emission sources that cannot be adequately quantified at the facility level are excluded from the cap-and-trade program.

[2] When California links to the WCI partner jurisdictions, emissions from electricity generation in those jurisdictions will be covered by those jurisdictions. Emissions from electricity generated in a WCI partner jurisdiction and imported into California would not be covered by the California program once the programs are linked.

[3] The six Kyoto Protocol gases are: carbon dioxide, methane, nitrous oxide; sulfur hexafluoride (SF_6); hydrofluorocarbons (HFCs); and perfluorocarbons (CF_4 and C_2F_6).

2015-2017: Starting in the second compliance period, transportation fuels are added to the cap-and-trade program. Although the precise point of regulation for these fuels remains under development, the expectation is that these fuels will be covered where they enter into commerce in California, such as at the refinery and/or the rack. The compliance obligation at the point of regulation will be based on the fossil carbon content of the fuels at that point (based on the presumption that the fuel will be combusted when it is used).

Also starting in the second compliance period is the coverage of residential and commercial fuels that are not covered in the first compliance period. Natural gas is the primary fuel in this category. The compliance obligation will be at the local distribution company, such as the gas company that delivers natural gas to homes and businesses.

2018-2020: The coverage of the third compliance period is the same as the second compliance period.

Excluded from Coverage: The proposed design excludes several emissions categories from compliance obligations under the California and WCI cap-and-trade program:

- changes in carbon stock on forest lands;[4]
- non-fuel agriculture emissions, such as emissions from livestock, manure management and soils; and
- direct emissions for which adequate emissions quantification method are not available.[5]

Exhibit 1 summarizes the coverage by compliance period. Approximately 800-1,000 entities are expected to have a compliance obligation under the cap-and-trade program in California.

2.2 The Allowance Budget for Each Compliance Period

The Scoping Plan and WCI Program Design Recommendations provide the high-level policy framework for setting the allowance budgets for each compliance period, including the following.

2020 Cap-and-Trade Program Allowance Budget: AB 32 established the California 2020 GHG emissions limit at 1990 levels for all sources and sinks. The ARB subsequently computed this level to be 427 million metric tons, which was adopted by the Board as the state emissions limit for 2020. This emissions limit is *not* the appropriate value for the 2020 cap-and-trade allowance budget because some emissions sources that are part of the 427 million metric tons are not covered by the cap-and-trade program. Rather, the cap-and-trade allowance budget for 2020 must be set at a level so that number of allowances issued plus the emissions from sources outside the cap-and-trade program sum to no more than the 2020 emissions limit of 427 million metric tons. As an illustration, assume that emissions from the sources not covered by the cap-and-trade program are expected to be 62 million metric tons in 2020. With this figure as an illustration, the allowance budget for 2020 would be 427 – 62 = 365 million metric tons in 2020. Exhibit 2 shows graphically this relationship between the economy-wide AB 32 limit and the cap-and-trade allowance budget in 2020. As shown in the exhibit, the 2020 emissions limit (labeled as “Economy-Wide Goal”) exceeds the cap-and-trade allowance budget in 2020.

2012 Allowance Budget: The 2012 allowance budget is to be set at the best estimate of expected actual emissions from the covered sources anticipated in 2012. This best estimate is

[4] Carbon sequestered or avoided carbon emissions due to activities on forest lands and agriculture lands may be eligible to earn offset credits.

[5] Examples of emissions for which quantification methods at the facility level are not currently adequate include: landfill methane emissions; oil and gas exploration and production fields; and certain process emissions.

to include the impacts of population growth, economic activity, complementary policies, and other factors as determined to be appropriate for estimating the expected actual emissions in 2012 for the sources covered by the cap-and-trade program.

2013-2014 Allowance Budgets: For the years 2013 and 2014, a rate of emissions decline (ROD) will be computed that is consistent with steady progress by the sources included in the first compliance period toward achieving the 2020 emissions limit. Labeled as ROD_1 in Exhibit 2, this rate of decline is used to set the allowance budgets in 2013 and 2014.

2015 Allowance Budget: The 2015 allowance budget is computed in two parts. The first part applies the rate of decline from the first compliance period to the sources covered in the first compliance period. This amount is the lower portion of the 2015 allowance budget shown in Exhibit 2. The remainder of the 2015 allowance budget is calculated as the best estimate of expected actual emissions from the sources covered for the first time in the second compliance period (starting in 2015). The sum of these two parts is the allowance budget for 2015.

2016-2019 Allowance Budgets: The allowance budgets between 2015 and 2020 are computed as linear interpolations between the 2015 and 2020 budgets. The annual change in the allowance budget is labeled as ROD_2 in the exhibit, for the second Rate of Decline.

An illustration of this allowance budget setting approach is as follows (all figures are illustrative):[6]

- The best estimate of 2012 emissions covered by the program, 200 million metric tons in this example, establishes the 2012 budget.
- ROD_1 is used to calculate the 2013 and 2014 budgets. Assuming for this illustration that ROD_1 is 5 million metric tons, the 2013 and 2014 budgets are 195 and 190 million metric tons respectively.
- The best estimate of newly covered emissions in 2015 is used to calculate the 2015 budget. Assuming for this illustration that this value is 220 million metric tons, the 2015 budget would be 220 plus 185 = 405 million metric tons.
- The allowance budgets from 2016 to 2019 decline linearly so that the budget reaches 365 million metric tons in 2020. In this illustration, ROD_2 is 40 / 5 = 8 million metric tons. The 2016 budget would be 405 – 8 = 397 million metric tons. Subsequent years would be computed similarly.

3. Program Design Options Affecting Allowance Value

Several program design features influence the allowance price during the period 2012 to 2020, including the following.

Compliance Periods: As discussed above, the first nine years of the cap-and-trade program are divided into three compliance periods of three years each in the WCI Program Design Recommendations. Following the end of each compliance period, each regulated entity is required to surrender sufficient allowances (and offsets) to cover its emissions during the compliance period. By using three year periods, the regulated entity has complete flexibility to use emission allowances from any of the three years to cover its total emissions during the three years. The flexibility afforded by the three year compliance periods helps to smooth out variability in emissions, and provides time for emission reduction technologies to be installed.

[6] This illustration uses figures from the Scoping Plan. The final allowance budget will be based on updated analyses and will vary from this illustration.

The first compliance event under the program is planned for 2015, after the end of the first compliance period of 2012-2014.

Offsets: The Scoping Plan and the WCI Program Design Recommendations propose that offset credits may be used for a portion of an entity's compliance obligation. Offsets are proposed to be limited to no more than 49% of the absolute emission reductions required throughout the cap-and-trade program from 2012-2020. This limit has been proposed to ensure that a majority of the required absolute emission reductions are achieved in the covered sectors.

By allowing offsets to be used for compliance, regulated entities may choose to purchase offsets rather than reduce emissions at their own facilities or purchase allowances. Based on assessments of potential offset supply prices,[7] it is expected that the offsets will be less costly than some emission reduction options, and under certain circumstances could be the marginal compliance method. Consequently, analyses have found that allowing offsets to be used for compliance purposes reduces estimates of allowance prices substantially from what would be expected in the absence of offsets. This impact on allowance prices may be particularly important during the transition period from 2012-2020 as low-carbon technologies are developed and deployed and industries and consumers shift their behavior in response to the carbon price.

Using the allowance budget illustration above in section 2.2, the offset limit would translate into approximately 3.5% to 4.0% of emissions from 2012 to 2020. In other words, the offset limit would allow emissions at the covered entities to be about 4% higher than would otherwise be the case without offsets. Using the figures above, the total allowed amount of offsets in the California cap-and-trade program is on the order of 110 million metric tons for the period 2012 to 2020.

Allowance Banking: The proposed program design provides that allowances can be banked into the future and used for compliance in a future compliance period. Banking provides flexibility to save emission allowances for future use by reducing emissions more than required early in the program. Analyses have found that allowance banking can help to reduce overall compliance costs. Additionally, while it may increase allowance prices in early years (as "extra" emission reductions are undertaken) it reduces allowance prices later in the program (as the banked allowances are used for compliance purposes).

Complementary Policies: The Scoping Plan proposes complementary policies that will reduce emissions from sources covered by the cap-and-trade program as well as emissions from sources excluded from the program. Emission reductions required at sources excluded from the cap-and-trade program allow the 2020 allowance budget for the cap-and-trade program to be set higher than would otherwise be the case (see section 2.2). A larger allowance budget for capped sectors in 2020 helps to reduce allowance prices.

Complementary policies with substantial emission reduction impacts are also planned for sources covered by the cap-and-trade program, including energy efficiency programs, renewable portfolio requirements, the low carbon fuel standard, and improved community planning incentives. Several of these policies are designed to require emission reducing activities that are not well motivated by prices alone, including energy efficiency investments and community planning decisions. Consequently, these complementary policies will require actions that the cap-and-trade program would not produce alone. In so doing, the complementary policies will help reduce allowance prices.

[7] For example, the U.S. EPA estimated the U.S. offset supply based on a review of other studies. The U.S. EPA material is available at: www.epa.gov/airmarkt/progsregs/cair/docs/OffsetMethodology.pdf and www.epa.gov/airmarkt/progsregs/cair/docs/CO2OffsetMarginalCost.xls.

Analyses have confirmed the important impact that complementary policies can have on allowance prices and overall compliance costs. Energy efficiency investments and improved community planning have both been found to have the potential to have substantial impacts.

Auction Reserve Price: The Scoping Plan and WCI Program Design Recommendations propose that a "reserve price" be included as part of the auction design. A reserve price establishes a minimum price for the emission allowances sold at auction. The WCI design suggests that the reserve price can be used to manage the risk of inadvertently setting the allowance budget too high so that real emission reductions are not achieved. The level of the reserve price has not been established for the California and WCI cap-and-trade program. The Waxman-Markey legislation includes a reserve price that starts at $10 per metric ton and escalates.[8] The Kerry-Boxer draft legislation includes the same provision.

Allowance Distribution: The manner in which allowances are distributed could affect allowance prices under certain conditions. For example, if the free distribution of allowances to certain sectors includes updating features that affect production decisions, the allowance price could be affected. Alternatively, if allowance value is used to offset potential increases in electricity prices, consumer response to carbon prices may be muted, thereby affecting allowance prices.

Linking: Through the WCI, California intends to link its cap-and-trade program with those of other U.S. states and Canadian provinces. The programs will be linked by each program accepting for compliance purposes the emission allowances issued by the other jurisdictions. For example, once California and Oregon regulators confirm that each jurisdiction's program satisfies the necessary conditions to allow linking, California would accept emission allowances issued by Oregon, and Oregon would accept emission allowances issued by California. All allowances issued by linked WCI Partner jurisdictions would thereby become interchangeable for compliance purposes, leading to a single market for emission allowances, and a single price across the linked Partner jurisdictions. The combined emission reduction requirements and emission reduction opportunities across the linked Partner jurisdictions therefore affect the allowance price.

Post-2020 Requirements: As discussed above, the emphasis to date has been on the design of the cap-and-trade program through 2020. Because the expectation is that allowances may be banked into the future, post 2020 emission reduction requirements may have an impact on the allowance prices prior to 2020. In particular, if allowances issued during the period of 2012-2020 can be used for compliance post 2020, some pre-2020 banking may occur in anticipation of post-2020 compliance requirements. This pre-2020 banking could increase allowance prices as "extra" emission reductions are achieved during this period.

4. Exogenous Influences on Allowance Value

A variety of factors outside of the program may affect allowance prices.

Fuel Prices: Analyses have shown that allowance prices are influenced by expected fuel prices. With higher fuel prices, allowance prices tend to be lower as emission reductions are motivated by fuel prices. Lower fuel prices tend to have the opposite effect.

[8] The provision in Waxman-Markey is (Section 791): "RESERVE AUCTION PRICE.—The minimum reserve auction price shall be $10 (in constant 2009 dollars) for auctions occurring in 2012. The minimum reserve price for auctions occurring in years after 2012 shall be the minimum reserve auction price for the previous year increased by 5 percent plus the rate of inflation (as measured by the Consumer Price Index for all urban consumers)."

Economic Growth: GHG emissions are correlated with economic output. Consequently, faster economic growth tends to lead to higher allowance prices as more emission reductions are required to remain within the cap-and-trade emissions allowance budget.

Weather: California produces and imports a significant amount of hydroelectric power (hydropower). In years with above average hydropower availability, GHG emissions tend to be lower as hydropower substitutes for fossil generation (and vice versa). Weather also affects the demand for energy used for space heating and cooling, and, consequently influences fuel use and GHG emissions.

Reference Case Emissions: Fuel prices, economic growth, and other policies influence the level of future emissions anticipated in the absence of the cap-and-trade program. Developments nationally have led analysts to predict relatively flat GHG emissions in the U.S. through 2020. Key factors driving this result include the economic downturn, expected fuel prices, and tightened standards for appliances, vehicles, and buildings.

Technical Advancement: Given the expected national and international policies to reduce GHG emissions, considerable investment is occurring to advance low-carbon technologies. Breakthroughs in advanced biofuels, carbon capture and storage (CCS), electricity storage, and other areas may reduce the costs of transitioning to a low-carbon economy. While these breakthroughs are considered essential for achieving 2050 emission goals, they may have little impact prior to 2020.

Exhibit 1: Summary of Source Categories Covered by Compliance Period

	Compliance Period		
Emissions Category	**2012-2014**	**2015-2017**	**2018-2020**
In-state electricity generation	Covered	Covered	Covered
Imported electricity	Covered	Covered	Covered
Stationary sources with ≥25,000 metric tons/yr	Covered	Covered	Covered
Transportation fuels	Excluded	Covered	Covered
Fuel delivered to residential, commercial, small industrial customers	Excluded	Covered	Covered
Change in carbon on forest lands	Excluded	Excluded	Excluded
Non-fuel agriculture sources	Excluded	Excluded	Excluded
Sources without adequate quantification methods	Excluded	Excluded	Excluded

Exhibit 2: Illustrative Graph of Allowance Budgets