

**APPENDIX E**  
**SETTING THE PROGRAM EMISSIONS CAP**

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## **Appendix E**

### **Setting the Program Emissions Cap**

#### **A. Establishing California Greenhouse Gas Allowance Budgets**

The limit on greenhouse gas (GHG) emissions—the program “cap”—is a critical part of the cap-and-trade program design. The cap number determines the number of allowances issued by ARB and, when combined with the number of permissible offset credits, determines the total limit on emissions from all of the covered entities in the program.<sup>1</sup>

Assembly Bill 32 requires that California reduce greenhouse gas emissions to 1990 levels by 2020 (HSC § 38550). In December 2007, the Board approved the 2020 economy-wide emission limit of 427 million metric tons of carbon dioxide equivalent (MMTCO<sub>2</sub>e) of greenhouse gases.<sup>2</sup> The Scoping Plan described the relationship between the AB 32 economy-wide target for 2020 and the desired emission levels in 2020 for the sources covered in the cap-and-trade program.<sup>3</sup>

In the cap-and-trade regulation, staff moves beyond a one-year (2020) framework and proposes a cumulative emissions cap for the years 2012 through 2020 for the emissions sources covered by the program. This nine-year cap is divided into annual budgets, each of which specifies the number of allowances created for each year. This Appendix explains how the cap trajectory, or schedule of annual allowance budgets, was developed and how additional flexible compliance mechanisms were established relative to these allowance budgets.

#### **1. Conceptual Summary of Approach**

Staff’s intention was to set a cap trajectory that would provide for a gradual GHG emission reduction path toward the 2020 target. Accordingly, staff determined it was appropriate to set the starting allowance budget levels equal to the expected emissions for the year that a category of covered sources enters the program.<sup>4</sup>

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<sup>1</sup> The number of allowances plus the number of offsets allowed is referred to as the total supply of “compliance instruments.”

<sup>2</sup> *Staff Report California 1990 Greenhouse Gas Emissions Level and 2020 Emissions Limit*. California Air Resources Board. November 2007. [http://www.arb.ca.gov/cc/inventory/pubs/reports/staff\\_report\\_1990\\_level.pdf](http://www.arb.ca.gov/cc/inventory/pubs/reports/staff_report_1990_level.pdf) (accessed 9/18/10).

<sup>3</sup> *Climate Change Scoping Plan: A Framework for Change*. California Air Resources Board. December 2008. <http://www.arb.ca.gov/cc/scopingplan/document/scopingplandocument.htm> (accessed 9/18/10).

<sup>4</sup> This approach was initially proposed in the WCI Partners design document released in September 2008 (*Design Recommendations for the WCI Regional Cap-and-Trade Program*, Western Climate Initiative. September 2008. [Corrected March 2009]), <http://www.westernclimateinitiative.org/component/remository/general/design->

With this approach, the allowance budgets enable emissions to continue as expected under business-as-usual (BAU) conditions in the first year of a sector's inclusion in the program.

The approach is presented graphically in Figure E-1. The initial budget for 2012 (Point A) was selected based on the projected 2012 emission levels for the sources that will be covered at the outset of the program. These sources are referred to as the "narrow-scope sources." This BAU estimate reflects the current economic downturn and incorporates reductions achieved by 2012 from other Scoping Plan measures.

The budget levels increase in 2015 as fuel suppliers are phased into the program to cover GHG emissions from distributed fuel use. To account for these newly covered emissions, staff started with the level of the narrow scope budgets in 2015 based on continued decline in the narrow-scope cap (Point C) and added an incremental increase equal to the BAU estimate of emissions for the distributed fuel use sources in 2015. The 2015 BAU for emissions from these fuels reflects reductions from other Scoping Plan measures. The combination of the distributed fuel use sources and the narrow-scope sources are referred to as the "broad-scope sources." The 2015 broad scope budget is Point D.

The 2020 target (Point E) represents the maximum permissible emission levels from capped sources to ensure that the overall AB 32 economy-wide target is achieved. As the Scoping Plan explained, the 2020 allowance budget is a subset of the AB 32 2020 economy-wide target selected such that the number of allowances issued plus expected emissions from uncapped sectors will equal the 2020 economy-wide target.

The rate of decline in annual allowance budget numbers for the narrow-scope sources ( $ROD_1$ ) is proportionate to the rate of decline that would occur if the broad-scope sources were covered at the outset of the program ( $ROD_0$ ).<sup>5</sup> The rate of decline for broad-scope emissions post-2015 ( $ROD_2$ ) is greater than

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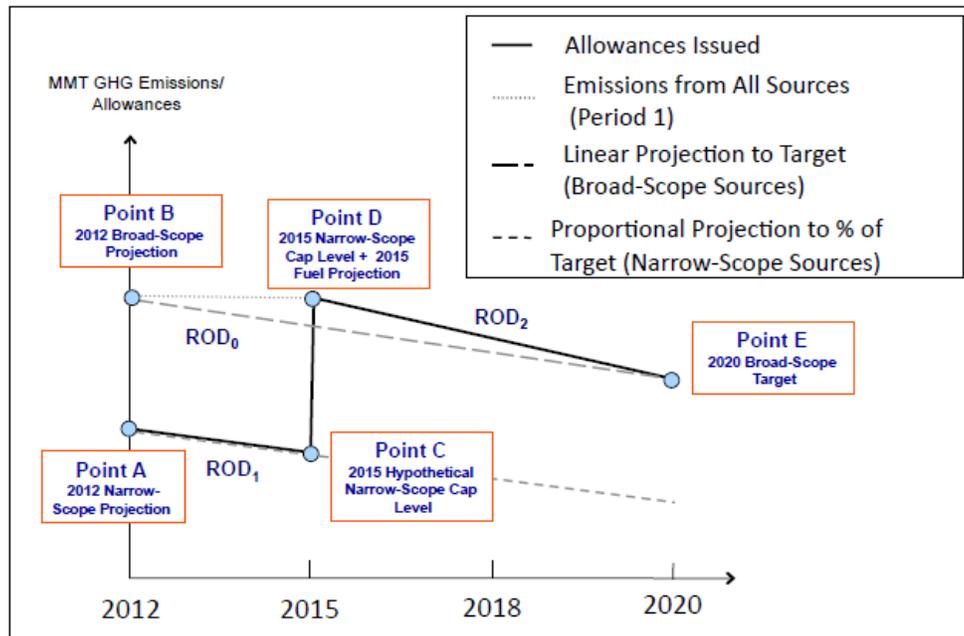
[recommendations/Design-Recommendations-for-the-WCI-Regional-Cap-and-Trade-Program/](#) (accessed 9/18/10).

ARB staff held two workshops discussing this methodology with California stakeholders in April and November of 2009. The Western Climate Initiative process developed guidelines for how Partner jurisdictions should set allowance budgets (*Guidance for Developing WCI Partner Jurisdiction Allowance Budgets*. Western Climate Initiative. July 2010, <http://www.westernclimateinitiative.org/component/remository/Cap-Setting--and--Allowance-Distribution-Committee-Documents/Guidance-for-Developing-WCI-Partner-Allowance-Budgets/> [accessed 9/18/10]). These guidelines help prevent any double coverage of emissions by different jurisdictions and ensure smooth functioning of a regional market.

<sup>5</sup>  $ROD_1$  is equal to  $ROD_0$  multiplied by the ratio of expected narrow-scope and broad-scope emissions in 2012 (Point A divided by Point B).

ROD<sub>0</sub> due to expected emissions growth from distributed fuel use sources in the 2012–2015 timeframe.

**Figure E-1: Key Points Used to Establish Allowance Budgets**



## 2. Reliance on Mandatory Reporting Data to Ensure Accuracy in Cap Setting

Setting the cap to achieve an appropriate level of stringency is critical to the proper functioning of a cap-and-trade program. If the cap is set too tight, unacceptably high allowance prices will result. If the cap is set too loose, prices will be lower than expected and a weakened incentive to reduce emissions will be created. Accuracy in emissions estimates from covered entities is a key component of ensuring that the desired level of cap stringency is implemented. Throughout the regulatory process, staff heard concerns from environmental groups that the cap would be unintentionally set too lax—a condition sometimes referred to as “oversupply” or “over-allocation.”

The over-allocation condition occurs if too many allowances are supplied to covered entities relative to expected business-as-usual emission levels. This issue arose in the early years of the European Union’s Emission Trading Scheme (EU ETS). During the trial phase of the program, which ran from 2005–2007, caps were set without a good source of GHG emission data for the facilities covered in the program.

The lack of accurate emissions data led to initial cap levels that, although intended to require a reduction of 4 percent at the outset of the program, in actuality created a surplus of approximately 4 percent. This oversupply—8 percent beyond intended levels—coupled with the fact that allowances could not

be saved from the trial periods for use in the later phases, led to a price crash in August 2006, when the first year of verified emissions data were made publicly available.<sup>6</sup>

In 2007, ARB put in place a mandatory reporting program to provide accurate greenhouse gas emissions data for the sources that will be covered in the first compliance period of the cap-and-trade program. The data gathered through this program will help ensure that the over-allocation issue is not repeated in the California context.

### **3. Adjustment of the Cap-and-Trade 2020 Target from Scoping Plan Levels Using Mandatory Reporting Data**

The Scoping Plan's rough estimate of the target for the 2020 allowance budget (Point E in Figure E-1) was 365 MMTCO<sub>2</sub>e. Since the plan was adopted, staff have developed more specificity on what emission sources within the different sectors will be covered in the cap-and-trade program. Staff have also used the 2008 facility-level data gathered through the mandatory reporting program to improve emissions estimates for the covered entities. Using these improved estimates, staff calculated a new broad scope 2020 allowance budget of 334 MMTCO<sub>2</sub>e. This number was developed by multiplying the Scoping Plan 365 MMTCO<sub>2</sub>e 2020 budget estimate by the ratio of the improved estimate of 2008 broad scope emissions (403 MMTCO<sub>2</sub>e, determined using information from mandatory reporting of GHGs at the facility level) to the 2008 emissions inventory estimate for broad-scope sector categories (440 MMTCO<sub>2</sub>e, calculated using the Scoping Plan accounting).

### **4. 2012–2020 Allowance Budget Levels**

To inform the cap-setting work, ARB staff revised and improved the greenhouse gas emissions projection conducted for the Scoping Plan.<sup>7</sup> This refinement involved creating a dataset that represents historical emissions from the capped sources and then anticipating the way in which these emission levels will change in the future.

Figure E-2 compares staff's projection for the broad-scope emissions covered in the California cap-and-trade program with the Energy Information Administration's (EIA) projection of CO<sub>2</sub> emissions for the Pacific region from the

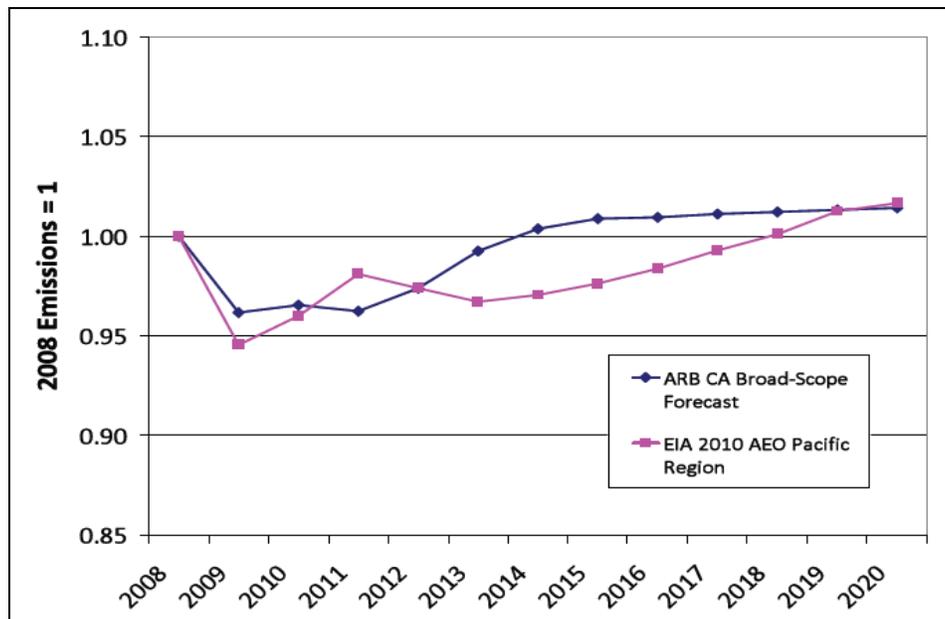
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<sup>6</sup> *Pricing Carbon: The European Union Emissions Trading Scheme*. A. D. Ellerman, F. J. Convery, C. Perthuis, E. Alberola, and B. Buchner. Cambridge University Press. Cambridge, U.K. 2010.

<sup>7</sup> A detailed description of the ARB projection methodology is available at <http://www.arb.ca.gov/cc/inventory/data/forecast.htm>

2010 Annual Energy Outlook.<sup>8</sup> Both projections show a similar trend in the near term. Emission levels dip below 2008 levels slightly before returning to a gradual growth path in the longer term. The ARB forecast predicts that a recovery in emissions growth happens slightly more quickly but that growth in the 2015–2020 period is moderate. The EIA numbers foresee GHG levels remaining below 2008 levels for a longer period but a steeper upward trend in the later years.

**Figure E-2: Comparison of ARB and EIA Emissions Projection Estimates**

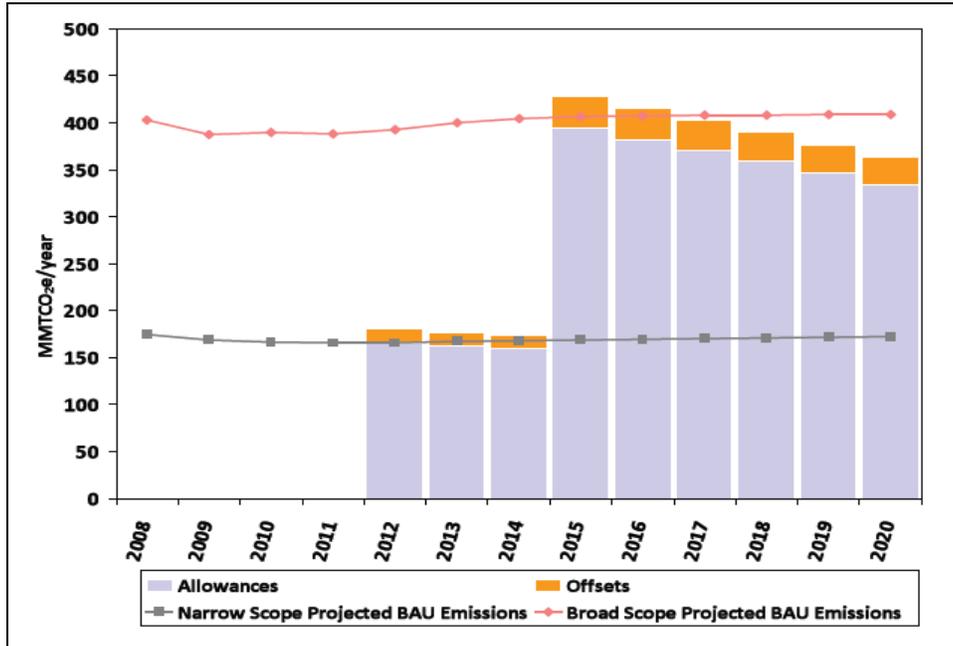


The ARB projected values and the methodology summarized above was used to set the 2012–2020 allowance budgets. These budgets, and the amount of offsets available, are shown relative to the business-as-usual trend in Figure E-3 and discussed in greater detail below.<sup>9</sup>

<sup>8</sup> See the supplemental tables of the EIA's 2010 Annual Energy Outlook CO<sub>2</sub> Emissions from the Pacific Region (*Annual Energy Outlook 2010: Supplemental Tables*. U.S. Energy Information Administration. December 2009. <http://www.eia.doe.gov/oiaf/aeo/supplement/supref.html> [accessed 9/18/10]). The Pacific region includes California, Oregon, Washington, Hawaii, and Alaska. Although these EIA data include some emissions that do not fall within the scope of the California program, a large portion of these emissions in the Pacific region do come from Californian broad-scope sources. Therefore, staff believes that this dataset provides a useful external point of comparison for the ARB projected emission values.

<sup>9</sup> Expected offset levels are also shown in this figure, assuming the amount of offset use in each year is proportionate to the allowance budget for that year and that offset supply equivalent to 8 percent of the total compliance obligation (8.7 percent of each allowance budget) is available.

**Figure E-3: Projected GHG Emissions Relative to Allowance and Offset Levels**



### 5. Expectations for Establishing Post-2020 Budget Levels and Other Adjustments

Post-2020 budgets will be set as targets for economy-wide greenhouse gas levels are revised through the Scoping Plan update process.

Corrections to budget levels from 2012–2020 are conceivable; however, to the extent feasible, ARB expects to avoid such changes to provide the maximum level of certainty to market participants as they forecast market prices and plan investments in greenhouse gas reductions based on an understanding of cap stringency.

In the Preliminary Draft Regulation (PDR) the concept of explicit administrative adjustments to allowance budgets was proposed.<sup>10</sup> This concept involved providing some flexibility for the ARB Executive Officer to adjust the cap trajectory in response to predefined criteria in the case that budget levels were set too loosely or too stringently. Staff has removed the notion of administrative adjustments in response to stakeholder comment and has replaced it with the price containment mechanism described below. With the removal of the

<sup>10</sup> *Preliminary Draft Regulation for a California Cap-and-Trade Program*. California Air Resources Board. November 2009. <http://www.arb.ca.gov/cc/capandtrade/meetings/121409/pdr.pdf> (accessed 9/18/10).

administrative adjustment option, any future changes to the 2012–2020 budget levels will require a revision of the cap-and-trade regulation.

## **B. Enhancing Compliance Flexibility and Program Adaptability to Manage Compliance Costs**

### **1. Offsets**

Offset credits are generated from sources or sinks of emissions not directly covered under the cap-and-trade program. Offsets provide additional low-cost abatement options to the program participants, and can reduce the costs of the program for covered entities.<sup>11</sup>

The cap-and-trade program is part of a suite of AB 32 policies that will collectively generate the emissions abatement from 2012–2020 needed to stay within the cap levels. The majority of the emissions reductions needed in the cap-and-trade program will come from actions required under other Scoping Plan measures. Offsets will serve a limited role in achieving the AB 32 target unless the complementary policies do not perform as well as the Scoping Plan estimated.

In the case where complementary policies are less effective than anticipated, offsets credits can provide a mechanism to help ensure that the AB 32 reduction goals are still achieved at reasonable costs to the covered entities. Offsets provide this cost containment by increasing the supply of compliance instruments available at a given price.

In adopting the Scoping Plan the Board embraced a limit on the use of offsets designed to ensure that the majority of reductions from the cap-and-trade program come from sources covered by the program rather than from offsets. This policy helps maintain a strong incentive for emission reductions from covered entities. Action by covered entities will help California move toward a clean-energy, low-carbon economy.

In the PDR, staff proposed an approach to enforcing the offset limit to ensure that the majority of the required emission reductions under AB 32 programs would come from direct action by the covered entities. The result was that the use of

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<sup>11</sup> *Updated Economic Analysis of California's Climate Change Scoping Plan*. California Air Resources Board. March 2010. <http://www.arb.ca.gov/cc/scopingplan/economics-sp/economics-sp.htm> (accessed 9/18/10).

offsets would be limited to four percent of the compliance obligation for each covered entity.<sup>12</sup>

In developing the offset limit in the PDR, staff started from the Scoping Plan goal of ensuring that the majority of emissions reductions come from action at covered entities.<sup>13</sup> An illustrative example, shown in Table E-1, is useful to understand the relationship between reductions expected from reference levels, the sum of expected program-wide compliance obligations, and the offset limit.

If emissions remained constant at the levels when a source category is initially covered under the cap (2012 levels for narrow-scope sources and 2015 levels for fuel supplier emissions) a total of 2,920 MMTCO<sub>2</sub>e of greenhouse gases would be cumulatively emitted from the capped sources over the 2012–2020 period. Imagine, for this example, that the potential emission levels of sources outside of the cap, from which offset credits can originate, represent an additional potential emissions of 300 MMTCO<sub>2</sub>e for all years from 2012–2020.

If we first consider a case in which ARB did not allow any offsets into the cap-and-trade program, ARB would issue 2,675 million allowances for all years between 2012 and 2020. This cap would ensure that no more than 2,675 MMTCO<sub>2</sub>e would be emitted from the capped sources and 245 MMTCO<sub>2</sub>e of emission reductions would occur. The non-capped sources that represent potential offset opportunities would still emit 300 MMTCO<sub>2</sub>e.

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<sup>12</sup> This limit may be better understood by imagining a covered entity with a compliance obligation of 100 metric tons. To meet this obligation the entity could surrender up to 4 metric tons of offset credits and no fewer than 96 metric tons of allowances.

<sup>13</sup> Greenhouse gas targets can be defined in relation to a given base year, or in relation to expected future development trends (*Climate Change 2001: Mitigation, Chapter 7: Costing Methodologies*. Intergovernmental Panel on Climate Change. March 2001, <http://www.ipcc.ch/ipccreports/tar/wg3/index.php?idp=314> [accessed 9/27/10]). Staff distinguishes between “reductions” from a given base-year emission level (e.g., 2012) and “abatement” relative to projected future emission levels under a business-as-usual projection.

**Table E-1: Illustrative Example of the Relationship between Offset Limit and Reductions from Initial Emission Levels**

	Reference Levels	No Offsets	4% Offsets
Emissions from Capped Sources	2,920	2,675	2,786
Emissions from Non-Capped (Offset) Sources	300	300	189
Total Emissions	3,220	2,975	2,975
Reductions from Capped Sources	0	245	134
Reductions from Offsets	0	0	111
Total Reductions	0	245	245

Now consider a case with offsets. Assuming the 4 percent of compliance obligation could be met using offsets, the total emissions from capped sources for all years from 2012–2020 could not be greater than 2,786 MMTCO<sub>2</sub>e (because emissions from capped sources could be matched with 2,675 million allowances and 111 million offset credits).

Capped source emissions increase relative to the “no offsets” case, but these increases are offset by reductions occurring at non-capped sources. Therefore, the total emission reductions achieved (at both capped and non-capped sources) will be 245 MMTCO<sub>2</sub>e—identical to the total reductions achieved in the no offsets case.

In the offsets case the majority of reductions come from action at capped sources (134 MMTCO<sub>2</sub>e), and the minority of reductions come from action at non-capped sources that generate offset credits (111 MMTCO<sub>2</sub>e). Offset credits represent 4 percent of the total number of instruments that must be surrendered by capped sources (the sum of expected program-wide compliance obligations).

## **2. Price Containment Mechanism**

In response to stakeholder comments received after the release of the PDR, staff considered additional ways to expand program flexibility while meeting or exceeding AB 32’s rigorous environmental requirements. One way to add flexibility to the program and enhance investment certainty for covered sources is to increase the supply of compliance instruments at high prices and decrease supply at low prices. Staff has developed such an allowance price containment mechanism to help contain allowance prices within an anticipated price band.

Academic literature suggests various approaches to price containment mechanisms (also called “price collars”) that attempt to mitigate allowance prices above a ceiling price or below a floor price.<sup>14</sup> Staff has rejected proposals to set firm maximum price controls, known as “hard collars” or “safety valves.” These mechanisms introduce an unlimited supply of allowances at a given price which could result in not meeting the AB 32 2020 economy-wide target. Staff is proposing a “soft collar” mechanism to adjust the supply of compliance instruments in the market if specified price levels are reached.

**a. Creation of the Allowance Price Containment Reserve**

Staff recommends creating an allowance price containment reserve by placing 4.6 percent of the total 2012–2020 allowances (123.5 million allowances) into a reserve account that would be available to the covered entities. To prevent this reserve from increasing the stringency of the program, staff recommends allowing use of a matching number of additional offsets. These offsets would be in addition to the previously proposed offset levels.

The allowances from this reserve will only be deployed as described below. The proposed regulation will implement this mechanism by setting the quantitative limit on offsets to 8 percent of compliance obligation for the 2012–2020 period (allowing up to 232 million offsets) and by allocating 123.5 million allowances to create the reserve. Staff proposes allowances will be earmarked in the following manner to fill the reserve:

- 4.9 million allowances will be dedicated to this use from the 2012–2014 budgets (1 percent of allowances from the first compliance period),
- 45.9 million allowances will be dedicated to this use from the 2015–2017 budgets (4 percent of allowances from the second compliance period), and
- 72.7 million allowances will be dedicated to this use from the 2018–2020 budgets (7 percent of allowances from the third compliance period).

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<sup>14</sup> For example see:

*Strategic Carbon Reserve: Nicholas Institute Discussion Memo on H.R. 2454, American Clean Energy and Security Act of 2009.* B. Murray. August 2009.

<http://nicholasinstitute.duke.edu/climate/aces2009/Strategic%20Carbon%20Reserve> (accessed 9/19/10) or

*Climate Policy Design with Correlated Uncertainties in Offset Supply and Abatement Cost.* H. Fell, D. Burtraw, R. Morgenstern, and K. Palmer. Resources for the Future Discussion Paper. January 2010. <http://www.rff.org/documents/RFF-DP-10-01.pdf> (accessed 9/19/10).

The rationale for withdrawing greater amounts of the allowances to create the reserve from the later years of the program is because the stringency of the program in the early years of the program is an area of concern to many covered entities. Removing fewer allowances from earlier years provides additional flexibility as the program is being phased in.

The targeted range of prices chosen for the reserve mechanism and appropriate reserve size was established based on expected allowance price ranges from the following documents and the analysis contained in Appendix G: Allowance Price Containment Reserve Analysis.

- Economic modeling of the proposed California cap-and-trade program<sup>15</sup>
- Economic analysis of the proposed WCI market<sup>16</sup>
- Economic analysis of proposed U.S. federal greenhouse gas emissions trading legislation<sup>17</sup>
- Historical data on the range of EU ETS allowance prices<sup>18</sup>
- Established level of British Columbia's carbon tax of \$30 in 2012<sup>19</sup>

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<sup>15</sup> *Updated Economic Analysis of California's Climate Change Scoping Plan*. California Air Resources Board. March 2010. <http://www.arb.ca.gov/cc/scopingplan/economics-sp/economics-sp.htm> (accessed 9/18/10).

<sup>16</sup> *Updated Economic Analysis of the WCI Regional Cap-and-Trade Program*, Western Climate Initiative. July 2010. <http://www.westernclimateinitiative.org/component/remository/func-startdown/265/> (accessed 9/18/10).

<sup>17</sup> *Congressional Budget Office Cost Estimate: H.R. 2454 American Clean Energy and Security Act of 2009*. Congressional Budget Office. June 2009. <http://www.cbo.gov/ftpdocs/102xx/doc10262/hr2454.pdf> (accessed 9/19/10);

*EPA Analysis of the American Clean Energy and Security Act of 2009: H.R. 2454 in the 111th Congress*. United States Environmental Protection Agency. June 2009. [http://www.epa.gov/climatechange/economics/pdfs/HR2454\\_Analysis.pdf](http://www.epa.gov/climatechange/economics/pdfs/HR2454_Analysis.pdf) (accessed 9/19/2009);

*Energy Market and Economic Impacts of H.R. 2454, the American Clean Energy and Security Act of 2009*. U.S. Energy Information Administration. August 2009. <http://www.eia.doe.gov/oiaf/servicerpt/hr2454/index.html> (accessed 9/19/10).

<sup>18</sup> *Point Carbon EUA OTC Assessment*. Point Carbon. September 2010. <http://www.pointcarbon.com/news/marketdata/euets/forward/eua/> (accessed 9/19/10).

<sup>19</sup> *British Columbia Carbon Tax Notice*. BC Ministry of Small Business and Revenue. February 2008. [http://www.sbr.gov.bc.ca/documents\\_library/notices/British\\_Columbia\\_Carbon\\_Tax.pdf](http://www.sbr.gov.bc.ca/documents_library/notices/British_Columbia_Carbon_Tax.pdf) (accessed 10/9/10).

The level of access to the reserve will provide a direct indicator of how well the cap-and-trade program is doing in meeting the desired emission targets within the desired price band.<sup>20</sup>

#### **b. Access to Allowances in Reserve Account**

Release of the reserve allowances will be accomplished through a direct sale of allowances to covered entities. These sales would occur in the following fashion:

- ARB will offer to sell the allowances in the reserve at fixed prices to covered entities in three tiers. Initially, one-third of the reserve allowances will be available at \$40/metric ton, one-third at \$45/metric ton and one-third at \$50/metric ton. These prices would be increased annually at a rate of five percent plus inflation.
- This offer to sell reserve allowances will take place six weeks after each quarterly auction.

#### **c. Price Floor Mechanism**

A floor price will be set by enforcing a minimum reserve price for allowances sold at auction. This price will begin at \$10/metric ton in 2012 and will be increased at a rate of five percent per year plus inflation.

Allowances offered by ARB remaining unsold when an auction settlement price is equal to the reserve price would be placed in the price containment reserve. Allowances offered on consignment for other entities would be returned to the limited use holding accounts of the owners.

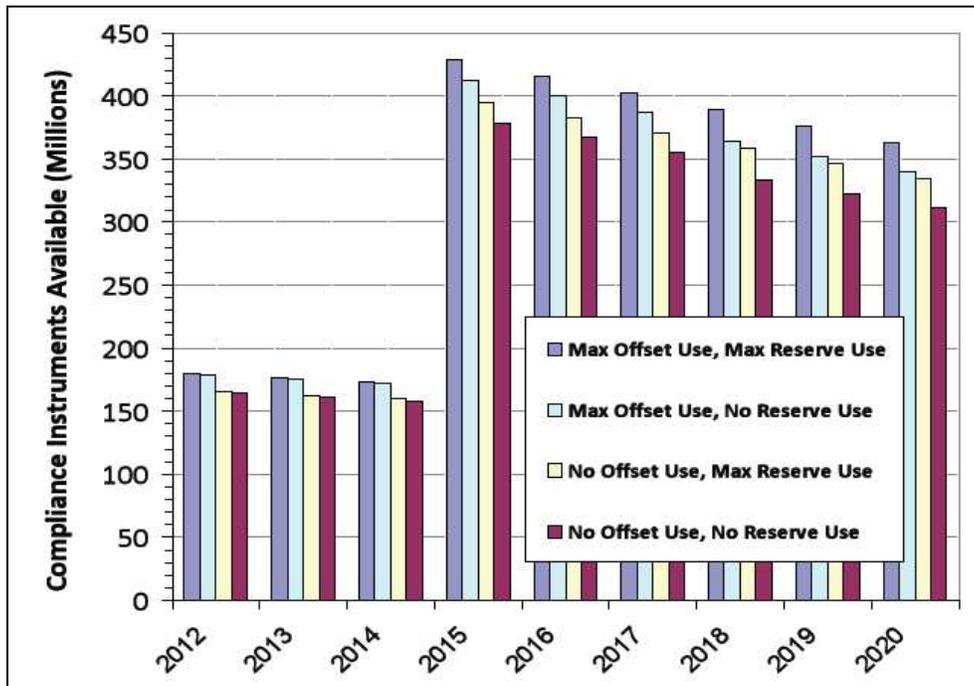
### **3. Summary of Flexibility in Compliance Instrument Supply**

In summary, offset usage and the price containment mechanism can add flexibility to the program by increasing or decreasing the supply of compliance instruments if allowance prices reach unanticipated levels. The total supply of compliance instruments under various bookended levels of reserve and offset use is shown graphically in Figure E-4.

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<sup>20</sup> *Strategic Carbon Reserve: Nicholas Institute Discussion Memo on H.R. 2454, American Clean Energy and Security Act of 2009*. B. Murray. August 2009, <http://nicholasinstitute.duke.edu/climate/aces2009/Strategic%20Carbon%20Reserve> (accessed 9/19/10).

**Figure E-4: Flexibility in Compliance Instrument Supply**



### C. Connection between Economic and Abatement Analyses and Cap Setting

In determining the acceptable level of cap stringency, it is critical to analyze how the cap-and-trade program is anticipated to drive GHG emissions abatement and compliance costs. Within the capped sectors, a significant portion of emission reductions will be achieved through complementary policies such as improved building efficiency standards, renewable electricity requirements, low-carbon fuels, and cleaner vehicle measures. The additional abatement needed to bring emissions within the cap will be driven by the incentives created by the allowance price. Together, direct regulation and the carbon price signal assure that emissions are brought down cost-effectively to the level required by the overall cap.

Staff has undertaken multiple analyses in an attempt to anticipate where emissions abatement might occur in response to the carbon price signal and at what costs.<sup>21</sup> Together these analyses show that the expected emission

<sup>21</sup> See: Appendix F: Compliance Pathways Analysis, Appendix N: Supporting Documentation for the Economic Analysis, and *Updated Economic Analysis of California's Climate Change Scoping Plan*. California Air Resources Board. March 2010.

<http://www.arb.ca.gov/cc/scopingplan/economics-sp/economics-sp.htm> (accessed 9/18/10).

reductions required by the proposed cap trajectory are both technically feasible and cost-effective.

#### **D. Comparison of the California Cap and Offset Levels to Levels in Other Programs**

In addition to the work analyzing GHG abatement and economic impacts described above, staff compared the proposed California compliance instrument levels to levels in other GHG cap-and-trade programs, including the Regional Greenhouse Gas Initiative (RGGI) and the EU ETS. RGGI and EU ETS are operational GHG cap-and-trade programs that are functioning without economic harm and little-to-no emissions leakage.<sup>22</sup>

By comparing the stringency of the caps and permissible levels of offset usage to covered emissions in these programs, the California cap-and-trade program cap levels can be placed in some perspective. The results of this comparison are presented in Figure E-5. This figure is normalized to a 2008 reference level from the emissions sources covered in each year of the programs.

RGGI's supply of allowances relative to 2008 levels of emissions is expected to be significantly higher than the comparable values in the EU ETS. This is reflected in allowances prices.<sup>23</sup> As of September 2010 EU ETS allowance transactions occur at approximately \$20 (15 €) per metric ton.<sup>24</sup> Current vintages of RGGI allowances trade in the \$2 per short ton range.<sup>25</sup>

Figure E-5 shows that the rates of decline in supply of allowances, relative to historical emissions, are in the same general range across these three programs

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<sup>22</sup> *Pricing Carbon: The European Union Emissions Trading Scheme*. A. D. Ellerman, F. J. Convery, C. Perthuis, E. Alberola, and B. Buchner. Cambridge University Press. Cambridge, U.K. 2010, and *RGGI Emissions Trends*, Environment Northeast. June 2010. [http://www.env-ne.org/public/resources/pdf/ENE\\_RGGI\\_Emissions\\_Report\\_20100617\\_FINAL.pdf](http://www.env-ne.org/public/resources/pdf/ENE_RGGI_Emissions_Report_20100617_FINAL.pdf) (accessed 9/19/10).

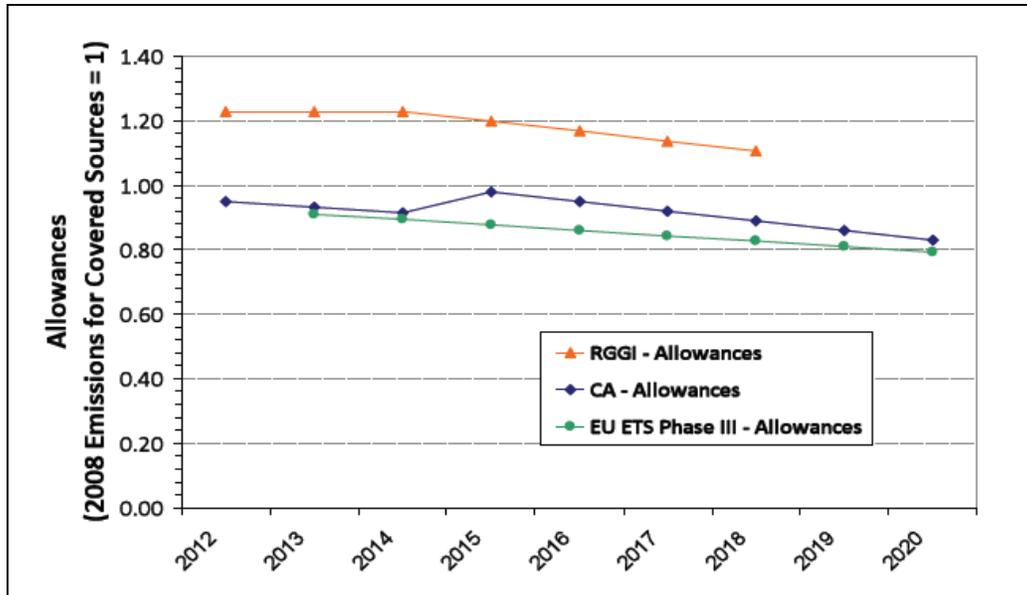
<sup>23</sup> Allowance price and allowance quantity relative to expected abatement are important (and interrelated) metrics that must be considered together when comparing and contrasting the stringency of various greenhouse gas reduction programs.

<sup>24</sup> *Point Carbon EUA OTC Assessment*. Point Carbon. September 2010. <http://www.pointcarbon.com/news/marketdata/euets/forward/eua/> (accessed 9/19/10).

<sup>25</sup> Many market analysts consider the RGGI system over-supplied due to this low price; however, this general level of stringency, as indicated by allowance price, is not drastically far from that predicted by the designers of the system (*Frequently Asked Questions: Regional Greenhouse Gas Initiative*. Massachusetts Department of Environmental Protection. September 2009. <http://www.mass.gov/dep/air/climate/rggifaq.htm#cost> [accessed 9/19/2010]). This is because the RGGI auction reserve price of \$1.86 per short ton is containing prices, as intended, on the low end (*RGGI Hovers Above Reserve Price*. Kim Moore. Point Carbon News. September 2010. <http://www.pointcarbon.com/news/1.1474552> [accessed 9/19/2010]).

for the post-2015 time period. The total supply is higher in the RGGI system relative to 2008 emission levels. The demand for allowances—and therefore the prevailing allowance price—is unlikely to be equivalent due to the differences in the scopes of program coverage, the abatement opportunities available within each scope, and the fact that a significant bank of allowances has been built up from early compliance years in the RGGI program.<sup>26</sup>

**Figure E-5: Comparison of California Allowance Budgets to Budgets in Existing GHG Cap-and-Trade Programs**



This simple analysis shows that the California cap trajectory is comparable to those of existing carbon markets. This assessment may help assuage concerns expressed by some stakeholders that ARB is setting targets that are somehow inconsistent with existing well-functioning greenhouse gas cap-and-trade programs. Staff believes the proposed stringency of the California cap is appropriate in relation to the examples set by the well-functioning RGGI and EU ETS systems.

**a. Cost Containment and Price Containment Mechanism in Other Programs**

**i. Regional Greenhouse Gas Initiative**

Similar to the approach being taken in California’s proposed program, the RGGI member states decided that offset use should initially be limited to 50 percent of

<sup>26</sup> Allowance price is a more appropriate metric for evaluating program stringency due to these issues.

the total emissions abatement expected from the program. The 50 percent goal was not viewed as a hard target, but rather a guiding principle in determining the initial quantitative offset limit to strike an appropriate balance between achieving emissions reductions in covered sectors and providing entities with a flexible compliance option.<sup>27</sup>

RGGI emitters can currently use offsets to cover up to 3.3 percent of their total compliance obligation. This limit would increase to five percent if the RGGI allowance price rises over \$7 per short ton, and further increases to 10 percent if the allowance price exceeds \$10 per short ton. Offsets in eligible project categories can initially come from any RGGI state. Clean Development Mechanism (CDM) credits can be used if the RGGI price exceeds \$10 per short ton.

The price trigger provision described above allows for increased cost containment through the use of offsets at higher allowance prices. This flexibility allows the offset limit to more closely align with RGGI's goal of controlling compliance costs. The price triggers utilize 12-month rolling averages to minimize the impact of very short-term market volatility. Prices are based on 2005 dollars and are adjusted for inflation each year.<sup>28</sup>

To contain prices on the low side, the RGGI system has an auction reserve price of \$1.86. This reserve price is currently maintaining a floor price in the RGGI system.<sup>29</sup>

## **ii. European Union Emissions Trading Scheme**

The European Union Emissions Trading Scheme imposes limits on the amount of offset credits that may be used for compliance in both Phase II (2008–2012) and Phase III (2013–2020) of the program. The EU limits apply at the facility level but are slightly different than those proposed in the California and RGGI systems;

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<sup>27</sup> *Analysis Supporting Offsets Limit Recommendation*. Regional Greenhouse Gas Initiative Staff Working Group. May 2006. [http://www.rggi.org/docs/offsets\\_limit\\_5\\_1\\_06.pdf](http://www.rggi.org/docs/offsets_limit_5_1_06.pdf) (accessed 9/19/10). The RGGI limit references abatement relative to an increasing level of emissions under a business-as-usual scenario.

<sup>28</sup> *Offsets Summary: The Regional Greenhouse Gas Initiative*. Environment Northeast. Summer 2008. [http://www.env-ne.org/public/resources/pdf/ENE\\_RGGI\\_offset-design.pdf](http://www.env-ne.org/public/resources/pdf/ENE_RGGI_offset-design.pdf) (accessed 9/19/10).

<sup>29</sup> *RGGI Hovers Above Reserve Price*. Kim Moore. Point Carbon News. September 2010, <http://www.pointcarbon.com/news/1.1474552> (accessed 9/19/2010).

the EU limits are specified based on a percentage of a facility's free allocation in a given period, rather than as a percentage of compliance obligation.<sup>30</sup>

### **(1) EU ETS Limits in Phase II**

In international climate negotiations, it was agreed that domestic abatement of emissions should take precedent over use of the flexible mechanisms (CDM and Joint Implementation [JI]).<sup>31</sup> This concept of prioritizing domestic action is referred to as "supplementarity." The supplementarity concept was included in the international agreements partially at the behest of European nations, and the concept of prioritizing domestic action from capped sources located in the EU was included in the design of the EU ETS.<sup>32</sup>

In the second phase of the EU ETS, each member state has a different limit on the use of offsets credits from the international flexible mechanisms (CDM and JI credits).<sup>33</sup> These limits are usually specified as a percentage of the total amount of allowances freely allocated to an installation. If fully utilized, the levels set for use of offsets in Phase II likely allow for more than 50 percent of reductions to be met through offsets.<sup>34</sup>

### **(2) EU ETS Limits in Phase III**

Recognizing that the limits on offsets for Phase II were too generous to guarantee that domestic action would represent more than half of the reductions

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<sup>30</sup> *Pricing Carbon: The European Union Emissions Trading Scheme*. A. D. Ellerman, F. J. Convery, C. Perthuis, E. Alberola, and B. Buchner. Cambridge University Press. Cambridge, U.K. 2010.

<sup>31</sup> *Kyoto Protocol to the United Nations Framework Convention on Climate Change*. United Nations. 1998. <http://unfccc.int/resource/docs/convkp/kpeng.pdf> (accessed 9/19/10).

<sup>32</sup> *Supplementarity in the European Carbon Emissions Market*. J. Eyckmans, J. Cornille. Katholieke Universiteit Leuven Center for Economic Studies Energy Transport and Environment Working Paper. February 2001. <http://www.econ.kuleuven.ac.be/ew/academic/energmil/downloads/ete-wp01-05.pdf> (accessed 9/19/10).

<sup>33</sup> *Pricing Carbon: The European Union Emissions Trading Scheme*, A. D. Ellerman, F. J. Convery, C. Perthuis, E. Alberola, and B. Buchner. Cambridge University Press. Cambridge, U.K. 2010.

<sup>34</sup> Some environmental groups estimate that between 88%–100% of the emission reductions required under the combined cap for the EU ETS could theoretically take place outside of the EU through the use of offset credits (*Emission Impossible: Access to JI/CDM Credits in Phase II of the EU Emissions Trading Scheme*. World Wildlife Foundation United Kingdom. June 2007. [http://assets.panda.org/downloads/emission\\_impossible\\_final.pdf](http://assets.panda.org/downloads/emission_impossible_final.pdf) [accessed 9/19/10]). See also, *International Offsets and the EU 2009: An Update on the Usage of Compliance Offsets in the EU Emissions Trading Scheme*. R. Elsworth and B. Worthington, July 2010, <http://sandbag.org.uk/files/sandbag.org.uk/offset2009.pdf> (accessed 9/19/10).

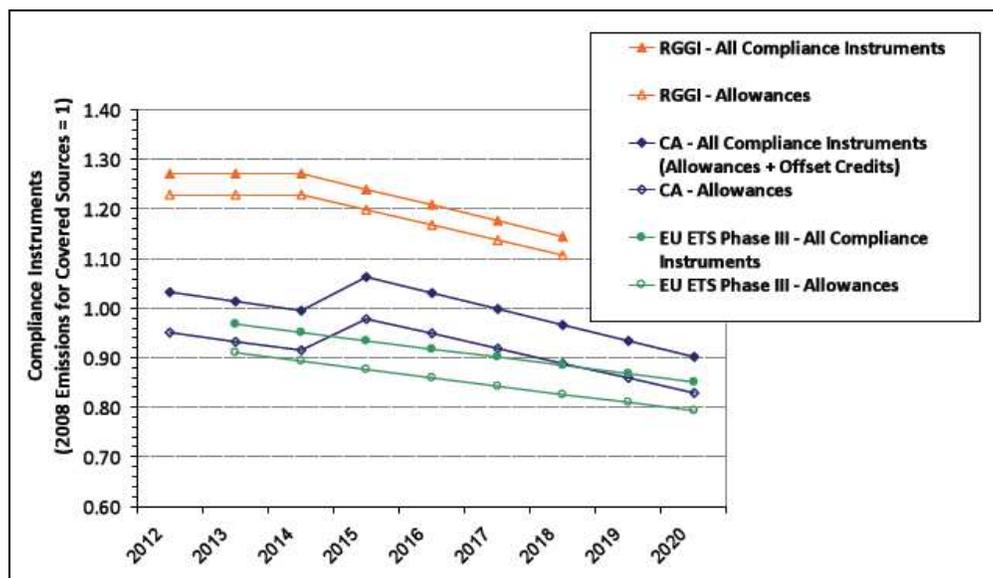
needed to meet the cap levels, the EU Commission is in the process of tightening the limits on the use of offsets in Phase III.

The Phase III limits will not only be more stringent than the Phase II limits, they will also ensure greater harmonization across EU member states.<sup>35</sup> Based on communications with EU ETS experts, staff expects the offset levels in Phase III to be on the order of 6 percent of the compliance obligation.<sup>36</sup>

The EU ETS does not contain any explicit price intervention measures (e.g., allowance reserves, offset level price triggers), but instead relies on the flexibility of the broad emissions trading market (including the use of offsets) to maintain costs at acceptable levels.

Figure E-6 provides a comparison between the maximum levels of compliance instruments (allowances plus offsets) across RGGI, the EU ETS, and the proposed regulation. It shows that staff’s approach to setting the total permissible compliance instrument levels in the proposed regulation is consistent with those in existing GHG cap-and-trade programs.

**Figure E-6: Comparison of CA Total Compliance Instrument Levels to Levels in Existing GHG Cap-and-Trade Programs**



<sup>35</sup> Questions and Answers on the Revised EU Emissions Trading System. EUROPA, December 2008.

<http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/08/796&format=HTML&aged=0&language=EN&guiLanguage=en> (accessed 9/19/10).

<sup>36</sup> Personal Communication. Sam Wade of California Air Resources Board and Matthew Coyne United Kingdom Department of Energy and Climate Change. January 26, 2010.

## **E. Stakeholder Comments on Cap-Setting and Flexible Compliance Issues**

### **a. Stakeholder Comments on Cap Stringency**

In comments received in response to the PDR, stakeholders were generally comfortable with the initial cap levels being set using best estimates of 2012 (narrow-scope) and 2015 (distributed fuel use) emissions, and using linear declining cap trajectories to a 2020 target with the caveats noted below.

First, many commenters pointed out that the cap trajectory should account for long-term economic cycles—specifically, recognizing that the current recession has depressed greenhouse gas emission levels in California. Secondly, some commenters requested additional analysis to demonstrate that the emission reductions required by this cap trajectory are feasible and can be achieved at reasonable cost to the covered entities and to society as a whole. Other commenters asked for assurance that the cap will not be set too loosely and requested demonstration of how ARB will maintain the proper incentive to achieve the greenhouse gas reductions required by AB 32.

Staff believes the proposed cap level will create the correct incentive to achieve AB 32 goals. Staff has included a variety of mechanisms to add flexibility to account for a return to non-recessionary levels of economic activity and to ensure that the AB 32 environmental goal will be met with reasonable costs to the regulated community and with a negligible impact on the economy of California as a whole.

Many stakeholders felt that allowing administrative adjustments in the cap would create undesirable uncertainty in the allowance market. They pointed out that any major change in the scope of the program should be dealt with through the full administrative process required for any revision to an ARB regulation rather than through an adjustment made at the discretion of the ARB Executive Officer. Staff has accepted this suggestion and eliminated all administrative discretion; therefore, any changes to allowance budgets will require a full rulemaking process.

Stakeholders affiliated with environmental organizations and participants in the voluntary market for renewable power expressed support for recognition of voluntary investment in renewable electricity through a cap adjustment. Some covered entities felt that a cap adjustment for voluntary renewable electricity was unnecessary and commented that it was inappropriate to tighten the cap in response to the emissions reductions attributed to voluntary renewable generation. Staff has included a placeholder for an adjustment for voluntary

renewable electricity in the proposed regulation and will continue to consider the details of such an adjustment mechanism.<sup>37</sup>

#### **b. Stakeholder Comments on Quantitative Offset Limits and Price Containment Mechanisms**

Covered entities, offset project developers, brokers, and other financial entities felt that the 4 percent limit proposed in the PDR was overly restrictive. These stakeholders felt that priority should be placed on ensuring offset quality rather than on quantitative restrictions on offset use. They argued that an increased limit would allow for greater use of low-cost reductions, thus fulfilling the full potential of offset credits as a cost containment mechanism. They protested the arbitrary nature of the limit and cited the cost-effectiveness language found in AB 32. Many environmental and citizen advocate groups called for increased stringency of the limit, arguing that action at capped sources was essential to the environmental and community protection goals of AB 32. Some of these stakeholders called for complete prohibition on the use of offsets.

Some of the stakeholders who called for expanded use of offsets offered thoughts as to how this could be tied to allowance prices and connected to other potential cost containment mechanisms such as allowance borrowing or strategic reserves. Stakeholders requested greater clarity in how the limit was calculated and clearer justification for the 4 percent number.

Staff has raised the offset limit from the PDR level from 4 percent to 8 percent of compliance obligation. However, this increased offset use is coupled with the initial withholding of allowances in the allowance price containment reserve. This Appendix and Appendix G: Allowance Price Containment Reserve Analysis explains the rationale and approach to design of the reserve mechanism and the connection to the offset limit. Staff believes this program design choice manages the risk of unexpectedly high or low allowance prices while maintaining the environmental integrity of the program cap levels.

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<sup>37</sup> For a discussion of these issues, see *Voluntary Renewable Energy Market: Issues and Recommendations*. Western Climate Initiative, July 2010. <http://www.westernclimateinitiative.org/component/registry/func-startdown/275/> (accessed 9/18/2010).