CAP AND TRADE PROGRAM DESIGN OPTIONS OVERVIEW

FOR DISCUSSION

CAP AND TRADE WORKSHOP
OCTOBER 24, 2005

PREPARED BY:

CAP AND TRADE SUBGROUP

CLIMATE ACTION TEAM

DISCUSSION DRAFT

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CAP AND TRADE PROGRAM DESIGN OPTIONS OVERVIEW

1. Purpose

This paper provides a brief overview of the Cap and Trade program design options being evaluated by the Cap and Trade Subgroup of the California Climate Action Team (CAT). This paper is being circulated in advance of the October 24, 2005 Cap and Trade Workshop to solicit comments from stakeholders on the relative merits of the alternative program design options being examined.

1.1 Governor Schwarzenegger's Executive Order

Governor Schwarzenegger signed Executive Order S-3-05 on June 1, 2005 establishing greenhouse gas emission reduction targets for California, including:

- by 2010, reduce GHG emissions to 2000 levels;
- by 2020, reduce GHG emissions to 1990 levels; and
- by 2050, reduce GHG emissions to 80 percent below 1990 levels

The Governor directed the Secretary of the California Environmental Protection Agency to coordinate efforts to meet the targets and report to the Governor and the State Legislature by January 2006 (and biannually thereafter) on progress made toward meeting the emission targets. The Executive Order also directs the Secretary to report on the impacts to California of global warming, and on mitigation and adaptation plans to combat the impacts.

1.2 The Climate Action Team and the Cap and Trade Subgroup

The Secretary assembled the Climate Action Team to address the requirements of Executive Order S-3-05. The Climate Action Team includes representation from: the Business, Transportation and Housing Agency, the Department of Food and Agriculture, the Resources Agency, the Air Resources Board, the Energy Commission, the Public Utilities Commission, and the Integrated Waste Management Board. The Climate Action Team is examining a broad set of strategies for reducing emissions to meet the Governor's targets.

Among the options being examined is the imposition of a cap on total greenhouse gas emissions from various sectors or sources across the state. The Cap and Trade Subgroup has been created for the purpose of evaluating the pros and cons of a range of Cap and Trade program design options. The results from the Subgroup will be provided to the Climate Action Team to support the January 2006 report to the Governor and the State Legislature.

1.3 Public Meetings

The Climate Action Team is holding a series of public meetings to obtain stakeholder input. The October 24, 2005 Cap and Trade Workshop is one of this series of meetings. The schedule of meetings is presented in Exhibit 1. As shown in the exhibit, the October 24, 2005 meeting is the second workshop covering Cap and Trade issues. Two workshops were also scheduled for the Scenario Planning Subgroup that is examining climate change scenarios and impacts. The full Climate Action Team has a schedule of three public meetings.

1.4 To Provide Comments

The Cap and Trade Subgroup is soliciting comments on the broad range of cap and trade program design options being examined. To provide comments, stakeholders are encouraged

to attend the October 24, 2005 workshop during which there will be opportunity for public comment and dialogue. The Subgroup welcomes comments on all aspects of designing a cap and trade program, and Section 4 below lists specific issues on which we are requesting input. Written comments are greatly appreciated, and may be provided at the workshop or sent via e-mail to Michael Gibbs (mgibbs@icfconsulting.com) and Eileen Tutt (ETutt@CALEPA.ca.gov).

Exhibit 1: Climate Action Team Public Meeting Schedule

Climate Action Team Meetings	Scenario Subgroup Meetings	Cap and Trade Subgroup Meeting
July 28, 2005 Stakeholder Briefing Cal/EPA Byron Sher Auditorium 2 p.m. - 4 p.m.	**August 29, 2005** Stakeholder Briefing on Scenario Analysis Cal/EPA Coastal Hearing Room 3 p.m. - 5 p.m.	**August 29, 2005** Stakeholder Briefing on Cap & Trade Cal/EPA Coastal Hearing Room 1 p.m. - 3 p.m.
September 13, 2005 Climate Action Team Workshop California Energy Commission Hearing Room A 1 p.m. - 3 p.m.	**December 13, 2005** Scenario Analysis Subgroup (Location to be determined)	**October 24, 2005** Cap & Trade Workshop Cal/EPA Coastal Hearing Room 1:30 p.m. - 4:30 p.m.
December 13, 2005 Climate Action Team Workshop (Location to be determined)		

2. Cap and Trade as an Emission Reduction Policy

"Cap and trade" is the name given to a market-based environmental policy designed to limit emissions of pollutants. Under a cap and trade program, a total emission limit or "cap" is established that defines the maximum quantity of emissions allowed in a given time period, such as a year. Also defined is the set of sources that must comply with the cap.

To impose the overall cap on the sources that fall under the program, the regulatory body implementing the program creates "emission allowances" in an amount that just equals the cap. For example, 1,000 emission allowances may be created, with each allowance representing one ton of emissions. Each entity with facilities that fall under the cap is then required to hold enough emission allowances to cover the emissions from its facilities.[1]

Each entity decides how best to comply with the cap. For example, the entity may choose to reduce emissions to match the allowances it holds. The methods used to reduce emissions are up to its discretion, so long as the methods do not violate other emission requirements or regulations that also apply to the facilities' emissions. Rather than reducing its own emissions, the entity may choose to purchase additional emission allowances from others. In this case, another entity must reduce its emissions enough so that it has extra allowances to sell. This opportunity to purchase and sell emission allowances is the "trade" portion of the cap and trade program.

A cap and trade program can be implemented in coordination with, or in place of, traditional regulatory requirements and incentives. For example, traditional regulatory programs may be used to require that certain sources achieve a minimum level of emission control, for example as expressed in terms of emissions per hour of operation. An emission cap could be implemented as well, so that total annual emissions are limited.

Much has been written on the use of cap and trade policies as a means of limiting pollutant emissions.[2] Several benefits often cited include:

- *Efficiency:* As a market-based policy, cap and trade has the potential to ensure that the emissions limit is achieved as efficiently as possible. By allowing the trading of emission allowances, the sources that find it least costly to reduce emissions can do so and sell allowances to those sources for which emission reduction is more costly.
- *Certainty of Emissions:* By establishing a specific cap, the total emissions will be limited to the amount of the cap. Other emission reduction policies do not necessarily offer this certainty.

[1] As discussed in Section 3.1, one of the program design options under consideration is to require Load Serving Entities (LSEs) in the electric power sector to hold emission allowances for the electricity they deliver to customers. In this case, the emission allowances must be sufficient to cover the emissions from the electric generators that produced the electricity procured by the LSE and delivered to customers.

[2] There is a wealth of materials describing cap and trade policies. Several examples include the following. *Tools of the Trade: A Guide to Designing and Operating a Cap and Trade Program for Pollution Control*, Office of Air and Radiation, U.S. Environmental Protection Agency, Washington, D.C., June 2003. *An Evaluation of Cap-and-Trade Programs for Reducing U.S. Carbon Emissions*, Congressional Budget Office, The Congress of the United States, Washington, D.C., June 2001. "How Environmental Laws Work: An Analysis of the Utility Sector's Response to Regulation of Nitrogen Oxides and Sulfur Dioxide Under the Clean Air Act," by Byron Swift, Environmental Law Institute, published at: 14 Tulane Environmental Law Journal 309 (Summer 2001).

- *Flexibility and Innovation:* The sources subject to the cap have the flexibility to decide how best to reduce emissions. This flexibility can spur innovation to find new and less costly methods of reducing emissions.
- *Administrative Ease:* Adopting an overall emissions cap can be administratively simpler than defining command and control requirements for a broad set of equipment types that contribute to emissions.

Particularly relevant to the goal of reducing greenhouse gas emissions in California, the cap can be lowered over time according to a set schedule.

Several concerns have been raised regarding cap and trade systems. Some have argued that the policy does not provide an incentive to reduce emissions below the cap, even if the cost of doing so is modest. Alternatively, as the emission cap becomes binding, the price for the emission allowances can rise, and under certain circumstances can become volatile. This volatility can create uncertainty for the sources covered by the cap, making it difficult for them to plan how best to comply. For criteria pollutants that contribute to local air pollution, care must be taken to ensure that trading programs do not adversely affect public health in communities. This issue of emissions potentially being concentrated geographically is less of a concern for greenhouse gas emissions because their impact is global (greenhouse gases do not contribute directly to local air pollution).

Moving forward with a cap and trade program as a mechanism for reducing greenhouse gas emissions in the State of California will require consideration of the characteristics of the state's emission sources, their opportunities to reduce emissions, and a range of program design options. The pros and cons of a cap and trade program will need to be weighed against each other, and the policy must be compared to alternative policies for achieving the emission reduction targets established in Executive Order S-3-05.

3. Cap and Trade Program Design Options

A cap and trade program for reducing greenhouse gas emissions in the State of California may be defined in terms of the following program design elements:

- Scope: What sectors or sources to include.
- Emissions covered: What gases to include and whether to include non-combustion (i.e., process) emissions.
- Allowance distribution: How and on what basis emissions allowances are distributed to the entities covered by the cap.
- Allowance trading: Whether and how to limit the trading of allowances among entities covered by the cap.
- Allowance banking and borrowing: Whether and how to allow banking and borrowing of emissions allowances across time period.
- Emissions offsets: Whether and how to allow emissions offsets to be used to comply with the emissions cap.
- Non-compliance penalties: What are the implications of non-compliance.

Each of the program design elements is described briefly.

3.1 Program Scope

The program scope defines what entities are included in the cap and trade program. Generally, a broader scope is preferred for several reasons, including:

- a broad scope can capture a large portion of total greenhouse gas emissions in the state, thereby having a significant impact on total state emissions;
- a broad scope with diverse sources can capture a wide range of emission reduction opportunities, so that the low-cost emission reduction options are undertaken first;
- a broad scope with many sources can enable a vibrant market for emission allowance trading to develop, so that a few large entities cannot dominate the market and exert market power.

A broader scope may also bring with it increased administrative complexity and enforcement costs. Therefore, the scope must also be realistic from an implementation perspective.

The Cap and Trade Subgroup is evaluating a range of options for the scope of a cap and trade program. The options are summarized in Exhibit 2. The first option is to define the scope of the program by industry sectors. The second approach is to define the scope in terms of major fossil fuel stationary combustion sources across all sectors. The third option is to define the scope in terms of fossil fuels themselves. Each approach is summarized.

3.1.1 Scope Defined by Industry Sectors

The scope of the cap and trade program can be defined in terms of the industrial sectors included under the cap. The narrowest scope under consideration is to include the electric power sector only. There are three ways this could be accomplished.

- California Power Plants of 25 MW or Larger. Under this option, only in-state electric power plants of 25 MW or larger would be included in the cap. The CEC reports that there are approximately 313 fossil fuel-burning generating facilities that operate in the state that meet

this criterion, including 98 facilities that are identified as co-generation facilities. These facilities account for about 90% of the electricity generated from fossil fuels in the state, and about 55% of total power generation in the state. The overwhelming majority of this electricity is produced from natural gas.

A key drawback of this option is that it excludes emissions from imported electricity. Depending on the year, up to 30% of power consumed in California comes from out of state generating facilities. The emissions from these sources would be omitted under this option. Most importantly, a program with this scope would provide an incentive to build new power plants in other states, and to import the power in order to avoid the in-state emissions limit. This result is called "leakage" in that emissions "leak out" from under the cap, in this case into neighboring states.

Exhibit 2: Options for Defining the Scope of the Cap and Trade Program

Option 1: Define the Scope in Terms of Sectors

- Electric Power Sector Only
  - In-state generators only
  - Investor Owned Utilities as Load Serving Entities
  - All Load Serving Entities
- Multiple Sectors with the Electric Power Sector
  - Oil Refining
  - Oil and Gas Extraction
  - Landfills
  - Cement Production
  - Others

Option 2: Define the Scope in Terms of Stationary Combustion

Define the scope to include all major sources of fossil fuel stationary combustion in the state, encompassing all major sources of carbon dioxide emissions, without reference to specific sectors as being either in or out of the cap.

Option 3: Define the Scope in Terms of All Fossil Fuels

Limit total fossil fuel consumption in the state by placing a cap on the total carbon content of oil, gas, and coal consumed.

- Investor-Owned Utilities (IOUs) as Load Serving Entities (LSEs) Under this option, the three main IOUs (PG&E, SCE, and SDG&E) would be required to limit their total emissions associated with the power they deliver to their customers. These three utilities account for about 70% of the electric power delivered statewide. To comply with their limit, each utility would be required to track or calculate the emissions associated with all the electricity it delivered, regardless of whether it was produced in California or out of state. This scope solves the leakage problem discussed above. However, it requires an ability to track emissions from all power generation through the market to its eventual delivery. No such tracking system exists today. Options for creating this tracking include: relying on average emissions rates by season and time of day; requiring tracking of emissions characteristics

for all power (with the possible exception of power sold on the spot market); and other methods.

- All Load Serving Entities (LSEs) Statewide. Under this option, all the LSEs statewide would be included in the cap. In addition to the three main IOUs, there are two large municipal utilities (Los Angeles Department of Water and Power and Sacramento Municipal Utility District), the California Department of Water Resources, and 41 other entities (including municipal utilities and irrigation districts). This option would also require the development of an emissions tracking system that would enable emissions to be tracked through to delivery.

The electricity sector accounts for nearly 20% of total statewide emissions of greenhouse gases, if imported power is counted in the total. In-state electricity generation accounts for on the order of 10% of total state emissions of greenhouse gases, with imported power accounting for an additional 10% of the total. While this sector is one of the largest individual sources of greenhouse gas emissions in the state, it does not account for the majority of emissions.

The scope of the cap and trade program can be broadened by including additional sectors. The sectors that may be considered for inclusion within the cap and trade program include the following.

- Oil Refining. Oil refining accounts for about three percent of state greenhouse gas emissions. The California Energy Commission lists 21 refineries operating in California, with the capacity to refine about 2 million barrel of oil per day.[3] The Air Resources Board identifies approximately 143 facilities in SIC Code 29 that includes "petroleum refining, manufacturing paving and roofing materials, and compounding lubricating oils and greases from purchased materials."[4] Within this sector, the oil refineries account for the overwhelming majority of the emissions.
- Oil and Gas Extraction. Oil and gas extraction accounts for about three percent of state greenhouse gas emissions. The Air Resources Board identifies about 429 facilities in SIC Code 13 that includes "producing crude petroleum and natural gas; extracting oil from oil sands and oil shale; producing natural gasoline and cycle condensate; and producing gas and hydrocarbon liquids from coal at the mine site. Types of activities included are exploration, drilling, oil and gas well operation and maintenance, the operation of natural gasoline and cycle plants, and the gasification, liquefaction, and pyrolysis of coal at the mine site."
- Landfills. Landfill methane emissions are estimated to account for about two percent of state greenhouse gas emissions. Methane produced in landfills migrates to the surface and is emitted to the atmosphere. The emissions estimate for this source is more uncertain than the estimates for emissions from fossil fuel combustion in other sectors. The California Integrated Waste Management Board's Solid Waste Information System (SWIS) database lists more than 2,500 solid waste facilities in the state, of which about 300 are identified as landfills. Of these landfills, 162 are listed as active, with the remainder being closed or otherwise inactive. Approximately 85 landfills account for 90% of the amount of waste estimated to have been disposed in the approximately 300 landfills, and more than 90% of the waste currently being disposed in landfills in California. These facilities would likely be the primary sources of methane emissions from this sector.

[3] The California Energy Commission refinery summary data are at: http://www.energy.ca.gov/oil/refineries.html.

[4] SIC Code definitions are available at: http://www.osha.gov/pls/imis/sic_manual.html.

- Cement Production. Cement production accounts for on the order of one to two percent of state greenhouse gas emissions, and there are 11 cement plants located in California. The Air Resources Board identifies approximately 124 facilities with air pollution emissions in SIC Code 32 that includes "manufacturing flat glass and other glass products, cement, structural clay products, pottery, concrete and gypsum products, cut stone, abrasive and asbestos products, and other products from materials taken principally from the earth in the form of stone, clay, and sand." The 11 cement plants probably account for the overwhelming majority of the greenhouse gas emissions from this sector.
- Other Sectors. Other sectors that may be considered for inclusion in the cap and trade program account for smaller portions of total state greenhouse gas emissions. These sectors may include: pulp and paper production; semiconductor manufacturing; and natural gas transmission and distribution.

Agriculture and forestry sectors also contribute to state greenhouse gas emissions, including emissions from enteric fermentation (cattle), manure management, agricultural soil management (primarily fertilizer application), and land use change. Although these sectors are significant sources of emissions, accounting for about 8% of annual state greenhouse gas emissions,[5] they are likely to be less appropriate for inclusion in a cap and trade program, in part due to their diffuse nature and in part due to the difficulty associated with measuring or calculating the emissions from individual facilities.

The mobile source sector could also be considered for inclusion in the cap and trade program. Mobile source combustion is the largest single source of greenhouse gas emissions in the state, accounting for more than 40% of the total statewide emissions. Strategies for reducing emissions from this sector may include demand management, alternative fuels, and emission standards for vehicle fleets. Options for incorporating this sector into a cap and trade system, however, remain to be defined.

3.1.2 Scope Defined by Major Fossil Fuel Stationary Combustion Sources

The scope of the cap and trade program can be defined to include all major sources of fossil fuel stationary combustion in the state. This approach would encompass all major sources of carbon dioxide emissions, without reference to specific sectors as being either in or out of the cap. This approach could be considered as a companion to a cap defined for the electric power industry, as discussed above. Consequently, this approach can be considered to be the major sources of fossil fuel stationary combustion outside the electric power sector.

The Air Resources Board identifies approximately 5,200 facilities statewide with nitrogen oxide (NOx) or carbon monoxide (CO) emissions. Because NOx and CO emissions are an indication of combustion, these facilities would make up the universe of potential facilities to include in a cap and trade program that focused on stationary combustion. Preliminary analysis of the NOx and CO emissions data indicates that the top 500 facilities probably account for about 90% of the emissions from these facilities. Consequently, a cap and trade program could be designed to capture a very large portion of the carbon dioxide emissions from fossil fuel stationary combustion by focusing on the order of 500 facilities statewide.

One of the weaknesses of this approach to defining the scope of the cap and trade program is that it may omit significant process emissions, such as fugitive emissions of high global warming

[5] Enteric fermentation, manure management, and agricultural soil management have reported emissions of 32.6 MMT CO_2-Eq. for 2002. Land use change and forestry emissions are reported at 4.3 MMT CO_2-Eq., with an sink of 20.3 MMT CO_2-Eq. See *Inventory of California Greenhouse Gas Emissions and Sinks: 1990 To 2002 Update*, B. Bemis and J. Allen, Staff Paper, California Energy Commission, Sacramento, California, CEC-600-2005-025, June 2005.

potential (GWP) gases (e.g., sulfur hexafluoride (SF_6) emissions from electric power distribution systems). If needed, additional sources or sector-specific processes could be added to the scope of the program to address this issue.

3.1.3 Scope Defined in Terms of All Fossil Fuels

The scope of the cap and trade program could be defined to include all fossil fuels. This approach would implement a limit on greenhouse gas emissions by placing a cap on the total carbon content of oil, gas, and coal that could be consumed. The primary advantage of taking this approach to defining the scope of the program is that it encompasses all sectors that use fossil fuels in the state. Consequently, all options for reducing the use of fossil fuels across all sectors can contribute to achieving the emissions cap. Additionally, all sectors are put on an equal footing as it relates to their use of fossil fuels.

To achieve GHG emissions reductions via this cap, "carbon allowances" would be defined. These allowances would be required to be held by entities at some point in the distribution or use of fossil fuels in the state. For oil consumption, the appropriate point to require that carbon allowances be held is where liquid fuels enter into commerce at refineries and storage facilities. This distribution point is called the "terminal rack." There are approximately 100 terminal rack locations in the state. The flow of liquid fuels is currently tracked at these locations for federal excise tax purposes. Those responsible to pay federal excise taxes on these fuels could also be required to hold carbon credits in an amount that matches the carbon content of the fuel they deliver.[6]

Natural gas flows would likely be tracked at major pipeline transfer points or through the natural gas utilities. There are fewer than 10 locations statewide where these flows would need to be tracked. For coal, it may be easiest to track coal combustion in major boilers, as the transportation of coal is not tracked and the number of coal-fired boilers is relatively modest in the state.

To implement this fuels-based approach, the issue of imported electricity must be addressed. If in-state fossil fuel combustion is capped without addressing electricity imports, there will be an incentive to build new power plants in other states and import increasing amounts of electricity. This situation would substantially reduce the effectiveness of the cap. Two approaches may be considered to resolve this. First, the electric power industry could be capped as a sector as described above. In this case, the electric power sector would be excluded from the fuel cap (it would have its own emissions cap), and the issue of imported electricity would be addressed as part of the electric power emissions cap. Fossil fuels delivered for electricity production would not be counted against the carbon cap for fuels because electricity production would have its own cap.[7]

The second approach is to require that electricity importers hold carbon allowances in amounts that equal the embedded carbon content of the imported electricity. In this case, the carbon content of imported electricity would be treated like the carbon content of all other fuels consumed in the state. As discussed above, a system for tracking the emissions characteristics of imported power would need to be developed in order to implement this approach.

[6] Note that fossil fuels are consumed during the production of liquid fuels. The embedded carbon content of the fuels should also be considered in this process.

[7] Although the electric power and fuels sectors could be segmented, the carbon allowances used to cap fuels and the emission allowances used to cap emissions from the power sector could be tradable with each other. A common exchange rate between the two instruments would be defined to keep total emissions capped.

3.2 Emissions Covered

The cap and trade program can be defined to include all greenhouse gases, or a subset, such as carbon dioxide (CO_2) only. CO_2 emissions from fossil fuel combustion account for about three-quarters of the emissions in the state. About one-half of these emissions is associated with the mobile source sector.

Non-CO_2 emissions most often come from processes or biological sources that are more difficult to quantify, such as landfills, agricultural sources, and fugitive emissions from equipment.

3.3 Allowance Distribution

As described above, entities covered by the cap and trade program will be required to hold emission allowances (or in the case of a fuel-based cap, carbon allowances). There are three main options for distributing allowances:

- allowances may be distributed by the program to the relevant entities covered by the cap;
- allowances may be auctioned by the program to the relevant entities; or
- a combination of distribution and auction may be used.

Much has been written regarding the pros and cons of distributing allowances versus auctioning allowances.[8] When allowances are distributed to entities covered by the cap, those entities receive something of value: the emission allowances. When the allowances are auctioned, the government collects a portion of the value of the allowances in the amounts paid for the allowances during the auction. Both approaches can result in essentially the same cost of controlling emissions, and both approaches are expected to have the same impact on consumer prices.

If allowances are auctioned, the revenue raised can be used to run the cap and trade program as well as for other beneficial purposes. Some have argued that the revenue can be used to offset other taxes in a manner that would improve the overall efficiency of the economy, thereby producing economic benefits. These benefits can be directed to those who would otherwise be adversely affected by the impacts of the emissions cap. Others have argued that while these benefits of obtaining revenue from an auction are feasible, they are not guaranteed to be realized.[9]

While there is a growing literature on how to design and run auctions of emission allowances, cap and trade programs have primarily distributed allowances (for example, the Acid Rain program that limits sulfur dioxide emissions). To distribute allowances to the relevant entities, data must be developed and verified that form the basis for the distribution. The data would need to be specific to each entity that falls under the cap. The two primary methods of distributing emission allowances are:

- Baseline Emissions. Emission allowances are distributed on the basis of recent emissions as defined in a baseline for each entity. This method distributes fewer allowances to those entities that reduced their emissions prior to the baseline period, thereby penalizing them for taking early action. Additionally, it makes no accommodation for entities that have grown since the baseline period.

[8] See, for example, *Who Gains and Who Pays Under Carbon-Allowance Trading? The Distributional Effects of Alternative Policy Designs*, Congressional Budget Office, The Congress of the United States, Washington, D.C., June 2000.

[9] See, for example, *Revenue Recycling and the Cost of Climate Policy*, Global Climate Change Research Area Environment Sector, Technology Group, Electric Power Research Institute, Palo Alto, California.

- Output. Emission allowances are distributed on the basis of output. In the electric power sector, for example, emission allowances could be allocated to load serving entities (LSEs) in proportion to the total energy they delivered to customers (in GWh) in a recent year. By basing the distribution on output as opposed to emissions, past actions that reduced the emission intensity of the output are rewarded. To implement this approach, suitable measures of output would be required for all entities across potentially diverse sectors in the program.

Neither method of distributing emissions automatically accommodates new emissions sources on an equal basis with previously existing sources. Insofar as emission allowances are distributed on the basis of past emissions or output, new sources would not receive a share of the distribution of allowances. To address this issue, a portion of the emission cap can be set aside for new sources, so that they can be allocated a share of the cap. Alternatively, a share of the cap could be set aside to be auctioned off, so that all sources, new and existing, could bid for additional emission allowances over and above the allowances they receive through a distribution.

In addition to defining how to allocate emission allowances, the program must also determine how frequently to allocate allowances. Allowances can be allocated one time, so that the allowances are permanent. In this case, the original recipients (whether by distribution or auction), own the emission allowances in perpetuity unless they sell them. To reduce the cap over time, the annual emissions allowed by each allowance can be decremented according to a set schedule.[10]

As an alternative, the emission allowances can be allocated periodically, such as annually or every five years. In this case, the emission allowances would confer the right to produce a specific amount of emissions during the relevant period, such as a total of five tons of emissions over a specific period of five years. Some have argued that a periodic auction of emission allowances, such as annually, helps to create a liquid market for allowances and helps produce price signals regarding the marginal cost of reducing emissions.

3.4 Allowance Trading

A fundamental aspect of a cap and trade program is the ability for entities covered by the cap to trade emission allowances. The opportunity to trade helps to ensure that emissions are reduced at the lowest cost possible. Entities that can reduce emissions at low cost will sell their emission allowances to entities that face higher costs.

The primary program design question regarding trading is whether to impose some limits on how allowances are traded. For example, trading could be limited to take place only within sectors or source categories. Although such a restriction reduces the ability of the market to shift emission allowances to where they are most highly valued, it can be used to ensure that trades take place between emissions sources that have comparable emissions data quality. For example, trading could be allowed among all fossil fuel combustion sources, but trading of process emissions could be limited to emissions within the sector.

3.5 Allowance Banking and Borrowing

Banking and borrowing provide compliance flexibility by enabling entities covered by the cap to shift emissions among time periods.

[10] If emission allowances are allocated one time so that the owner has perpetual rights to emit, the emissions allowance would typically be expressed in emissions allowed per year.

- Banking. Banking allows unused emission allowances to be carried into future years. Banking is reasonable for greenhouse gas emissions given the long atmospheric lifetimes of the relevant gases. Banking can be an important cost-reducing compliance strategy when the emission cap is scheduled to decline in the future.
- Borrowing. Borrowing allows an entity to borrow allowances from its future allocation in order to comply with current emission limits. Although borrowing provides an additional compliance option for entities that have too few allowances in a compliance period, care must be taken to ensure the opportunity to borrow is not abused.

3.6 Emission Offsets

Emission offsets refer to verified emission reductions achieved by entities that are outside the cap and trade program. Emission offsets can play two roles. First, emission offsets can help an individual entity that is covered by the cap comply with the requirement to hold emission allowances in an amount that equals its emissions. Purchasing an emission offset would be equivalent to purchasing an emission allowance for the compliance period. The second role of emission offsets is that they can reduce the overall cost of reducing emissions in the state. Low-cost emission reduction options that exist outside the cap can be induced to be implemented by the opportunity to sell the offset to an entity that is inside the cap.

The key to making offsets viable from an environmental perspective is to ensure that they are real, verifiable, quantifiable, excess to any regulatory requirement, and not being counted toward any other GHG reduction targets. Several program design decisions regarding offsets include:

- Location. The location of the emission reduction could be restricted to California, or the United States. Alternatively, any appropriately documented emission offset could be allowed regardless of location.
- Baseline. The emission offset must demonstrate emission reduction relative to a baseline. The baseline would reflect existing regulatory requirements, so that the verified emission reduction is surplus to existing requirements. If offsets generated outside of California are eligible, it may be appropriate to define the baseline as *California regulatory requirements*, as opposed to the regulatory requirements in the location where the offset is generated. In this manner, the offset project must first achieve a California-equivalent baseline that reflects the California requirements for the source (if there are any), and then demonstrate emission reductions that are surplus to that California-equivalent baseline.
- Sectors and Sources. The sectors and sources eligible for producing offsets may be limited to ensure that the offsets are consistent with the goals of the cap and trade program. For example, an analysis of the impacts of allowing offsets from sectors that have performance standards has shown that allowing such offsets may increase overall emissions.[11]

Protocols for verifying offsets would be required. The Climate Trust is one organization that has developed a process for defining and verifying emissions offsets.[12]

3.7 Emissions and Compliance Tracking

Under all formulations of a cap and trade program, emissions and compliance must be tracked for all the entities covered by the cap. Emissions must be measured or calculated for each

[11] See, for example, *Combining Rate-Based and Cap-and-Trade Emissions Policies*, Carolyn Fischer, Resources for the Future, Washington, D.C., January 27, 2003.

[12] More information on the Climate Trust can be found at: www.climatetrust.org.

facility with emissions limited by the cap. Continuous emissions monitors (CEMs) are used in RECLAIM and the Acid Rain program to provide timely and accurate emissions tracking at the facility level. For power plants, these CEMs include CO_2 emissions. This approach may be appropriate for some facilities included in a greenhouse gas emissions cap and trade program, however, it is unlikely to be a cost-effective method for all sources under a broad multi-sector program.

A mandatory annual emission report is an option for tracking emissions at the facility level. The California Climate Action Registry has created the infrastructure to receive and verify greenhouse gas emission reports (which are currently submitted on a voluntary basis). The Registry could be the official repository of mandatory emission reports under a cap and trade program. As an alternative to the Registry, the air pollution control districts could receive and verify emission reports from covered facilities. The districts currently receive and review emission reports for other pollutants for facilities in their areas.

Closely related to emissions tracking is compliance tracking. Because entities may operate multiple facilities, compliance tracking requires the ability to aggregate emissions across facilities owned by a single entity. Some facilities have joint ownership among multiple parties (e.g., power plants). Because emissions compliance is at the level of the entity, the emissions from facilities with multiple owners must be allocated to the facility owners using an agreed upon method. The Registry has adopted methods to perform this allocation.

Compliance is tracked by comparing the emissions reports to the official record of allowances held by the entities. A system for tracking allowance ownership is needed, including "expiring" the allowances when they are used to cover emissions in a period. The compliance tracking needs to be done in a timely manner, so that compliance can be evaluated shortly after the end of the compliance period (for example, annually). The regulatory agency (or agencies) implementing the cap and trade program must have the authority to require that:

- emissions reports be prepared according to an accepted method and submitted appropriately in a timely manner;
- ownership of allowances be tracked and disclosed;
- allowances are held by each entity in sufficient quantity to cover the verified emissions for that entity; and
- documentation of the emissions and allowance ownership is maintained.

3.8 Non-Compliance Penalties

The purpose of non-compliance penalties is to provide consequences to the regulated entity in the event that the entity does not own emissions allowances in sufficient quantity to cover their actual emissions. The type of non-compliance penalties adopted will affect the market for allowances, as well as the emission level achieved. Options for non-compliance include the following:

- Require the entity to acquire allowances or offsets to make up the shortfall.
- Require the entity to pay a fee per ton for which they did not have sufficient allowances:
  - The fee could be a set amount ($/ton).
  - The fee could vary depending on the prevailing price of emission allowances observed in the allowance trading market or the auction (if an auction is used).
- Require the entity to implement controls to reduce emissions.

4. Request for Comments

The Cap and Trade Subgroup is soliciting comments on the broad range of cap and trade program design options being examined. To provide comments, stakeholders are encouraged to attend the October 24, 2005 workshop during which there will be opportunity for public comment and dialogue. The Subgroup welcomes comments on all aspects of designing a cap and trade program. This section lists specific areas in which input is requested. Written comments are greatly appreciated, and may be provided at the workshop or sent via e-mail to Michael Gibbs (mgibbs@icfconsulting.com) and Eileen Tutt (ETutt@CALEPA.ca.gov).

4.1 Scope

1. If the scope of the emissions cap is defined as in-state electric power generating facilities without also covering imported electricity in some manner, there will be an incentive to import more electricity in the future to avoid the emissions cap. Is this incentive to avoid the cap by importing electricity significant enough to make this option (in-state electric power generation only) a poor choice?
2. The primary option for including imported electricity in the emissions cap is to require Load Serving Entities (LSEs) to hold emissions allowances for all the power they deliver to their customers.
   - Are there options for including imported electricity in addition to the one defined here?
   - Emissions tracking by LSEs of all the electricity they procure is not performed today. Can a system be put in place that enables LSEs to track the emissions associated with the electricity they procure? How long would it take to develop this tracking capability, and what would it look like?
   - If emissions cannot be tracked for 100% of the electricity procured, can a "default factor" be used for the portion of the electricity for which an emissions value is not known? What would be an appropriate basis for developing this factor?
3. One approach to defining the scope of the cap and trade program is to include specific sectors. Key sectors identified to date are: electric power generation; refining; oil and gas extraction; landfills, and cement production. Are these sectors good candidates? What additional should sectors be considered?
4. Three approaches for defining the scope of the cap and trade program have been identified: (1) sectors; (2) fossil fuel stationary combustion sources; and (3) consumption of all fuels. Which approach is preferred? What factors are important in making this determination?
5. If multiple sectors are included in the scope, are policies required to accommodate the differing cost structures of the varying sectors? For example, as regulated entities, LSEs have different cost structures than the other sectors.
6. If multiple sectors are included in the scope, are policies required to address the wide variation in the sizes and resources of various entities that would be included in the program?

4.2 Allowance Distribution

7. Emission allowances can be sold through an auction or allocated to entities covered by the cap.
   - Do you support selling allowances through an auction, and if so, why?

- If allowances are sold, how should the revenue be used?
- If allowances are allocated, what method do you prefer for making the allocation (baseline emissions or output)?
- If allowances are allocated, what method do you prefer for handling new sources?

8. Should allowances be allocated one time, or periodically? What factors are important in making this determination?
9. Should the compliance periods (during which sufficient emission allowances must be held to cover emissions) be defined as individual years? Alternatively, should longer compliance periods be considered, such as successive five year periods?

4.3 Offsets

10. Should offsets be included in the design of the cap and trade program?
    - Should offsets be limited to emission reductions in California, or the U.S.?
    - Should certain sectors be excluded from the opportunity to generate offsets?

4.4 Other Program Design Considerations

11. Should the cap and trade program be limited to CO_2 emissions from fossil fuel combustion? What other gases and emissions sources should be included?
12. Should limits be imposed on how allowances are traded?
13. Do you have any concerns regarding banking and borrowing?
14. Do you have a preference for which organization is responsible for receiving and verifying greenhouse emissions reports if they were to become mandatory?
15. What option(s) do you prefer for addressing non-compliance with the cap?
16. What design elements best address Environmental Justice Issues?
17. What analyses can be undertaken to consider impacts of cap-and-trade options on communities with environmental justice concerns?