

To: Western States Petroleum Association
From: Todd Schatzki and Jonathan Borck, Analysis Group
Date: May 28, 2009
Re: Analysis Group Comments on Leakage

For states, regions or countries developing environmental regulations, several important policy concerns revolve around the concept of “leakage,” which includes both the potential for economic activity to shift to other regions and for environmental improvements in the regulated region to be diminished through increases in emissions in other regions. While California, along with other regions, has taken the lead on developing climate policy, being out in front of surrounding states and other countries creates the risk that economic leakage will adversely affect the state’s economy and that emissions leakage will diminish the effectiveness of AB 32 and other climate policies.

This memo is intended to provide background information about leakage. It briefly addresses the following five questions:

1. What is Leakage? Why is it a Concern?
2. What Characteristics Make an Industry Most Vulnerable to Economic Leakage?
3. An Example: Leakage in the Petroleum Refining Sector
4. How Should CARB Assess Leakage Potential?
5. What Should Be Done to Minimize Leakage?

What is Leakage? Why is it a Concern?

Differences in the stringency of environmental regulations between regions can lead to two types of leakage: *economic leakage* and *emissions leakage*. Economic leakage is a shift in *economic activity* from a region with more stringent environmental regulations to a region with less stringent (or no) regulations, while emissions leakage is a shift in the *pollutant emissions* such as greenhouse gases (GHGs) as a result of such differences in regulatory stringency. As described below, the two types of leakage are often closely related.

Economic leakage can arise when regulations impose additional costs on firms that competitors in other regions with less stringent or no environmental regulations do not face. These higher costs can arise from traditional command-and-control regulations or from market-based environmental policies, such as the cap-and-trade program included in CARB’s AB 32 Scoping Plan. By imposing incremental costs that competitors subject to less stringent regulations do not face, the affected firms can become less competitive than firms in other regions. As a result, they may lose market share to sources in less-regulated regions, forgo opportunities for new investment (that instead happens in less-regulated regions), or relocate to less-regulated regions. Employment in the affected sectors may decline, and the economy in the regulated region may suffer.

When considering the economic consequences of environmental policies, it is important to recognize that not all reductions in economic activity are symptomatic of economic leakage. The primary economic consequences of climate policy will arise from this substitution of more costly but less GHG-intensive goods and services for less costly but more GHG-intensive goods and services. These substitutions will have positive consequences for various sectors of the California economy and negative economic consequences for others, but they are necessary to achieve the intended environmental benefits of AB 32 and are unrelated to economic leakage.

Emissions leakage can arise from economic leakage. When economic leakage occurs, economic activity in the regulated region is replaced by economic activity in a less-regulated region. As a result, GHG emissions in the regulated region decrease. However, as a consequence of the shift in economic activity, increased GHG emissions in the less-regulated regions may partially, fully, or more than fully offset these emission reductions. These offsetting increases in emissions are referred to as emissions leakage. Thus, the more regulated region experiences both the economic consequences of the shift in economic activity and a diminishment of the environmental benefits from the policy.

Economic leakage may not, however, always lead to emissions leakage. The extent of emissions leakage arising from economic leakage will depend on the nature of environmental regulations facing competitors in each region. For example, if competitors in a less-regulated region must adopt some emission reduction measures but do not face an overall limit on their emissions of GHGs, then economic leakage could lead to emissions leakage. On the other hand, if competitors in two regions are each regulated by a cap-and-trade system, economic activity may leak from the region with a more stringent cap to the region with a less stringent cap, but overall emissions across the two regions would not change because both regions' total emissions are capped.

Emission leakage can also arise from overlapping environmental regulations. State or regional environmental regulations may create few or no environmental benefits if the scope of those regulations overlaps with federal regulations. For example, a cap-and-trade system covering California GHG sources would achieve no additional emission reductions, while imposing additional costs on California's economy, if these sources are subject to both state and federal cap-and-trade systems. Any incremental GHG emission reductions made by sources within California to comply with the more stringent state cap would be offset by increases in emissions from sources outside of California (that are subject only to the federal cap). Thus, California sources would face higher emission reductions costs while generating no additional GHG emission reductions. The potential for such overlaps in California and federal environmental policy is not limited to a cap-and-trade system, but can also arise with environmental standards, such as a renewable portfolio standard (RPS) or automobile fuel efficiency standards.¹

¹ California's Pavley standards would have effectively imposed more stringent automobile fuel efficiency standards on top of federal Corporate Average Fuel Economy (CAFE) standards. The announcement of similar federal standards eliminates this overlap. However, absent this federal action, the overlap in compliance obligations would have limited the gains from the Pavley standards because increases in fleet average fuel economy within California would have allowed auto manufacturers to reduce the fuel economy of the fleet sold outside of California. A recent analysis found that such shifts in fleet average fuel economy between states considering Pavley standards and the rest of the U.S. could have eliminated up to 85 percent of the emission reductions anticipated from the Pavley standards. Goulder, Lawrence et al., "Impacts of State-Level Limits on Greenhouse Gases Per Mile in the Presence of National CAFE Standards," April 2009.

Analyses of proposed federal programs suggest that both economic and emissions leakage could be serious concerns. For example, a recent study found that anywhere between 17 and 44 percent of the decline in production in key energy-intensive industries under a hypothetical federal cap-and-trade program would be offset by increases in production abroad.² Another recent study calculated that one-quarter of the reductions in emissions by U.S. firms under a federal climate policy could be offset by increases in emissions by foreign firms.³

Leakage may be even a greater concern at the state level, where regulated sources are more exposed to competition from imports from other states as well as those from other countries. Some analyses have suggested that emissions leakage in the electricity sector could allow it to meet AB 32 targets (i.e., 1990 GHG emission levels) for that sector.⁴ Aside from the electricity sector, potential leakage arising from other sectors of California's economy has received much less attention.

What Characteristics Make an Industry Most Vulnerable to Economic Leakage?

The vulnerability of a particular industrial sector to economic leakage under AB 32 depends primarily on two factors: (1) the difference in and nature of the costs of GHG regulations between California and other regions, and (2) the extent and nature of competition between California and out-of-state producers. The risk of leakage from new regulations generally increases as the costs of those new regulations rise and greater financial burdens are placed on producers. Moreover, a sector is more prone to leakage if sources in the sector face greater competition from out-of-state producers, which makes it more difficult to pass on the costs of GHG regulations to consumers.

Under AB 32, industrial sectors will bear added costs from the cap-and-trade program and complementary measures. These costs will be greatest for sectors that are energy and GHG-emissions intensive or that are regulated through complementary measures. Industries with the highest energy costs include metals, minerals, paper, petroleum refining, and chemicals.⁵ These industries will likely face the highest direct costs under a GHG cap-and-trade program. In addition, these and other sectors may face additional costs under AB 32's complementary measures, such as those requiring energy efficiency improvements, depending on how those measures are designed.

² Pew Center on Global Climate Change (2008), "Assessing Competitiveness in U.S. Climate Change Policy," Congressional Policy Brief, p. 4.

³ Ho, Mun S., Richard Morgenstern, and Jih-Shyang Shih (2008), "Impact of Carbon Price Policies on U.S. Industry," *Resources for the Future Discussion Paper 08-37*.

⁴ Bushnell, James, Carla Peterman, and Catherine Wolfram, "California's Greenhouse Gas Policies: Local Solutions to a Global Problem?" Center for the Study of Energy Markets, Working Paper 166, April 2007.

⁵ Pew Center on Global Climate Change (2008), "Assessing Competitiveness in U.S. Climate Change Policy," Congressional Policy Brief, p. 2; California Air Resources Board, "Discussion of Emissions Leakage Issues in Cap-and-Trade," presentation for a public meeting, April 13, 2009, p. 12; Houser, Trevor et al. (2008), "Leveling the Carbon Playing Field: International Competition and U.S. Climate Policy Design," Peterson Institute for International Economics, World Resources Institute.

An Example: Leakage in the Petroleum Refining Sector

Many California industries, including petroleum refining, face competition from out-of-state producers. California had historically been an exporter of petroleum products until 1999. Since then, however, California has been a net importer of all petroleum products.⁶ Imports come from refineries in Washington State, the U.S. Gulf Coast, and abroad. As discussed below, the added costs imposed by AB 32 policies combined with competitive pressure from out-of-state producers create the potential for leakage in the petroleum sector.

Compared to refiners in California, out-of-state refiners must bear an additional cost to deliver transportation fuels to California. The Energy Information Administration (EIA) estimates that the cost of transporting fuels to California are 3-4 cents per gallon from Washington State, 5-10 cents per gallon from the Gulf Coast and the Caribbean, and 8-12 cents per gallon from refineries elsewhere in the United States and abroad.⁷ These transportation costs represent additional costs faced by out-of-state refiners that give in-state refiners a competitive advantage in supplying transportation fuels to California customers.

Imposing additional costs on refiners in California that are not faced by out-of-state refiners may increase imports of gasoline into California. The resulting shift in refining activity from California to other states or regions could have economic consequences for California and could lead to emissions leakage. Back-of-the-envelope calculations suggest that a cap-and-trade system that covers refinery emissions would increase refining costs by 1.0 to 1.5 cents per gallon when allowance prices are \$10 per ton of CO₂. Of course, higher allowance prices would lead to correspondingly higher increases in in-state refining costs. In addition, AB 32's complementary measures may impose costs on California refiners above and beyond the costs imposed by the cap-and-trade system. For example, the Scoping Plan includes measures that would impact the refining industry, including potential requirements arising from energy efficiency audits, limits on refinery flares, and regulation of refinery methane emissions. As a result, out-of-state refiners could become more competitive with in-state refiners, which might increase the potential for economic and emissions leakage.

How Should CARB Assess Leakage Potential?

CARB is in the early stages of assessing leakage potential, and so its current approach lacks details. CARB appears to have taken careful consideration of how analysts have evaluated leakage in other programs and jurisdictions. CARB can certainly learn from and improve upon their methods as it considers leakage under AB 32.

When evaluating leakage, CARB should be sure to consider the added costs not only of the cap-and-trade program but also AB 32's complementary measures. As CARB recognizes, leakage originates when sources in California face additional regulatory costs that sources in other states or countries do not. Both the cap-and-trade program and other measures in AB 32 can contribute to these additional regulatory costs. However, CARB's April 13 public meeting on leakage focused largely on leakage from the proposed cap-and-trade program. As CARB assesses leakage and competitiveness effects of AB 32, it should be careful to consider the combined effects of all regulations, including its

⁶ Energy Information Administration, "2003 California Gasoline Price Study Final Report," November 2003, p. 27.

⁷ Energy Information Administration, "2003 California Gasoline Price Study Final Report," November 2003, Table 2-1.

complementary measures. If these measures raise the costs to California producers, they too can contribute to leakage.

When evaluating potential leakage and competitiveness effects, CARB should focus not only on current trends and immediate impacts but also on longer term effects. Along with the immediate impacts that increases in costs may have on the competitiveness of producers (e.g., refineries) in different regions, CARB should consider the incentives for future investment in light of permanent differences in costs across regions and uncertainties in costs arising from policy design. Therefore, it is essential that CARB consider not only the short-term economic impacts given current capital stock and trade patterns, but also how proposed regulations would affect growth and investment in vulnerable sectors.

What Should Be Done to Minimize Leakage?

Careful design of a cap-and-trade system can help mitigate leakage. Two key elements of a cap-and-trade system can potentially mitigate economic and emissions leakage: (1) development of a geographically broad and harmonized cap-and-trade system; and (2) implementation of cost containment provisions that minimize the cost of achieving GHG targets.

A geographically broad cap-and-trade system would eliminate leakage between regions covered by the system. Broadening the geographic scope of a cap-and-trade system would expand the number of competitors subject to a common set of requirements, which would reduce potential leakage from shifts in economic activity among these producers. For example, a harmonized federal cap-and-trade program would impose the same regulatory requirements on all domestic producers in a sector, thus eliminating any regulation-induced competitive advantage among domestic competitors in different states. However, while reducing leakage within the United States, even a federal policy would potentially be subject to leakage to other countries that have not taken on corresponding obligations to reduce GHG emissions.

In the near term, CARB should avoid setting overly stringent interim GHG targets or implementing costly complementary measures while broader cap-and-trade systems are developed. In light of progress on federal climate regulation (or even a region-wide system through the Western Climate Initiative), California should be cautious when considering stringent targets on sources that are potentially vulnerable to leakage, or it may needlessly impose additional economic costs and create (potentially irreversible) shifts in economic activity in an effort to achieve relatively *temporal* (and limited) environmental gains that can be achieved at lower cost and with greater environmental effectiveness through impending federal climate policy.

Absent a geographically broad GHG reduction program, cost-containment policies can mitigate emissions leakage by reducing the regulatory costs to California producers of achieving AB 32 climate goals. Because leakage is driven by differences in regulatory costs between California and less-regulated regions, CARB can minimize leakage concerns by taking steps to reduce those costs. Features of a cap-and-trade program such as allowance banking and borrowing, multi-year compliance periods, and the use of offsets can all reduce the costs imposed on regulated sectors – and therefore the potential for leakage – while still achieving GHG reduction goals.

Banking and borrowing can lower costs by allowing sources to reduce GHG emissions when it is least costly to do so. With the flexibility offered by banking and borrowing, sources can shift the timing of emission reduction efforts to minimize costs in the face of both expected and unexpected changes in the cost of reducing emissions. When facing a more stringent future cap, for example, sources can save some allowances for use in future years when emission reduction costs are higher

than they are today. In this sense, the benefit of banking and borrowing is analogous to the primary benefit of allowance trading under cap-and-trade systems in general: while allowance trading provides flexibility to reduce emissions across *sources*, banking and borrowing provide flexibility to reduce emissions across *time*. Both types of flexibility bring down the total cost of achieving GHG reduction goals.

Multi-year compliance periods essentially provide the advantages of banking and borrowing within well-defined, limited time periods. A multi-year compliance period, for example, gives sources the flexibility to undertake emissions reduction efforts at any time during the compliance period when it determines these actions will be least costly to undertake. Multi-year compliance periods do not necessarily permit banking and borrowing across compliance periods. Nonetheless, they provide a certain degree of flexibility across time, which helps reduce total compliance costs and leakage.

Finally, offsets help to contain costs by providing sources with the opportunity to reduce GHG emissions in areas not covered by the cap-and-trade system, both in California and throughout the world. By increasing the supply of low-cost emission reduction opportunities, the use of offsets can both lower the total cost of achieving emission targets and lower market prices for GHG allowances. The economic benefits may be significant. For example, one study of California's program found that achieving 30 MMTCO₂e of emission reductions through offsets (less than 20 percent of the total reductions required under AB 32) would reduce the social cost of a cap-and-trade program by more than 25%.⁸ Another study of the developing WCI cap-and-trade system projected that an offsets policy accounting for 22% of GHG emission reductions achieved by WCI partners in 2020 would reduce allowance prices from \$63 to \$24.⁹

To further mitigate leakage, CARB should consider limiting the costliest of AB 32's complementary measures, particularly those that affect sectors vulnerable to leakage. Complementary measures that impose additional costs on vulnerable sectors, but achieve limited GHG emissions reductions, can be eliminated to reduce regulatory burdens on sectors vulnerable to leakage. If these sectors are already covered by the cap-and-trade system, eliminating these complementary measures would allow California regulators to reduce regulatory burdens on these vulnerable sectors, without jeopardizing California's overall GHG reduction goals.

Free allowance allocations that are fixed or independent of sources' decisions can compensate sources for reductions in asset values from GHG reductions policies, but they are unlikely to appreciably affect the extent of leakage. Regulated sources will face higher costs to comply with many, if not all, of the provisions of AB 32, including the cap-and-trade program and AB 32's complementary measures. Policymakers often propose free allocation of allowances as a way to compensate regulated sources for reductions in asset values as a result of proposed regulations. This approach can be effective for providing such compensation.

However, fixed allowance allocations will not alter sources' ability to compete on the margin by offering lower prices, and, as result, will have limited effect on their incentives to forgo new investment or relocate production to regions with lower regulatory costs. Regardless of how sources receive allowances, the use of an allowance imposes an *opportunity cost* on the source that uses it. That is, regardless of whether the source originally purchased the allowance through an auction or received it for free, the source forgoes revenue that it would have received had it sold the allowance

⁸ Charles River Associates, "Economic Analysis of California Climate Initiatives: An Integrated Approach," prepared for the Electric Power Institutes, November 1, 2006.

⁹ WCI, "Design Recommendations for the WCI Regional Cap-and-Trade Program," September 23, 2008.

instead of using it to cover its emissions. Consequently, fixed allowance allocations do not eliminate the incentives faced by sources under a cap-and-trade that can reduce their competitiveness and lead to economic and emissions leakage.

Free, regularly updating allocation of allowances based on output levels can reduce leakage, but it can also distort incentives and increase the total costs of achieving GHG reduction goals. As an alternative to fixed allocations, allowances can be freely allocated in proportion to sources' recent economic activity – most commonly, their recent levels of output. Under an updating output-based allocation scheme, a source that increases its production receives a greater share of future allowances. Unlike fixed allocations, updating output-based allocations affect sources' *marginal* costs of production by providing what amounts to a production subsidy. Depending on how it is implemented, this implicit subsidy can offset, to varying degrees, the reduction in competitiveness experienced by an industry as a result of a cap-and-trade system.

A disadvantage of an updating allocation, however, is that it may result in goods and services being sold at prices that fail to reflect the full cost of GHG allowances. Like all subsidies, updating allocations provides an incentive for sources to lower prices to increase production. As a result, consumers may purchase more GHG-intensive products than they otherwise would have under a cap-and-trade system without the updating allocation. Therefore, to meet the cap given the weaker consumer incentives to reduce consumption of energy and energy-intensive goods and services, manufacturers will have to increase their efforts to reduce emissions in their production of goods and services. This shift in emission-reduction efforts raises the total cost of achieving GHG targets.

Border adjustments – requiring allowances for imports and/or providing allowance rebates for exports – can help reduce leakage. However, such adjustments may face legal challenges and could invite retaliation from other regions. A widely discussed proposal to combat leakage would make adjustments for differences in regulatory stringency for both imports and exports at the border of the regulated jurisdiction. Imports of carbon-intensive goods from regions without comparable GHG regulations would be required to, for example, surrender allowances to cover the “embodied” carbon content of the goods, while domestically produced goods would be granted an allowance rebate upon export to jurisdictions without comparable GHG reduction policies. These border adjustments would have the effect of “leveling the playing field” by attempting to ensure that producers within and outside the regulated jurisdiction face the same regulatory costs. Thus, these adjustments potentially limit leakage.

It is unclear whether adjustments imposed at the California border would survive legal challenges, particularly due to limits on the regulation of interstate trade imposed by the Commerce Clause of the U.S. Constitution. However, to the extent that such adjustments do survive such legal challenges, they potentially invite retaliatory measures by other states seeking to improve the competitiveness of their in-state producers.