

A Primer on the Use of Allowance Value Created under California's CO₂ Cap-and-Trade Program

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Executive Summary

The Global Warming Solutions Act of 2006, also known as AB 32, set the nation's first legally binding target on climate-disrupting greenhouse gases. One component of this program is a market-based *emissions cap-and-trade* program that will begin in 2013. Estimates of the value of tradable emissions allowances under the program in the first year alone range from roughly \$2.6 to \$7.8 billion, and will grow over time. Though the price of allowances is largely passed through to consumers in the form of higher prices for energy and other goods and services, and in some cases paid for by business, the value of the allowances including the revenue from the auction of allowances can be used to offset most of those costs.

Businesses, industries, and manufacturers included in the program receive most of the allowance value in the form of free allowances. A small fraction of allowances, with a value of roughly \$0.6 to \$1.8 billion in the first year, will be sold through an auction. That revenue will be returned to the California economy through appropriation by the legislature, in a manner that adheres to the objectives of AB 32. This might be done by returning value directly back to households or by making investments that improve the state.

By 2015 the value of all the allowances including the revenue raised from auction is expected to grow substantially when transportation fuels and natural gas are added to the program. To whom does this revenue belong? This is the key decision that should be of interest to all Californians.

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1. Where We Are Today

Motivated to avoid the potential damages climate disruption could bring to the economy, public health, natural resources and the environment, California enacted the Global Warming Solutions Act of 2006, also known as AB 32. This legislation set the nation's first legally binding target on climate-disrupting greenhouse gas (GHG) emissions and directed the Air Resources Board (ARB) to outline policies to meet it. The most important GHG is carbon dioxide (CO₂) and the most important source of emissions is combustion of fossil fuel.¹ In its Scoping Plan, the ARB drafted a suite of emissions reduction measures, such as a low-carbon fuel standard, energy efficiency and conservation measures, and a renewable portfolio standard for electricity generation. The measure attracting the most attention is ARB's market-based *emissions cap-and-trade* program, set to take effect in 2013.

The focus is mostly centered on the economic impact of the cap-and-trade program. Cap and trade has two parts. The first is the limit placed on GHGs and the corresponding combustion of fossil fuels that are embodied ubiquitously in the goods and services of California's economy. To emit one unit of pollution, a facility must surrender to regulators one emissions allowance. The second is the ability to trade allowances, which means they will have a price, which will be reflected in the price of energy and other goods and services. Ultimately, consumers and some businesses will pay the costs through higher prices. However, the allowance revenue generated by the trading of emissions allowances does not disappear—this value will cycle through the economy. The big question is: Who gets this value?

Estimates of the allowance value generated by the program in the first year alone range from roughly \$2.6 to \$7.8 billion, and will grow over time.² This value includes allowances that will be given away for free and sold through an auction. Revenues from the auction will range initially from roughly \$0.6 to \$1.8 billion, and grow substantially when transportation fuels and natural gas are added to the program in 2015. A variety of interest groups are rushing to claim a share of the allowance value created by the cap-and-trade program, and the ultimate decisions on how allowance value can and should be used are scheduled to be finalized over the next few months. Some allowances are allocated for free to protect jobs in vulnerable industries. The PUC will finalize how to utilize the value that is assigned to investor owned utilities and similar governing bodies will decide how to use the value assigned to publicly owned

¹ CO₂ is found in much greater concentrations in the atmosphere than other GHGs. CO₂ has a longer residence time (about 100 years) in the atmosphere than some GHGs like methane (about 12 years), but not as long as N₂O or HFCs. Luckily, those GHGs are found in extremely small concentrations in the atmosphere.

² Estimates are in 2007 dollars and are listed by the Economic and Allocation Advisory Committee to the ARB and California Environmental Protection Agency in their March 2010 report, "Allocating Emission Allowances Under a California Cap-and-Trade Program."

utilities. The state legislature will finalize the decision on how to utilize the revenue from the auction of a large portion of emissions allowances. These decisions are likely to impact many budgets within California, ranging from the state to the company and household levels.

This primer provides an introduction to the issues and a roadmap for decisions that will be made.

2. What is Allowance Value?

An emissions cap-and-trade program is different from previous regulations that allowed emitters to pollute for free as long as they met regulatory standards. Under cap and trade, emitters are required to surrender an emissions allowance for each unit of pollution. Since these allowances can be bought and sold, they have a price, which reflects their value in the market.

Who gets these valuable emissions allowances? Some allowances will be auctioned and some allowances will be given away for free. One might think of the allowance value as the money that comes to the auctioning agency. However, giving away allowances for free is like giving away the value. Consequently, we refer to allowance value as the value of all emissions allowances under the cap; and we refer to allowance revenue as the funds raised through an auction of a portion of the allowances.

The total allowance value, that is the value of all of the emissions allowances under the cap, will sum in the billions of dollars each year.

3. Where Will the Allowance Value Come From?

Emissions allowances have value because of the emissions cap that limits the total number of allowances issued under the program and emissions that can occur. The price emitters are willing to pay to purchase allowances determines their market value. Allowance value stems from this willingness to pay for allowances, but the actual revenue comes from the increase in the cost of energy and other goods and services under cap and trade. There is no free money—the allowance value is generated through these higher prices, paid for primarily by consumers and to some degree by businesses who participate in the California economy.

To fully understand the issues associated with allowance value, one needs to understand the basics of AB 32 and the cap-and-trade program.

a. California Emissions and AB 32

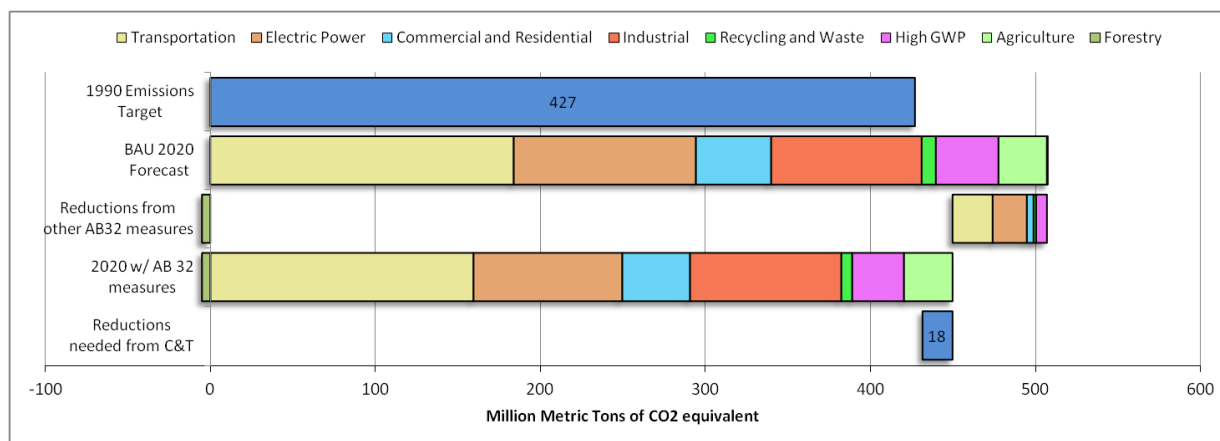
The Global Warming Solutions Act mandates that California GHG emissions return to 1990 levels by 2020. The figure below shows the sources of GHG emissions by sector estimated for 1990 (427 million metric tons of CO₂ equivalent, which is written MMTCO₂e) and the business-as-usual (BAU) projection for 2020 (507 MMTCO₂e).³ California will need to cut 80 MMTCO₂e from its BAU baseline in order to

³Final Supplement to the AB 32 Scoping Plan Functional Equivalent Document (p. 56)
http://www.arb.ca.gov/cc/scopingplan/document/final_supplement_to_sp_fed.pdf

meet the AB 32 target.⁴ In 2009, emissions in California declined to their 1999 levels (457 MMTCO₂e), due primarily to the economic downturn. With an economic recovery, BAU emissions would be expected to increase again.

The cap-and-trade program covers 85 percent of GHG sources within the State of California. (The remaining 15 percent are made up of CO₂ and other GHG emissions and come from diffuse sources such as agriculture, which are difficult to monitor and regulate.) In its first phase (2013–2015), the program begins by covering just the electricity and industry sectors, before also covering transportation fuels and natural gas in its second (2015–2017) and third (2017–2020) phases. The combined GHG emissions for industry and electricity totaled 40 percent and transportation fuels totaled 38 percent of GHG emissions in 2009 in California. Natural gas totaled 18 percent but after already accounting for the natural gas consumed in the electricity and industry sectors, the remaining natural gas accounts for only 8 percent of 2009 GHG emissions.⁵

Figure 1. Sources of GHG Emissions and Expected Reductions in 2020



Sources: Allowance numbers and emissions estimates are based on figures in ARB’s Final Regulation Order. http://www.arb.ca.gov/cc/inventory/data/tables/reductions_from_scoping_plan_measures_2010-10-28.pdf & <http://www.arb.ca.gov/cc/inventory/data/forecast.htm>

The scarcity of emissions allowances under cap and trade equates to the magnitude of the reduction required under AB 32. That said, cap and trade is one of many measures dedicated to achieving the reduction goal of 80 MMTCO₂e by 2020. Of these, 62 MMTCO₂e are expected to come from standards and measures already underway, such as the implementation of a low-carbon fuel standard, energy efficiency and conservation measures, and a 33 percent renewable portfolio standard for electricity generation.⁶ These measures are illustrated by the third bar in the figure. As illustrated by Figure 1, the roughly 18 MMTCO₂e of additional reductions are expected to come from cap and trade.

⁴Final Supplement to the AB 32 Scoping Plan Functional Equivalent Document (p. 6)

http://www.arb.ca.gov/cc/scopingplan/document/final_supplement_to_sp_fed.pdf

⁵ Emissions are based on the ARB’s California Greenhouse Gas Inventory for 2000 – 2009:

http://www.arb.ca.gov/cc/inventory/data/tables/ghg_inventory_scopingplan_00-09_2011-10-26.pdf

⁶ http://www.arb.ca.gov/cc/inventory/data/tables/reductions_from_scoping_plan_measures_2010-10-28.pdf

Firms can avoid paying the price placed on emissions under the cap-and-trade program by limiting emissions. So, firms have an incentive to look for emissions reductions even where they are not required by other regulatory standards and measures. For this reason, the program is expected to be a cost-effective mechanism to achieve the additional emissions reductions necessary to meet the overall target and *leave no low-cost emissions reductions behind*.

Box 1. Complementary Measures

In addition to the cap-and-trade program, there are several other measures that will result in significant emissions reductions from transportation, electricity, and other sources by 2020. These measures will reduce energy use or reduce the carbon content of the energy that is used, thereby lowering the cost of the cap and trade program. We list significant examples here, many of which are outlined by the ARB in their Scoping Plan to achieve AB 32.

The **Low Carbon Fuel Standard (LCFS)** mandates that the carbon content of fuels decrease by 10 percent by 2020 (a goal envisioned by Governor Schwarzenegger in Executive Order S-01-07). Its estimated emissions reduction is 15 MMT CO₂e in 2020. Court proceedings are addressing whether the LCFS violates the commerce clause as it assigns a higher carbon intensity level to out-of-state ethanol than in-state ethanol. The ARB continues to develop and enforce the program while the case is on appeal.

The **Sustainable Communities and Climate Protection Act (SB 375)** allows the ARB to establish regional GHG targets, and requires that regional planning organizations develop sustainable community strategies (SCS) to meet them. These strategies might include the development of high-density housing close to commercial and work centers and of alternative transit options, including walking, biking, public transit, carpool and road pricing. This law creates an incentive for building strong sustainable community strategies. Depending on their SCS, planning agencies are eligible to forgo or abbreviate the rigorous environmental analysis required by the California Environmental Quality Act. Its estimated emissions reduction is 3 MMT CO₂e in 2020.

A **High Speed Rail System** would link San Francisco and Anaheim with tracks allowing train speeds in excess of 200 mph. If built, it is estimated to displace 86 to 117 million passengers from road and air travel by 2030, and achieve emissions reductions around 1.0 MMT CO₂e in 2020.

California's **Million Solar Roofs** program (SB 1) was enacted in 2006 and requires home developers to either include solar power systems on new homes or to install them in other projects. Its estimated emissions reduction is 1.1 MMT CO₂e in 2020.

The **Refrigerant Management Program** was adopted by the ARB in 2009 under AB 32 and regulates the installation, service, and disposal of gases with global warming potential orders of magnitude higher than CO₂. These are used primarily in commercial cooling applications (supermarkets, cold storage, food processing, etc.). Its estimated emissions reduction is 5.8 MMT CO₂e in 2020.

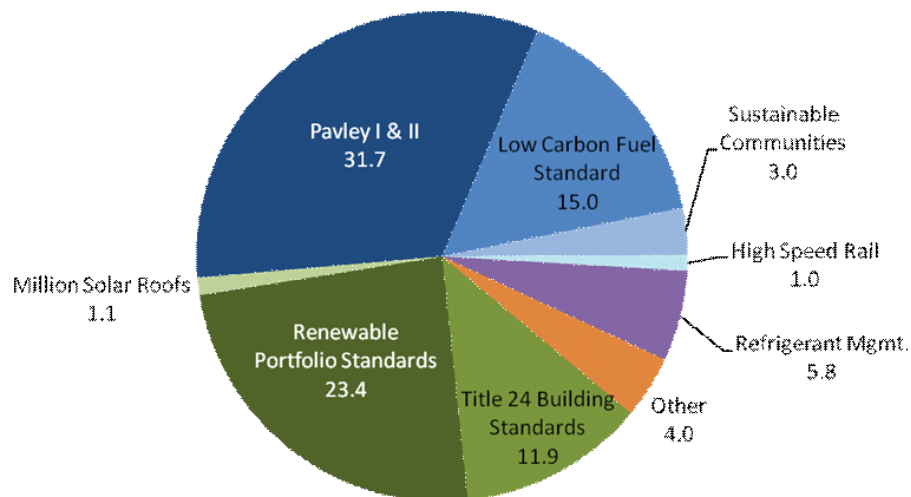
The **Renewable Portfolio Standard (RPS)** is a statewide law, (SB) 2 (1X), requiring that 33 percent of electricity originate from renewable generation sources by 2020, with interim targets of 20 percent in 2013 and 25 percent in 2016. Like SB 375, it was initially part of the Scoping Plan, but then became law under separate legislative authority. These targets build on an existing RPS that aimed for 20 percent

renewables by 2020. The new standards are expected to yield emissions reductions of 23.4 MMT CO₂e in 2020.

The **Clean Car Standards** in AB 1493 (Pavley I) passed the legislature in 2004 and require greater fuel efficiency and lower GHG emissions from California automobiles of model year 2012 through 2016. The Advanced Clean Car Standards (Pavley II) tightens these for passenger vehicles of model years 2017-2025 and mandates that California passenger vehicle fleets meet a 42.5 miles per gallon efficiency by 2020. The ARB estimates that the Pavley I and II standards will lead to reductions of 31.7 MMT CO₂e in 2020 compared to business as usual.

Title 24 Building Energy Efficiency Standards were established in 1976 under the Warren-Alquist Act and are updated periodically. In 2008 they required newly constructed buildings to comply with updated lighting, HVAC, insulation, and other efficiency standards. The estimated emissions reductions from these updated standards are 11.9 MMT CO₂e in 2020.

Emissions Reductions in 2020 from Scoping Plan and Other Measures (MMT CO₂e)



Box 2. Basic Features of the Cap-and-Trade Program

What gases are covered? Carbon dioxide (CO₂) is the most important gas covered in the cap and-trade program. Other covered gases include methane, nitrous oxide, sulfur hexafluoride, hydrofluorocarbons, perfluorocarbons, nitrogen trifluoride, and other fluorinated GHGs.

When does the program begin? The program is split into three compliance periods. The first is from 2013 to 2014, the second from 2015 to 2017, and the third from 2018 to 2020.

Who needs to comply? Entities covered by the cap-and-trade program include first deliverers of electricity (entities that deliver power into the California electricity grid), operators of industrial facilities (cement, refineries, and fertilizer plants, for example), and suppliers of transportation fuels and natural gas. The electricity and industrial entities must begin to comply starting in 2013, while the suppliers of transportation fuels begin in 2015. These sources comprise an estimated 85 percent of California's total GHG emissions today, 83 percent in 2015 and 81 percent in 2020 under the BAU baseline forecasts.

How does it work? The program relies on requiring covered entities to surrender allowances for each ton of emissions produced. Allowances are made available through either a direct allocation to the firm or through a purchase in the general auction or secondary market. The availability of allowances declines, corresponding to a tightening of the cap over time.

How does the cap decline? The cap-and-trade program begins with an annual cap of 163 million allowances in 2013 when it covers the industry and electricity sectors, which are forecast to have emissions of 167 million metric tons under the BAU baseline. The cap increases in 2015 to 395 million allowances when transportation fuels and natural gas become covered, and the total estimated emissions covered total 407 million metric tons under the BAU baseline. From 2015 and going forward, the cap declines, arriving at 334.2 million allowances in 2020, when BAU baseline emissions for sources under the cap are forecast to be 409 million metric tons. Throughout the program, the cap is always below the forecast emissions from covered sources, and although the cap is set well below forecast emissions in 2020, both the cap-and-trade program along with other measures will be responsible for achieving the AB 32 emissions reductions target.

What is the role of emissions offsets? Offsets are reductions in emissions that occur outside the emissions sources covered by the cap. Offsets also include measures that take CO₂ out of the atmosphere, such as forest preservation. A regulated source can use offsets to meet up to 8 percent of its compliance obligation in any one year. As of now, no international offsets can be used.

What are the auctions going to be like? The first auction will be held on November 14, 2012. Beginning in 2013, four auctions will be held per year on the twelfth business day of February, May, August, and September. The auctions will be a uniform price, single round, and sealed bid format. Allowances will be given first to the bidder with the highest bid and in declining order by bid until supply is exhausted. Winners pay the lowest bid offered by a winning party. The auction will have a reserve price initially set at \$10 per ton and increasing over time; this will function to establish a minimum price for allowances.

What happens to revenue from the auction? Revenues from allowances sold by the electricity sector are to be returned to the utility customers; how that will occur, however, is yet to be decided by California's Public Utility Commission (PUC). The decision of how to use the revenue from the auction of other allowances is also in question, and is in the process of being decided by the governor and the state legislature.

What is the price containment reserve? The reserve is intended to protect against unanticipated price increases. The reserve will contain four percent of cumulative allowances from 2013 to 2020 and will be available through direct sale at three price levels, starting at \$40, \$45, and \$50.

Who gets a direct allocation of allowances? The electricity sector receives a direct allocation of 96 million allowances in 2013, declining to 83 million in 2020; however, the investor-owned utilities must

liquidate their share of allowances through the general auction. Specific industries also begin with direct allocation because they are unable to recoup costs associated with compliance or because they face out-of-state competition. In total, this direct allocation begins at roughly 60 million allowances in 2013 and declines over time.

b. How Will Cap and Trade Address Climate Disruption?

As noted above, cap and trade has two parts. The first part is the emissions cap, which places an overall limit on the total emissions that can occur at facilities covered by the program. In California's program, each allowance authorizes one metric ton of CO₂ to be emitted into the atmosphere. To emit one unit of pollution, a facility must surrender to regulators one allowance.⁷ The number of available allowances plus some allowances that are held in reserve equals the total emissions cap.

The second part is the ability to trade emissions allowances. To comply with the law, a facility might buy an emissions allowance to meet its obligation. Alternatively, a facility might reduce its emissions. In doing so, it avoids the cost of buying an emissions allowance to surrender to the regulator. Facilities can also sell unused allowances to other sources. It is expected that the process of trading will do a better job of finding the low-cost opportunities than could regulators if they were to mandate specific emissions reductions. Because regulators do not have private information about the equipment and operations at each firm, they cannot identify all the low-cost opportunities that individual firms can. Under a prescriptive regulation, facilities have an incentive to hide their options to reduce pollution to avoid the costs of investments in pollution control. In contrast, under cap and trade, facilities have an incentive to find and exploit their low-cost options to avoid the cost of using allowances.

Cap and trade has been used in many other pollution programs over the last two decades and it consistently has been found to substantially reduce the overall costs of emissions reductions. The most well-known example is the sulfur dioxide emissions trading program created under the 1990 Clean Air Act amendments. This program reduced costs by at least 40 percent, saving billions of dollars.⁸ This cost savings helps address climate disruption because trading makes it possible to achieve a greater amount of emissions reductions at the same total cost.

c. The Allowance Value Will Be Substantial

The allowance value is dependent on the quantity and price of allowances. The quantity is determined by the cap. The price is determined by various factors but most importantly by the decisions of individual firms.⁹ In coming up with its compliance strategy, a firm will evaluate whether it is less

⁷ Facilities can also surrender eligible offset credits. These are acquired by verifying GHG emissions reductions from sources outside the cap. As noted earlier, these include CO₂ and other GHGs from sources like agriculture that are difficult to regulate directly.

⁸ The cost savings would be substantially greater if compared against a technology forcing approach that had previously been proposed in Congress. See: Carlson et al. 2000. "SO₂ Control by Electric Utilities: What are the Gains from Trade?" *Journal of Political Economy* 108(6): 1292–1326; and Ellerman et al. 2000. *Markets for Clean Air*: Cambridge University Press.

⁹ Many cap-and-trade design elements also affect allowance prices: the stringency of the cap, the method by which allowances are initially distributed, whether allowances from one year can be banked for use in the future,

expensive to reduce emissions by an additional ton or to purchase an allowance. If the cost of reducing emissions is less than the price of an allowance, the firm would reduce emissions and sell its extra allowances into the market (or avoid buying additional allowances). Otherwise, the firm would purchase an allowance to cover its continued emissions. The regular auctions of emissions allowances will help identify their market price and make the value of emissions reductions even more salient, especially for those firms looking to buy allowances at the auction. Because all firms are expected make the same calculation, the cost of reducing an additional ton of emissions is expected to be about equal at all firms. In this way, the equilibrium allowance price will reflect the private information that individual firms use to make profit maximizing decisions.

The allowance value is the sum of value for the approximately 160 million allowances introduced into the market in 2012 and 2013, increasing to 378 million allowances in 2015 when the heating and transportation fuels are added to the program. At an allowance price of \$20.92 per metric ton, this value would total roughly \$7.9 billion (\$2012) for allowances sold with a 2015 vintage.¹⁰ The value is uncertain because the price is uncertain, but the price is bounded on the low side by the price floor of \$10 and to a limited degree on the high side by the allowance reserve trigger prices beginning at \$40, with both rising 5 percent per year.

There are many possible uses of allowance value, including giving it to firms or consumers as compensation through free allowance allocation, or directing it to an allowance auction and using the auction revenue to address a variety of public policy objectives. To consider these options one needs to consider who pays the costs of the program and to whom the allowance value ultimately belongs.

d. Who Pays the Cost of Cap and Trade?

There are two parts to the cost of the program. A relatively small share of the increase in energy costs will be due to the cost of actual investments to reduce emissions by 80 MMTCO₂e. The larger share will be due to the cost of emissions allowances. This share is larger because the allowance cost applies not to the emissions that have been reduced, but to each remaining unit of pollution totaling the 378 MMTCO₂e cap. This is the mechanism of a market-based policy. It ensures that the polluter pays for pollution and consequently it produces allowance value.¹¹

Because carbon and other GHGs are embedded throughout the economy, everyone in California will share the cost of the cap-and-trade program. The cost will show up in the price of energy and energy-intensive goods and services. This is true whether firms buy emissions allowances through an auction or receive allowances for free. If firms buy allowances through an auction, the revenue from the auction

whether or not offsets are allowed and available, whether the program is linked to other states or jurisdictions and whether or not the complementary measures in place such as investments in efficiency and the renewable portfolio standard effectively reduce emissions.

¹⁰ Allowance prices are forecast to be \$15.90 (\$2012/Mt) in 2013, \$20.92 in 2015, rising to \$36.94 for in 2020. Allowance prices were taken from the [2011 Market Price Referent](#), which uses the allowance prices from a 2009 CO₂ price forecast report from Synapse Energy Economics. Prices have been converted to 2012 dollars and metric tons of CO₂.

¹¹ For an introduction see Burtraw and Palmer 2008. "Compensation Rules for Climate Policy in the Electricity Sector," 2008. *Journal of Policy Analysis and Management*, 27 (4):819-847.

accrues to the state and is to be distributed through the legislative process. If, on the other hand, allowances are given for free to emitters, the value associated with those allowances is given away with them. Allowances are equally valuable whether they are bought in the market, in an auction, or received for free. Consequently, firms will charge customers for their value by charging higher prices, whether they receive them at an auction or for free.

The exact increase in various product prices is uncertain, though it will depend on a few known factors, such as the market price of allowances and the ability of regulated sources to pass the price of allowances on to consumers. Most costs will be passed on to consumers; only some covered sources will be unable to do so. These include firms that produce goods that consumers will easily forgo if the price increases, such as non-essential luxury items or products that can easily be replaced by less expensive substitutes. It also includes firms that face competition from out-of-state companies that do not have to comply with California's emission target. In these cases the owners of firms will bear the cost, but in most cases the cost will fall on households.

Therefore, commensurate with the increase in costs faced by some firms and all households is the introduction of significant allowance value. On net, allowance value has the possibility of offsetting most of the costs of the cap-and-trade program. Depending on how the allowance value is used, in fact, it could stimulate growth leading to a net economic benefit.

4. To Whom Does the Allowance Value Belong?

As discussed previously, billions of dollars value is associated with the sale, allocation, and trading of emissions allowances that authorize the right to emit into the public atmosphere. So then, to whom does this revenue belong?

One view is that the atmosphere is natural property under the domain of individuals. If the resource is being depleted by overuse, this view would argue for the equivalent of squatters' rights, granting incumbent emitters the right to continuing use of the resource, so called "grandfathering." This view was rejected by an advisory committee to the ARB, citing a number of problems associated with free allocation of emissions allowances to incumbent emitters.¹²

A different view is that the atmosphere is like many public spaces—many use it, but no single owner has sole responsibility for its care. These public spaces are referred to as "common property resources" because they are owned in common. Presently, AB 32's cap-and-trade program places intangible property rights on the atmosphere and restricts the release of California's GHG pollutants into it. One could argue that the cost of emissions allowances is a payment for an environmental service provided by the atmosphere or that it is compensation to the owners of the atmosphere for its degradation. Further, since consumers bear most of the cost of the program, one could argue the allowance revenue is

¹² Economic and Allocation Advisory Committee, March 2010, "Allocating Emissions Allowances Under a California Cap-and-Trade Program," http://www.arb.ca.gov/cc/scopingplan/economics-sp/updated-analysis/updated_sp_analysis.pdf.

primarily the money of individuals and households. Another view is that the atmosphere is a resource that belongs to the state. This view would support the argument that allowance value could be considered part of the general funds.

These arguments lead the ARB's advisory committee to the conclusion that—like the atmosphere—the allowance value belongs to all Californians. Returning the allowance revenue or a similar benefit to all Californians can take a variety of forms in practice, which we discuss below.

5. How Might the Allowance Value Be Used?

Conceptually, there are many ways the revenues might be used but, in practice, the choices are constrained by law, by the legislative intent expressed in AB 32, and by regulatory decisions already in place.

a. A Conceptual Answer

An advisory committee to the ARB listed four conceptual options for the use of allowance value that exist in a perfect or “first-best” world, which we paraphrase at length here.¹³

1. One approach would be to **ameliorate adverse impacts** that might otherwise occur to various parties as a result of AB 32. The portfolio of standards and measures under AB 32 may place burdens on some households and firms, for example by raising fuel and energy prices. These price increases may be especially burdensome to low-income households. The policy may also negatively affect businesses whose products are energy intensive and that face competition from out-of-state businesses that do not have similar regulatory constraints. Free output-based allocation of allowances to such firms provides an incentive to keep jobs and economic activity in the state. Because it is based on output, the allocation would be reduced if the firm reduces its level of economic activity.
2. A second approach would be to **finance government expenditures** of various kinds. In this case allowances might be auctioned and the revenue used to fund priorities such as education, infrastructure, health services, or other statewide objectives. More compelling may be to fund programs related to the goals of AB 32, helping households, industry, local governments, and the state to adopt cleaner technologies and reduce emissions. This approach supports large investments in transportation and land-use infrastructure. It might promote public efforts to overcome market barriers to new emissions-reducing technologies. It could also support projects to remediate the vulnerability of disadvantaged communities to climate change and other environmental problems.

¹³ Economic and Allocation Advisory Committee, March 2010, “Allocating Emissions Allowances Under a California Cap-and-Trade Program,” http://www.arb.ca.gov/cc/scopingplan/economics-sp/updated-analysis/updated_sp_analysis.pdf.

3. A third approach would be to **return allowance value to households through dividends** to the general public. One justification would be to compensate households for the increase in energy costs caused by measures in AB 32, including cap and trade. This would lead to the conclusion that compensation should be tied to the costs incurred and that households that incur a greater cost should receive more compensation.

A different justification would be to compensate households for the damage to the environment from pollution. Support for this use stems from the idea that the atmosphere is a common property resource, owned by the general public, and that the allowance value is payment for its use by emitters. This reasoning would conclude that each individual should receive equal compensation, perhaps through direct payments or dividends as occurs in Alaska in the form of royalties from oil and gas development. For a point of comparison, with California's population projection in 2020 of roughly 44.1 million and an allowance price of \$37, equal dividends per capita would result in payments of \$205 per person on an annual basis in 2020.¹⁴

4. A fourth approach promoted by public finance economists would be to auction allowances and use revenues to **reduce current taxes or prevent future tax increases**. Though it is widely understood that at least some level of tax revenues is essential, it is also widely understood that the collection of taxes often has unfortunate and unintended effects. Many economists believe that most existing taxes lead to inefficiencies that tend to slow economic growth by discouraging work effort, saving, and investment. These inefficiencies result because some of the returns to economic activity (work) are taxed away, reducing the incentive for it. By lowering the tax rate, allowance revenues from cap and trade would help the economy to grow.

The second, third and fourth options are made possible through the auction of allowances and the use of revenue from the auction.

One approach that was explicitly rejected by the ARB's advisory committee was delegating allowance value (or equivalently, giving allowances away for free) as compensation to the regulated firms. This approach is called "*grandfathering*" because it gives special status to the incumbent emitters. It was used in the first large-scale cap-and-trade program for sulfur dioxide emitted from power plants in the United States and in the early phases of the European Union's Emissions Trading Scheme. Grandfathering has been criticized for a number of reasons, including that firms often earn windfall profits under this scheme because they can charge consumers for emissions allowances through higher product prices even when they receive allowances for free. Concern about windfall profits led the northeast states participating in their regional cap-and-trade program (the Regional Greenhouse Gas

¹⁴ Population estimate is taken from California Department of Finance, Demographics Research Unit: County Total Population By Decade
http://www.dof.ca.gov/html/demograp/reportspapers/projections/p1/documents/p1_press_release_7-07.pdf. Subsequent estimates were based on carbon price projections found in the 2011 Market Price Referent (MPR), which uses carbon price projections from a 2009 CO₂ price forecast report from the Synapse Energy Economics and have been converted to 2012 dollars and metric tons of CO₂:
http://docs.cpuc.ca.gov/word_pdf/FINAL_RESOLUTION/154753.pdf.

Initiative) to rely almost exclusively on auctioning to initially distribute emissions allowances. The EU will also auction allowances on a wide scale in the third phase of its program in 2013.

The option to *ameliorate adverse impacts* for firms differs from grandfathering in an important way. Unlike grandfathering, which gives away allowance value based on incumbency status, output-based allocation makes a strategic assignment of allowance value to offset the costs for firms that face competition from out-of-state producers. If firms reduce activity in the state, their future allocation is reduced proportionately, giving them an incentive to remain in the state. For those firms that cannot raise prices there should be no possibility for them to earn windfall profits. Also, in perfectly competitive markets there should be little possibility to earn windfall profits.¹⁵ However, in general if free output allocation is given to firms that can raise prices there is a possibility for windfall profits and this approach should be used cautiously.

b. Practical Options

While the four options listed above exist conceptually, there are legal and practical limitations on how allowance value can be used.¹⁶ A related study published by Next 10 outlines the legal issues surrounding these options.¹⁷

The first is the 1997 Sinclair Paint Company versus the State Board of Equalization ruling, in which the California Supreme Court established the need for a clear link (“nexus”) between the activity on which a fee is levied and the way any resulting revenues are used. The allowance value stems from pollution, so this legal constraint implies that allowance value including revenues from an auction must be used for a purpose related to that pollution.¹⁸ One example is financing further emissions reductions. The intent of AB 32 is somewhat broader, calling for regulations including the distribution of emissions allowances in a manner that is equitable and seeks to maximize total benefits, protect vulnerable communities from the effects of the policy including costs and ancillary environmental impacts, and maximizes additional environmental and economic benefits. Revenues from an auction can therefore probably be used for purposes in relative proportion to these goals but must be limited to these purposes.¹⁹ Directing revenue to the general fund for new, unrelated programs or to reduce marginal tax rates appears to be precluded.

¹⁵ In competitive markets the output based allocation is an output subsidy that reduces variable production costs and offsets potential increases in prices.

¹⁶ . Legislative Analyst’s Office, “The 2012-13 Budget: Cap-and-Trade Auction Revenues,” February 16, 2012. <http://www.lao.ca.gov/analysis/2012/resources/cap-and-trade-auction-revenues-021612.aspx>.

¹⁷ Farber, D. and D. Lambe, 2012. *Proposition 13 and Proposition 26: Spending California’s Cap-and-Trade Auction Proceeds*. www.next10.org

¹⁸ Another limitation on the state is Proposition 26 that passed in 2010. It requires that fees that benefit the public broadly might be considered a tax and be subject to a two-thirds vote in support in the legislature, and some portion of those fees would be spent on K–12 public schools and community colleges. The cap-and-trade program is probably not subject to this constraint because AB 32 was passed before Jan 1, 2010, the retroactive start date for Proposition 26.

¹⁹ Horowitz et al. 2012. *Spending California’s Cap-and-Trade Auction Revenue: Understanding the Sinclair Paint Risk Spectrum*. Emmet Center on Climate Change and the Environment, UCLA School of Law. http://cdn.law.ucla.edu/SiteCollectionDocuments/Centers%20and%20Programs/Emmett%20Center%20on%20Climate%20Change%20and%20the%20Environment/Spending_CA_Cap_and_Trade_Revenue_March_2012.pdf

Another consideration is the requirement that tax increases require a two-thirds majority vote in the legislature. Proposition 26, approved by voters in 2010, expanded the definition of a tax and made clear that a two-thirds majority vote would be needed for any uses of allowance revenues that did not pass the Sinclair-nexus test.²⁰

In a practical sense, some decisions are already underway that will affect where revenues go. AB 32 directed the ARB to propose and approve regulations to achieve AB 32. In its Final Regulation Order, the ARB outlines three general objectives for revenues. Although these objectives are broad rather than specific, they offer some general guidance as to how the allowance value will be distributed.

- 1) Revenues generated from the auction of ***electricity sector allowances should be returned to ratepayers.***

This objective would be achieved by directing revenue to the benefit of electricity ratepayers in all customer classes. Of these, about two-thirds of revenues would go to investor-owned utilities or IOUs, which include Pacific Gas and Electric (PG&E), Southern California Edison (SCE), PacifiCorp and San Diego Gas and Electric (SDG&E). The other one-third would go to publicly owned utilities (POUs). Returning revenues to ratepayers draws on the conceptual option to ameliorate adverse impacts. Also, depending on how the Public Utilities Commission (PUC) implements this policy, it could also draw on the conceptual option to direct investment in measures that promote energy efficiency and emissions reductions and thus support the goals of AB 32.

For both the IOUs and POUs, the value of allowances directed to the electricity sector in 2013–2014 accounts for roughly 42 percent of the total value of allowances with vintage 2013–2014, the first phase of the program. In the second phase, beginning in 2015, the program will expand to cover natural gas and transportation fuels, and electricity’s share of the total value of allowances will fall to 22 percent (the bottom portion of allowances illustrated in green in Figure 2).

- 2) Some allowance value should be used to ***protect emissions-intensive, trade-exposed industries*** within California.

Under its second objective, the ARB aims to use allowance value to protect emissions-intensive, trade-exposed industries to offset their increase in costs and make them less vulnerable to competition from outside the state. This group constitutes a majority of emissions from the industrial sector. This draws squarely on the conceptual option to ameliorate adverse impacts and accounts for 26 percent of the total value of allowances in 2013–2014, falling to 12 percent in 2015 (the middle portion of allowances illustrated in red in Figure 2).

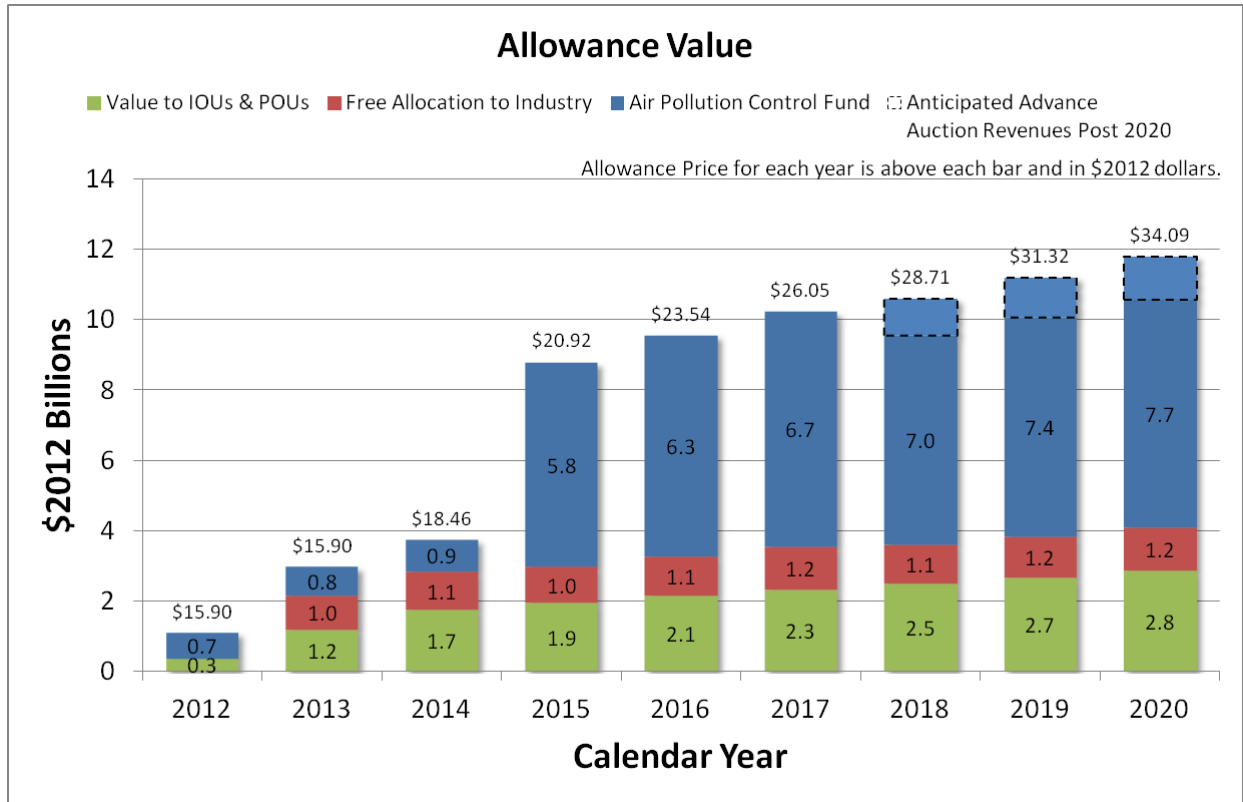
- 3) Remaining allowances should be auctioned, and revenues from the ***general auction will be deposited into the Air Pollution Control Fund*** and should be used to advance the objectives of AB32.

²⁰ All tax proceeds in California are also subject to Proposition 98, which directs a portion of all General Fund revenues to public schools and community colleges.

This approach would implement the conceptual option to finance government expenditures. As mentioned previously and illustrated in Figure 2, the fund will collect a relatively small share of total allowance value in 2012 and 2013, ranging from \$0.6 to \$1.8 billion, resulting primarily from the early auction of allowances with vintage 2015.²¹ However, the revenue in the fund will grow substantially in 2015, when suppliers of natural gas and transportation fuels come under the cap and are required to purchase allowances to cover their emissions. In 2015, revenues from the auction that will enter the fund will total \$5.8 billion; where \$4.9 billion will be generated at the general auction and \$0.9 billion at the advance auction (the top portion of allowances illustrated in blue in Figure 2).

Though important remaining decisions surround the near-term uses of revenue from the allowance auction, the most important decision still before us concerns the use of the substantial revenues that will accrue to the Air Pollution Fund in the long run.

Figure 2. Allowance Value Associated with Uses through 2020



6. Who Decides How Allowance Value Will Be Used?

As the agency tasked with creating regulations for the design of the cap-and-trade program, the ARB has already approved how to use allowance value to protect energy-intensive industry that is subject to out-

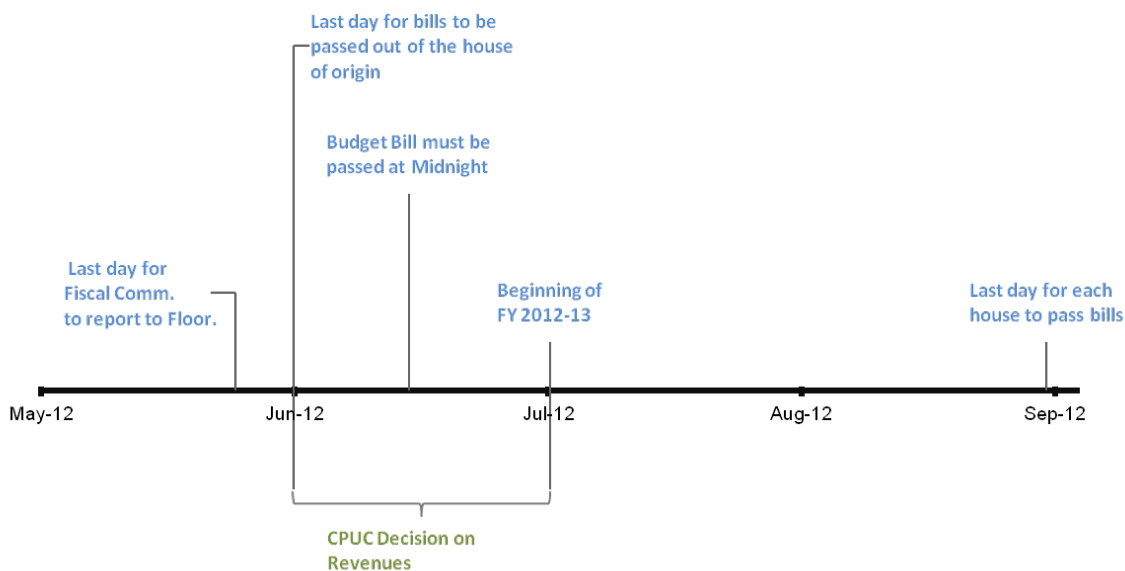
²¹ The allowance price forecast used in these estimates is described in footnote 10.

of-state competition. The ARB set out to identify these industries and to establish rules for allocating allowances to them for free in their Initial Statement of Reasons, released in October 2010. The ARB held two commenting periods and several workshops to solicit input from industries across the state until a final rulemaking affecting industry was approved in December 2011.

Figure 3 provides a timeline of decisions still underway and that will take effect in the next fiscal year affecting the two other uses of allowance value: the value assigned to electricity ratepayers and the revenue that will accrue in the Air Pollution Control Fund. In green is a bracket of time in which the PUC’s final rulemaking on allowance revenue associated with IOUs in the electricity sector is expected. Publicly owned utilities will make decisions according to various individual timelines. In blue are the legislative and executive actions and decisions that will determine who and what processes will control the revenue in the Air Pollution Control Fund.

Figure 3. Decision Timeline for 2012

Air Pollution Control Fund and Electric Utility Revenue Decision Timeline



Within its process of establishing regulations, the Executive Officer of the ARB worked with the PUC to hold a formal review of options to distribute allowance value to electric ratepayers. A final regulation is expected in June 2012.²² About two-thirds of the allowance value directed to the electricity sector is allocated to IOUs. The PUC will likely direct the majority or perhaps all of the value from the IOU allocation to offset increases in electricity prices. About one-third of the allowance value for the

²² The PUC’s official rulemaking (R1103012) began in March 2011 to decide how revenues would be returned to ratepayers. On January 6, 2012 many parties submitted proposals to the PUC.

electricity sector will go to publicly owned utilities whose governing boards will independently make decisions about how to use the allowance value.

Auction revenue that will accrue in the Air Pollution Control Fund is discussed in the governor's proposed budget for 2012–2013. The budget offers estimates that \$500 million already have been appropriated from general fund to existing GHG reduction activities and these costs will be offset by this new revenue from the 2012–2013 auctions.²³ The budget assumes that the other \$500 million expected to be raised in the auctions will be dedicated to clean fuel and energy efficiency; low-carbon transportation; natural resource protection; and sustainable infrastructure. Under the trailer bill attached to the budget, the Governor would give the legislature 30 days to approve any expenditure plans.

In the legislature, SB 1572 (Pavley) and AB 1532 (Perez) offer criteria and legislative oversight provisions that would mandate how the governor and state agencies could appropriate revenues in the fund. These bills are currently working their way through respective environmental and fiscal committees within the Senate and Assembly. If they go to a full vote of the legislature, each must be passed by a simple majority vote by August 31, 2012. The important dates in this process are detailed in Figure 3.

Both bills would create a Greenhouse Gas Reduction Account within the fund and would grant the legislature the power to assign criteria for the spending of the revenues and the power to appropriate them. Meanwhile, the governor's budget must be approved much sooner: by June 15, 2012. The trailer bill attached to the budget would also create a Greenhouse Gas Reduction Account within the fund, would grant the executive branch appropriation power, and would require that the legislature have a minimum of 30 days to review and approve any spending plans. Note: This should probably say "review and approve..." It is worth noting that until the budget has been enacted, the legislature cannot send the governor any bill appropriating funds for the same fiscal year.²⁴ Ultimately, before September 12, the governor and the legislature will have to come to agreement on how money from the fund will be deposited, controlled, and spent. ARB and other state agencies will likely support and carry out expenditure plans that fall within their jurisdiction.

The decision regarding the pending budget is important, but especially so because it will have implications for management of the fund in the long run. The real issue is how allowance value will be used in 2015 and beyond, when the annual auction revenues coming into the fund grow to \$5.8 to \$7.7 billion (\$2012) from 2015 to 2020.²⁵

²³ The Legislative Analyst's Office has questioned this amount, suggesting that a much smaller percentage of current appropriations would qualify given the legal constraints of the Sinclair test. "The 2012-13 Budget: Cap-and-Trade Auction Revenues," February 16, 2012. <http://www.lao.ca.gov/analysis/2012/resources/cap-and-trade-auction-revenues-021612.aspx>.

²⁴ California Constitution Article 4 Section 12; http://www.leginfo.ca.gov/const/article_4.

²⁵ The allowance price forecast used in these estimates is described in footnote 10.

7. How Will This Decision Affect California?

The ultimate economic impact of the cap-and-trade program, whether positive or negative, hinges on whether or not the use of allowance value makes it easier or harder to produce and consume goods and services in California. Most of the research on the statewide effects of the cap-and-trade program assumes that all revenues would be returned to households (which, as noted, would likely require legislative approval). This approach preserves allowance value in the economy and subsequently is expected to have a modest economic impact on the state. In fact, depending on how revenues are returned there could be a stimulus effect in the economy.²⁶ The ARB predicts that gross state product could decrease by as much as 1.4 percent or increase by as much as 0.2 percent. This finding is supported in studies by Charles River Associates and analysis for Next 10 by Roland-Holst and separately by Rose et al. who estimate similarly minimal impacts on gross state product through 2020.²⁷ In a new study sponsored by Next 10, Roland-Holst examines the positive impacts on gross state product of directing allowance value to various purposes.²⁸ In contrast, unregulated climate disturbance could significantly reduce gross state product.

The ARB analysis also finds that cap and trade and other AB 32 policies will not disproportionately impact small businesses. This is not surprising, as small businesses are not directly regulated under AB 32 and will not have to cut emissions or purchase allowances to cover them. They will see the added cost of carbon in the energy they buy (electricity, natural gas, and gasoline), but small businesses are relatively light consumers of energy. Small businesses are usually local and typically do not face competition from out-of-state competitors. Small business that are able to make energy efficiency investments or that can easily pass the costs of carbon through to the price of their goods and services will have a relative advantage over others.²⁹

The industries that might have been negatively affected by cap and trade are the deliverers of energy (utilities) or the energy-intensive industries subject to competition from out of state, but these industries receive free allocation specifically to ensure their ongoing activity in the state.³⁰

²⁶ Economic and Allocation Advisory Committee, March 2010, Allocating Emissions Allowances Under a California Cap-and-Trade Program (p. 31); http://www.arb.ca.gov/cc/scopingplan/economics-sp/updated-analysis/updated_sp_analysis.pdf.

²⁷ Revised Appendix D to EAAC report Updated Economic Analysis of California's Climate Change Scoping Plan March 24, 2010 (p. 19); http://www.arb.ca.gov/cc/scopingplan/economics-sp/updated-analysis/updated_sp_analysis.pdf.

Next 10, 2010. *Designing the Allocation Process for California's Greenhouse Gas Emissions Trading Program: The multi-billion dollar question*, (December) http://www.next10.org/sites/next10.huang.radicaldesigns.org/files/Next_10_Summary_Report.pdf

²⁸ Roland-Holst, D. 2012. *Options for Cap and Trade Auction Revenue Allocation: An Economic Assessment for California*. www.Next10.org

²⁹ Economic and Allocation Advisory Committee, Updated Economic Analysis of California's Climate Change Scoping Plan March 24, 2010(ES-8) http://www.arb.ca.gov/cc/scopingplan/economics-sp/updated-analysis/updated_sp_analysis.pdf.

³⁰ ARB, "Updated Economic Analysis of AB 32 Scoping Plan," March, 2010.

Even with free allocation to utilities and industry, the lion's share of allowance value is the remaining allowances that will be added to the program in 2015. Assuming the allowances are auctioned and the revenue is returned to households, studies estimate that the effect of AB 32 policies, including cap and trade, will decrease personal income by less than 1 percent. Nonetheless, there are important questions about *how* allowance value is returned to households. While we already discussed the direct return of auction revenues to households, directing revenues to the state's general fund to thereby reduce the need for other taxes is an alternative approach. In the long run, this may have greater beneficial effects for the state's economy. In the short run, however, given the possibility of continued economic sluggishness the economy might benefit from an infusion of direct spending that would result if revenues were returned directly to households rather than used to balance the budget or reduce other taxes.

The governor and the California legislature may decide on a very different outcome—to retain allowance revenues for other purposes. This decision could trigger new economic activities and opportunities in the state. Various proposals include small-scale funding of community programs to large-scale investment in new transportation and land-use infrastructure. The ARB's advisory committee also discussed the opportunity for investments in innovation, which some authors have found could have substantial benefits for the state.³¹

In summary, the decision about how to direct allowance value represents a rare opportunity and will influence the level of investment and distribution of wealth in the state well into the future.

8. How Will This Decision Affect Me?

As a consumer, you will face the cost of carbon in electricity rates, natural gas rates, and in transportation fuels. You will also benefit from the use of revenue raised in an allowance auction, or receive these revenues directly, which should offset most of these costs. Moreover other measures implemented by state agencies (see Box 1) will reduce your energy use and carbon in the fuels you use. These measures will help reduce the cost of the cap and trade program.

1. Do You Use Electricity?

On average, electricity will become more expensive due to the new cost of carbon at least in the short to medium term. However, as electricity and other energy use falls total household bills could also decline.³² If you are a low-income household enrolled in the California Alternative Rates for Energy (CARE) program, your household will be protected from rate increases. Similarly, if you consume

³¹ For example, Roland-Holst explores a scenario in which AB 32 delivers a small boost to the rate of innovation in energy efficiency leading to expanded employment, gross state product and income per capita. See: Next 10, 2010. *Designing the Allocation Process for California's Greenhouse Gas Emissions Trading Program: The multi-billion dollar question*, (December)

http://www.next10.org/sites/next10.huang.radicaldesigns.org/files/Next_10_Summary_Report.pdf

³² Keith et al. 2011. *Toward a Sustainable Future for the U.S. Power Sector*, Synapse Energy Economics, Inc. <http://worc.org/userfiles/file/Clean%20Energy/Synapse-Toward-a-Sustainable-Future-11-11.pdf>.

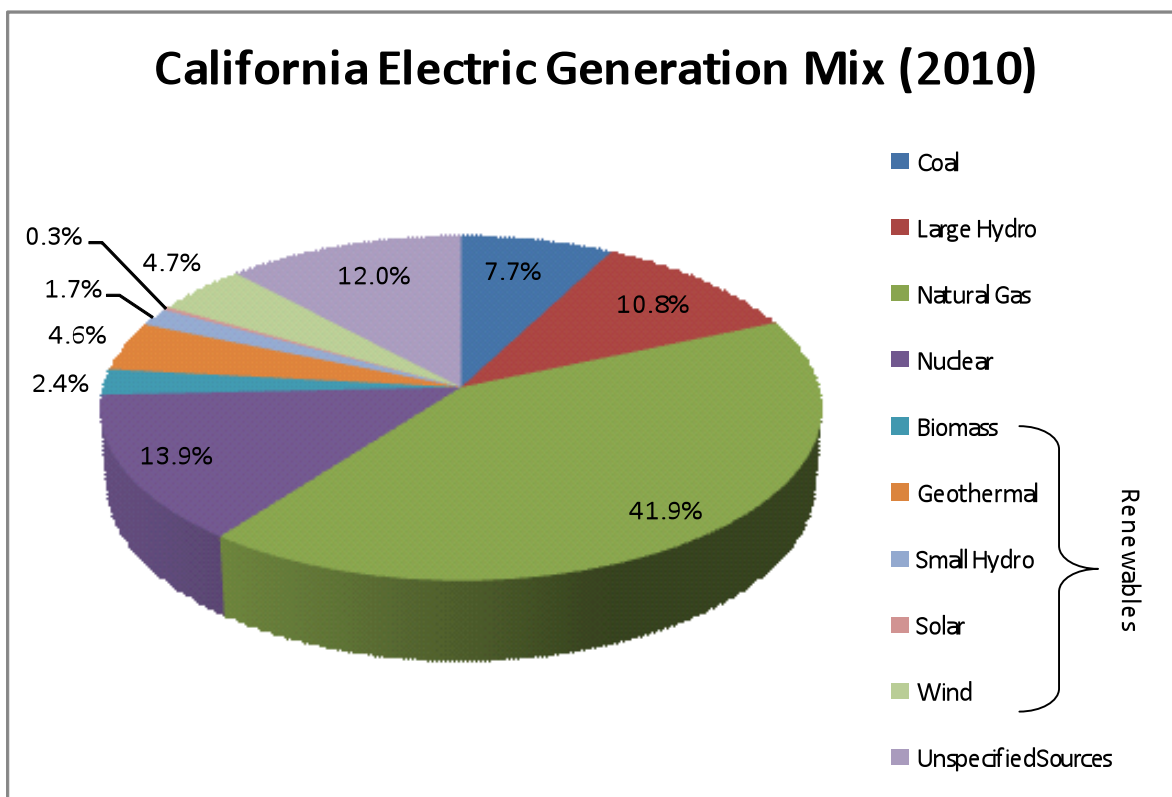
relatively little electricity and are exclusively a Tier 1 or Tier 2 ratepayer, your bill is not likely to increase.³³ Otherwise, ratepayers will probably see electric bills rise. This rise will be in proportion to the carbon pollution released from the generators that supply your electric power, which varies across different utilities that service different areas across the state. For example, PG&E, which operates in northern California, generates a larger proportion of its power from carbon-free sources³⁴ compared with many other utilities and subsequently has relatively lower carbon intensity. Initially, relatively more emissions allowances are given to utilities with greater carbon intensity, so ratepayers across the state would see a comparable impact on electricity costs. Over time, however, the allocation evolves so that customers of utilities with greater carbon intensity would see greater cost increases.

The mix of sources used to supply electricity across California (in 2010) is illustrated in the pie chart in Figure 4. The mix that your utility uses may look different. Coal-fired electricity has roughly twice the carbon emissions of natural gas. If your utility sells power that is generated with coal or natural gas, you will pay for carbon emissions. Power generated from hydroelectric sources, nuclear, and renewable fuels has little to no associated carbon emissions. The total mix of renewable sources in 2010 was 13.8 percent and is expected to grow to 33 percent in 2020 given the Renewable Portfolio Standard set in AB 32.

³³ In California, electricity rates are tiered using a baseline quantity of electricity consumed. The baseline is calculated using climate, season, and the electricity usage within a given “climate zone.” A household consuming at or below the baseline quantity in a given month is in Tier 1. However if a household consumes over 100 percent of baseline, they fall into the upper tiers. The cost of electricity consumed in each additional tier is higher, to encourage conservation and to keep rates low for households who do not use much electricity or who require low-cost electricity based on medical needs or poverty thresholds.

³⁴ PG&E reports that for 2010, nearly 16 percent of its electricity came from sources eligible for categorization as renewable, and about 16 percent from hydroelectric: <http://www.pge.com/about/environment/pge/cleanenergy/>.

Figure 4. Sources of Electricity Delivered to California Consumers in 2010



Source: California Energy Commission's Energy Almanac

The way you and your household will see the increased cost of carbon in electric bills will also depend on how the allowance value associated with electricity sector emissions will be returned to you. Written into the ARB's Final Regulation Order is the requirement that the allowance value given to IOUs must be returned to ratepayers. In June 2012, the PUC that regulates IOUs will finalize an official rulemaking on how revenues that are raised through the auctioning of the allocation to the IOUs will be returned to ratepayers. While there will be many details within this rulemaking, two main options under consideration would either roll a share of allowance value into your bill and thereby reduce your bill, or return it to you in a lump sum once or twice per year. As a consumer, you may have a preference between these two options. Ratepayers with low incomes and enrolled in CARE and those with relatively low consumption facing only Tier 1 or Tier 2 rates probably would not see rate increases, nor would they see returns under any plan being considered by the PUC. In a study for Next 10 related to this one, we examine how California ratepayer utility bills will be affected by the cap-and-trade program.³⁵

2. How Do You Heat Your Home?

If you heat water or your home with electricity, the subsection above answers how your fuel costs are likely to change. If you use natural gas, propane, or other fuels for heating, you can expect to see the

³⁵ Burtraw, D. and S. Szambelan. 2012. *For the Benefit of California Electricity Ratepayers: Electricity sector options for the use of allowance value created under California's cap-and-trade program.* www.Next10.org

cost of carbon reflected in price increases for those fuels starting in 2015. (Some homes are cooled with natural gas and those homes would be affected in 2015 also.) For every therm (unit) of natural gas you consume, approximately 0.005 tons of carbon dioxide are released into the atmosphere.³⁶ If the cost of one ton of carbon is \$20, and you consume 45 therms in a monthly billing period³⁷ (the average therms consumed by California households in 2007), your bill will include a \$4.50 charge for the carbon embodied in the fuel your household consumed.

3. Do You or Does Someone in Your Household Drive?

Starting in 2015, the carbon content in transportation fuels will be priced in the wholesale market and passed through to consumers at the pump. The everyday transport of people and goods is responsible for the largest share of GHG emissions in California and contributed 38 percent of total GHGs in 2009, (with travel from cars and light trucks making up three-quarters of transport-related emissions, or 30 percent of the total). The ARB estimates that gasoline (and other) price increases from the cap-and-trade program will depend on the effectiveness of other state programs. If various other measures implemented under AB 32 (the RPS discussed above, SB 375 and the energy efficiency measures discussed above in Box 1, and the offsets provision discussed in Box 2) are effectively implemented, these will help to reduce emissions and keep allowance prices low. If these measures are not effective, allowance prices will rise. A few other California policies outlined in Box 1 support lowering emissions from passenger transportation and may help reduce the cost for consumers, including the Low Carbon Fuel Standard, the Clean Car and Advanced Clean Car Standards (Pavley I and II), and the Sustainable Communities and Climate Protection Act (SB 375).

The ARB identifies a rise in gasoline prices of 6 percent from cap and trade, assuming offsets and measures to reduce emissions in the electricity and transportation sectors meet stated goals.³⁸ If these other measures fail to meet their goals, the cost could be higher; that is, gas prices could increase by between \$0.18 and \$1.45 per gallon (\$2007) and diesel by between \$0.24 and \$1.87 per gallon (\$2007) by 2020 due to the cap-and-trade program.³⁹ It is worth keeping in mind that these increases in gasoline prices as with all of the allowance-related costs could be offset for the consumer in the revenue allocation process. Moreover, the Pavley standards are expected to save California drivers thousands of dollars over the lifetime of new vehicles, and the shift away from carbon intensive fuels further insulates California consumers from billions of dollars of gasoline or diesel costs if those prices spike in the future.⁴⁰

4. Do You Buy Food, and Other Products and Services?

³⁶ See the CalEPA's Clean Energy Calculations and References page: <http://www.epa.gov/cleanenergy/energy-resources/refs.html>.

³⁷ According to the California Energy Almanac, this represents the average monthly natural gas consumption (rounded up from 44.8 therms) by household in California in 2007.

³⁸ Air Resources Board, "Updated Economic Analysis of California's Climate Change Scoping Plan," March, 2010.

³⁹ Air Resources Board, "Updated Economic Analysis of California's Climate Change Scoping Plan," March, 2010.

⁴⁰ Fine et al. 2012. "The upside hedge value of California's global warming policy given uncertain future oil prices," *Energy Policy*, forthcoming.

While the main costs of cap and trade will be seen in the direct consumption of energy discussed above, the cost of carbon also will be embedded into the cost of everyday products and services produced and offered in California. These indirect energy costs may make up roughly 40 percent of the total energy cost for the median-income California household.⁴¹ As energy costs increase to reflect the price of carbon, these indirect costs will increase as well.

5. What If Your Household is Not Average?

Overall, lower-income households pay a higher proportion of their income on energy, covering electricity, natural gas, and gasoline bills (though lower-income households also buy fewer consumer goods and other services). This means that the lower your income, the greater the pinch carbon will have on your budget; that is if no allowance value is returned to you. But, if allowance value is to be returned on a per capita basis, a large majority of households in the state would receive payments that would be greater than their out-of-pocket expenses under the program.

In a memo to the ARB's Economic Allocation Advisory Committee, Kammen and Krunkel (2009) compare increases in the cost of electricity, natural gas, and transportation fuels with the sums households might receive if allowance value were returned to them on a per capita basis.⁴² They find that under such an approach, the majority of California households would receive net financial benefits, depending on the portion of allowance value being returned to them. Even if the government were to retain 50 percent of the allowance revenues, the majority of households in 96 percent of the state's area would come out ahead. If revenues were dedicated for return to low-income households alone, most could be fully compensated even with the government holding 80 to 90 percent of allowance revenues for other purposes. Kammen and Krunkel assume an allowance price of \$30. Their analysis accounts for the geographic variation in carbon intensity due to regional differences in gasoline consumption and the generation mix of different electric utilities.

6. How Could You Benefit from Allowance Value?

California households could benefit from allowance value in three ways. First, the portion of allowances assigned to the electricity industry will be auctioned and the auction revenue will be used to offset most of the increase in electricity rates that would otherwise occur. This will be accomplished through rebates to customers or investments in energy efficiency in the generation and delivery of electricity. Second, the portion assigned to industry will protect jobs and economic activity in the state that would be

⁴¹ Using data from the Consumer Expenditure Survey from the U.S. Bureau of Labor Statistics, Boyce and Riddle (2009) found that the cost of indirect carbon emissions embedded in everyday goods and services makes up for roughly 40 percent of the cost of carbon-related expenses (a little over \$100) to the median-income California home (using 2003 income numbers). This is assuming a cap-and-trade policy with an allowance price of \$25, a 100 percent auction and an 80 percent return of allowance value back to households. For more information, see "Cap and Dividend: A State by State Analysis," Boyce and Riddle, 2009. *Cap and Dividend: A State-by-State Analysis*, University of Massachusetts, Amherst, Political Economy Research Institute.

⁴² Kammen and Kunkle, 2009. *Taxable Cap and Dividend*. Accessed April 13, 2012, from http://www.climatechange.ca.gov/eaac/documents/member_materials/Kunkel_and_Kammen_cap_and_dividend_taxable_dividend_%202009-11-09.pdf.

exposed to unfair competition. Because of this, households should be protected against price increases from these industries.

The third and most important way households will benefit from allowance value is from the use of auction revenues, as allocated by the legislature, from the Air Pollution Control Fund. How these funds are used remains the most important and unanswered question in the design of California's cap-and-trade program.

9. What Happens Next?

Generally speaking, the allowance value is dedicated to three purposes. The portion associated with electricity-related emissions will go to the investor or publicly owned utilities and be directed to the benefit of ratepayers. The important decisions about how this occurs will be decided by the Public Utility Commission for the privately owned utilities by July of 2012 and by the governing boards for the publicly owned utilities sometime this year.

The second portion is allocated for free to industry, contingent on industry maintaining jobs and economic activity in the state. If a firm reduces its activity in the state then its allocation is reduced in the future. California households could benefit from this allocation if it prevents jobs from leaving the state. But, if the free allocation is too generous, it could lead to windfall profits for industry. The ARB will be in the position of evaluating this issue over time.

The third portion is the revenue generated from auctioning allowances that will accrue in the Air Pollution Control Fund. In the next fiscal year, revenues in the fund will amount to \$0.6 to \$1.8 billion. The legislature is likely to authorize that some or all of these revenues be used to pay for the cost of programs associated with the implementation of AB 32. But by 2015, when natural gas and transportation fuels enter the program, the amount of revenue from the auction will grow five-fold. In the long run, the largest effect on households will hinge on the decision about how to use these revenues.

In summary, if the program is executed properly the allowance value does not leave the California economy. Though the price of allowances is largely passed through to consumers in the form of greater prices for energy and other goods and services, and in some cases paid for by business, the value of emissions allowances is an asset that can be used to offset most of those costs. A portion of allowance value has already been designated to electric utilities and industry to achieve specific goals, but the largest share of allowance value will be realized through the auction. Revenue from the auction might be returned directly back to households or used to make investments that improve the state. This is the key decision that should be of interest to all Californians.