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For the Benefit of California Electricity Ratepayers

Electricity Sector Options for the Use of Allowance Value Created under California's Cap-and-Trade Program

Dallas Burtraw, David McLaughlin, and Sarah Jo Szambelan

1616 P St. NW
Washington, DC 20036
202-328-5000 www.rff.org

RESOURCES FOR THE FUTURE

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Abstract

California will implement a cap-and-trade program to limit emissions of carbon dioxide covering industry and electricity sector emissions in 2013, expanding to cover transportation and natural gas in 2015. Although cap-and-trade would increase annual electricity costs for the average customer by $30 to nearly $100, the allowance value created under the program can offset all of these costs and even reduce electricity bills. California's Air Resources Board has directed electricity regulators to ensure this allowance value is used for the benefit of electricity ratepayers. This paper surveys four options: (1) reducing electricity bills; (2) sending equivalent revenue directly to households in proportion to costs; or (3) as equal payments per customer account; and (4) making investments to improve the electricity system and help reduce emissions. Under special consideration is this question: Who will receive the allowance value associated with the electricity sector? We explore the implications of three specific proposals.

Key Words: cap-and-trade, allocation, auction, public utility commission, investor-owned utility, energy efficiency, electricity rates

JEL Classification Numbers: Q54, Q58, L94

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Introduction

The State of California has enacted bold policies to reduce emissions of greenhouse gases that contribute to disruption of the climate and acidification of the oceans. One initiative is a market-based cap-and-trade program that will limit emissions from the electricity sector beginning in 2013. Emitters of carbon dioxide will be required to surrender emissions allowances to match their levels of pollution and be given the flexibility to trade allowances. This introduces a price on allowances, which will become a valuable asset worth more than a billion dollars per year in the electricity sector alone.

The California Public Utility Commission regulates private, investor-owned electric utilities; similar responsibilities rest with elected and appointed bodies that regulate publicly owned utilities. Under special consideration for all of these regulators is the question of who will receive the allowance value associated with the electricity sector.

The California Air Resources Board has directed electricity regulators to ensure that the allowance value is used "for the benefit of electricity ratepayers." This paper surveys four options to achieve this objective: (1) reducing electricity bills; (2) sending equivalent revenue directly to households in proportion to costs; (3) sending equivalent revenue directly to households as equal payments per customer account; and (4) making investments to improve the electricity system and help reduce emissions. We explore the implications of three specific proposals that combine elements of these objectives. This decision will affect the distribution of costs of the cap-and-trade program and could affect the achievement of long-run program goals.

* Burtraw is a Senior Fellow and Darius Gaskins chair at Resources for the Future (RFF). McLaughlin worked on this project before leaving RFF to join the Brattle Group. Szambelan is an independent consultant. The authors received financial support from Next 10 and benefited from helpful comments from Chris Busch, Jane Hall, and Sarah Henry, as well as from the staff of the California Public Utilities Commission. Related reports addressing the design of California's cap-and-trade program can be found at www.next10.org. Direct correspondence to burtraw@rff.org.

The **main findings** are the following:

- Allowance value directed back to ratepayers could offset all of the costs introduced by cap and trade for electricity consumers.
- How the allowance value is directed to ratepayers will affect the distribution of costs among customers, and it could affect the efficiency of the cap-and-trade program.
- If allowance value is returned on electricity bills, consumers will perceive that electricity is relatively less expensive. If it is returned in a separate envelope, consumers will perceive higher electricity bills but household budgets would be compensated. This decision will affect the political perception of the program.
- Rate increases resulting from other AB 32 policies, such as the Renewable Portfolio Standard may be substantial and will occur independently of cap and trade.

How Does Electricity Fit into the Cap-and-Trade Program?

To avoid the potential damages that climate disruption could bring to the economy, public health, and the environment, California enacted the Global Warming Solutions Act of 2006, also known as AB 32. This legislation requires the state to reduce climate-disrupting greenhouse gases (GHGs) to 1990 levels by 2020 and directs the California Air Resources Board (CARB) to outline policies to meet this target. In its Scoping Plan, CARB drafted a suite of emissions reduction measures that included a low-carbon fuel standard, energy efficiency and conservation measures, a renewable portfolio standard for electricity generation, and a market-based emissions cap-and-trade program, set to take effect in 2013.

Cap-and-Trade under AB 32

The cap-and-trade program will cover 85 percent of GHGs emitted from sources across California, from which 80 million metric tons of carbon dioxide (CO_2) equivalents ($MMTCO_2e$) will need to be cut to meet the AB 32 target (CARB 2011). Of these GHGs, CO_2 has the most important effect on climate change, and the combustion of fossil fuel is the most important source for CO_2 emissions.[1]

[1] CO_2 is found in much greater concentrations in the atmosphere than other GHGs. CO_2 has a longer residence time (about 100 years) in the atmosphere than some GHGs like methane (about 12 years), but does not persist as long as N_2O or HFCs. Luckily, those GHGs are found in extremely small concentrations in the atmosphere.

The economic consequences of the cap-and-trade program are attracting a great deal of attention. Cap and trade has two parts. 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 ton of CO_2, a facility must surrender to regulators one emissions allowance. Second is the ability to trade allowances, which means they will have a price that will be reflected in the cost 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. Estimates of the allowance value generated by the program in the first year alone range from roughly $2.6 billion to $7.8 billion[2] and will grow substantially over time. A pressing question for the state is, Who gets this value?

In its final regulation order of the AB 32 cap-and-trade program, CARB (2011c) stated:

> "…any allowance allocated to electrical distribution utilities must be used exclusively for the benefit of retail ratepayers of each such electrical distribution utility, consistent with the goals of AB 32."

This broad objective could be met a number of ways. CARB issued Resolution 10-42 and appointed the California Public Utility Commission (CPUC) to hold a review process and rulemaking proceeding to help specify how to achieve this objective. The ultimate decision of how to return allowance value to ratepayers is expected in the next few months.

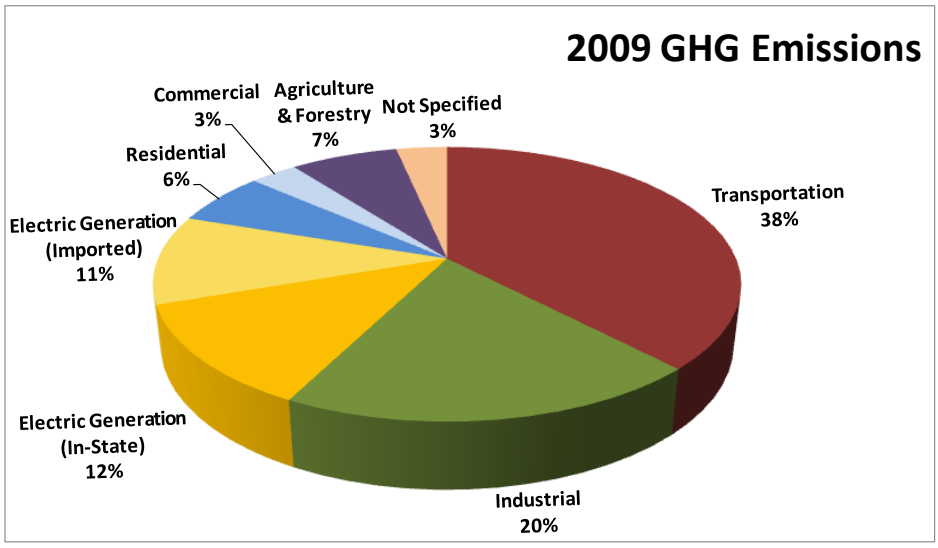
The Electricity Sector's Share of Emissions and Allowances

Behind transportation, the electricity sector is the biggest contributor of GHG emissions in California (Figure 1). The most recent California GHG inventory was released by CARB in April 2012 and shows that electricity generation was responsible for 103.6 $MMTCO_2e$, or 23 percent of total GHGs generated by the California economy in 2009. Of these emissions, 55.5 $MMTCO_2e$ was generated from in-state sources (12 percent of total statewide GHGs) and 48.1 $MMTCO_2e$ came from out-of-state sources (11 percent of total statewide GHGs).[3]

[2] Estimates are in 2007 dollars; see Economic and Allocation Advisory Committee to CARB and California Environmental Protection Agency (2010).

[3] The imported emissions in 2009 were 11.7 $MMTCO_2e$ below the average for the years 2000–2008 because of the economic downturn.

Figure 1. California's Greenhouse Gas Emissions, by Source (2009)



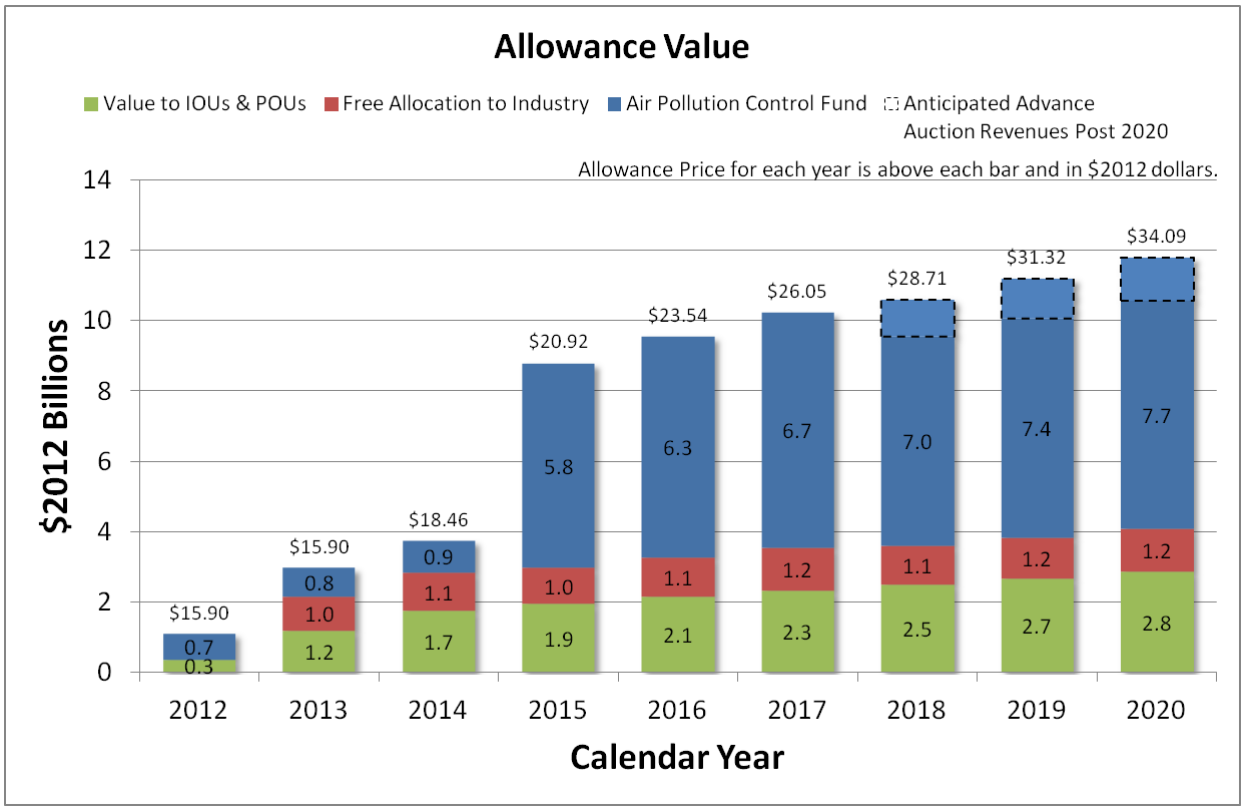
Source: CARB (2012)

The industry and electricity sectors will be subject to the cap in the first phase of the program (2013–2014). AB 32 requires compliance by all entities delivering electricity to the California grid. In 2020, emissions from in-state and imported electricity generation are expected to drop to 44.8 and 53.5 $MMTCO_2e$, respectively (CARB 2011a). These reductions will result from the implementation of the state's 33 percent renewable portfolio standard, the solar initiative, energy efficiency measures, transportation and land use initiatives and the cap-and-trade program, all outlined in CARB's scoping plan to meet the GHG target.

The electricity sector will be issued 42 percent of the total value of allowances used for compliance in the first phase of the program (2013–2014 allowances). In the second (2015–2017) and third (2017–2020) phases, when transportation and natural gas are included in the program, electricity's share of the total value of allowances will fall to 22 percent (green bar, Figure 2).[4]

[4] Burtraw et al. (2012) provide a discussion about general issues in the design of the California program and the allocation of allowance value within the program.

Figure 2. Estimated Allowance Revenues Under Cap and Trade



Source: Values for this graph were taken from allowance allocations listed in CARB (2011c) and allowance prices from the CPUC (2011a), which uses 2009 CO_2 price forecast from a report by Synapse Energy Economics. Prices converted to 2012 dollars. Emissions expressed in metric tons of CO_2.

Under the cap-and-trade program, both investor-owned and publicly owned electric utilities will receive a free allocation of allowances totaling 97.7 $MMTCO_2e$ in 2013, declining to 84.9 $MMTCO_2e$ in 2020 (CARB 2011c). These allocations do not match perfectly the emissions projected for the electricity sector. The free allowances are apportioned based on the utility's expected customer cost burden, projected energy efficiency savings, and early investment in renewables. Approximately 94 percent of the allowances are allocated to mitigate customer cost burden, 1 percent to acknowledge cumulative energy efficiency gains, and about 5 percent to recognize early action (CARB 2011b [App A]). CARB has intentionally allocated at least enough allowances to utilities to cover their customers' total projected cost burden.

CPUC's Proceeding on Returning Allowance Value to Ratepayers

IOUs and POUs

The two types of utilities are regulated differently and have been given different directives for the use of allowance value under the AB 32 cap-and-trade program. Investor-owned utilities (IOUs) are private corporations regulated by the CPUC, which in turn takes its direction from the California legislature; its five commissioners are appointed by the governor. CPUC approves rate structures and other policy decisions for the IOUs. The state has four IOUs: Pacific Gas and Electric (PG&E), PacifiCorp, San Diego Gas and Electric (SDG&E), and Southern California Edison (SCE). Together, they provide about 75 percent of California's electric power. In contrast, publicly-owned utilities (POUs) are nonprofit agencies, frequently government run and are not regulated by the CPUC. Policies on POU activities and rates are set by locally elected boards or governing bodies, such as city councils.

All utilities will receive a free allocation based on the percentages given above. The utilities provide retail services and deliver power directly to customers, but a large share of entities with a compliance responsibility (e.g., emitting power plants) are not owned by the utilities. The IOUs are required to liquidate (sell) their allowance allocation at quarterly cap-and-trade auctions, the first of which is expected in November 2012. To meet their own compliance obligation, they need to purchase allowances in the auction or in the secondary market. This provision—requiring the IOUs to sell their allocations in an auction and buy back what they need for compliance—is intended to guarantee liquidity in the allowance market and to help identify a market-clearing allowance price. POUs, in contrast, are allowed to use their free allocations directly for compliance.

About two-thirds of electricity allowances will go to the four IOUs. The other one-third of allowances will go to the 39 POUs, the largest of which is the Los Angeles Department of Water and Power.

Figures 3 and 4 illustrate the different customer classes to which each type of utility provides power.

Figure 3. 2010 IOU Electricity Consumption, by Customer Class

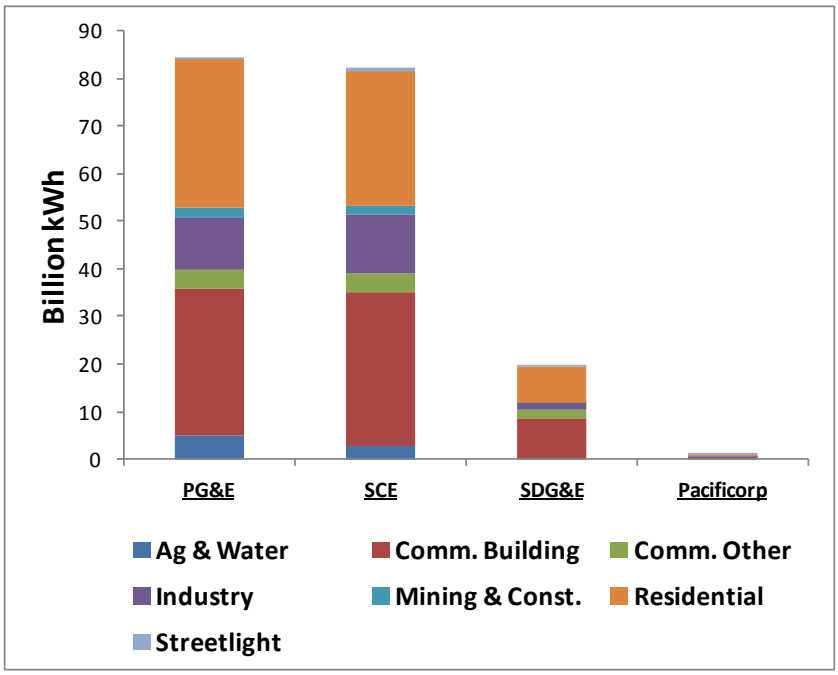
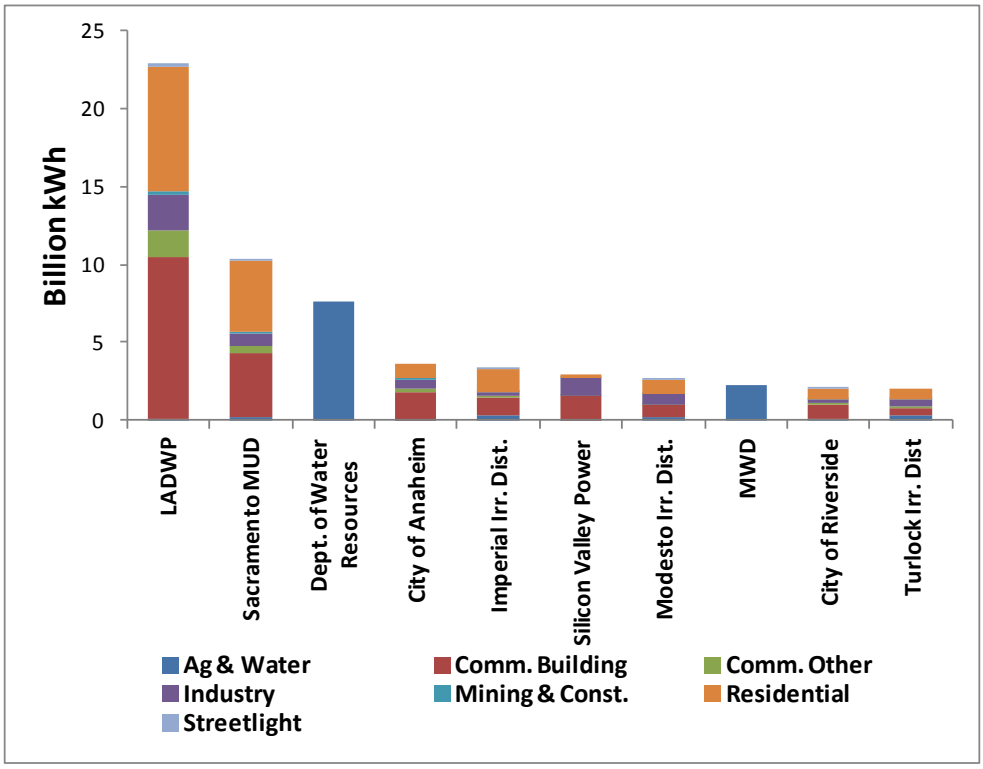


Figure 4. 2010 Electricity Consumption of 10 Largest POUs, by Customer Class



The Public Utility Commission's Solicitation of Proposals

In December 2010, CARB issued Resolution 10-42, which directs CARB's Executive Officer to work with CPUC to ensure that the allowance value from IOUs is used for the benefit of ratepayers. This was further outlined in CARB's final regulation order on the cap-and-trade program (CARB 2011c). In March 2011, CPUC issued its Order Instituting Rulemaking (R1103012), which opened the proceeding for parties to propose and discuss how to use IOU allowance revenue from quarterly auctions to achieve this goal. Specifically, CPUC Commissioner Peevey and two administrative law judges solicited proposals to address: (1) how much, if any, allowance value should be directed back to ratepayers; (2) the form of any return to ratepayers; and (3) how much should be used to benefit ratepayers through energy system improvements, such as investment in energy efficiency or renewable fuels. CPUC outlined seven policy objectives for consideration and allowed parties to contribute additional objectives (CPUC 2011b). The seven policy objectives were as follows:

1. to preserve the carbon price signal;
2. to prevent economic leakage (defined by AB 32 as the reduction in emissions within the state that is offset by an increase in emissions outside the state);
3. to distribute revenues equitably, recognizing the public asset nature of the atmospheric carbon sink;
4. to reduce adverse impacts on low-income households;
5. to correct for market failures that lead to underinvestment in carbon mitigation activities and technologies;
6. to maintain competitive neutrality across load-serving entities; and
7. to achieve administrative simplicity and understandability.

By January 6, 2012, several parties had submitted proposals. A final decision on how to return electricity allowance value is expected in June of 2012.

Conceptual Options for the Use of Allowance Revenues

In practice, these policy objectives can be achieved in numerous ways. Four general options for the use of allowance revenues are before the CPUC. One approach would be to direct allowance value to the benefit of ratepayers by reducing electricity bills. A second would return equivalent revenues directly to ratepayers in an envelope or electronic fund transfer separate

from their electricity bill. A third approach would return value on an equal basis per customer account. A fourth would make investments in the electricity system that benefit ratepayers. We consider each of these possibilities. The ultimate decision for how to direct allowance value to IOU ratepayers will be finalized by the CPUC in June and is likely to incorporate more than one of the general options discussed here.

1. Reduce Electricity Bills

One way to direct allowance value to ratepayers is to mitigate the increase in electricity bills from cap-and-trade. This approach has the advantage, as viewed by decisionmakers, of masking the cost of the program to customers. Low-income and low-volume customers would see no change in their bills from cap-and-trade because they are insulated against increases in their electricity rates by regulation and state law. For other customers the change would be small because the value of the allowances would nearly offset the increase in wholesale electricity prices created by the cap-and-trade program. Decision makers might also like this approach because it preempts a debate about advantaging one customer over another. If the allowance value were used to reduce the total costs paid by customers, then the benefits would be shared among customers according to the same formula that is used to share costs. Avoiding electricity bill increases and conflicts about who should benefit from the use of allowance value would help avoid political controversy that could affect the success of the program.

However, market-based pollution control policies such as cap-and-trade are predicated on clear and consistent price signals on pollutants to both producers and consumers. Masking the cost of the program by limiting increases in electricity rates would muddy the price signal for consumers. This could alter consumers' decisions about whether to purchase energy-efficient appliances, for example. In effect, suppressing the price signal constitutes a subsidy to electricity consumption compared with other uses of energy, especially transportation, where prices are likely to rise to fully reflect the allowance cost.

One proposed remedy would be to apply the allowance value as a credit against the total bill rather than use it to reduce rates. This approach would allow rates to rise with wholesale power prices so that customers see the cost of allowances reflected in their bill. The allowance value would be returned to ratepayers as a reduction in the fixed portion of the bill that includes transmission and distribution charges and administrative fees. In principle, this would preserve the signal to consumers about the value of reducing electricity consumption. At the same time, customer bills would increase by very little because the allowance value would be subtracted from the total bill.

Unfortunately, in practice, this proposed remedy of preserving the price signal for consumers is not likely to be effective because the vast majority of ratepayers pay little attention to the line items in their bills. If consumers see a lower total bill, they are likely to think that electricity is relatively less expensive and behave accordingly, even if incremental electricity rates are high (Borenstein 2009; Ito 2010). With more experimental work on how to effectively deliver this information, consumers might recognize the cost of carbon in their bill and adjust their behavior accordingly. However, today, the expected consumer response would be limited.

2. Return Revenues Directly

A more effective remedy might be to return allowance value in a separate envelope, so that when paying their electricity bill, ratepayers see rates and a total bill that reflect the real cost to the utility. This would preserve the full price signal, giving customers an incentive to reduce consumption. The payment in a separate envelope could balance household finances, offsetting the cost increase associated with the higher electricity rates.

This approach is likely to be somewhat less popular with utilities than applying the allowance value on the customer's bill because it places the utility in the position of delivering the bad news that electricity bills are going up. It is unclear who would assume the more enviable position of delivering the refund check. If it came from the utility, it might bring substantial good will. It is unclear whether a separate mailing from the utility would preserve the price signal as desired, or if customers would associate the mailing with the net cost of their electricity use. Moreover, a separate mailing or electronic fund transfer creates administrative costs.

A separate mailing or electronic communication could be a useful vehicle to advertise voluntary opportunities for customers to invest in energy efficiency. Customers might be invited to voluntarily accumulate funds in an interest-bearing account, for example, or take advantage of tax benefits or rebates programs promoting energy efficiency. They might be able to use expected future payments as collateral to take advantage of low-interest loans for efficiency measures or even for the purchase of an electric vehicle. Such programs might help reduce energy consumption and help the state achieve the goals of AB 32.

3. Severing the Connection between Payments and Consumption

Sending payments in separate envelopes raises the issue of whether or not the payments to each customer should be based on the volume of electricity consumed or some other measure. On the one hand, it might seem that those who see the biggest increase should see the biggest share of benefits from the distribution of allowance value. However, one might question the

fairness of basing the payments on the volume of a customer's energy use, because they are in fact responsible for a greater share of carbon emissions. To avoid this, payments could be made independent of electricity consumption, which some call dividends. The rationale for returning value directly to customers is that the atmosphere is a common property resource, and that the allowance value is payment for its use by emitters, compensating the general public for damage to this resource from CO_2 emissions.

The logical conclusion from that reasoning is that each individual should receive equal compensation, perhaps through direct payments or dividends, as Alaska does with its royalties from oil and gas development. Neither the utility nor CPUC has the information or the authority to direct dividend payments to individuals, but equal payments to customer accounts would reflect this principle and could approximate this type of approach. As suggested above, the disbursement of payments could provide an opportunity to inform customers about energy efficiency investment options. Equal payments to customers would presumably apply only to residential customers and might involve only the proportion of allowance value associated with electricity generation for residential use.

4. Invest in the Electricity System

A third way to direct allowance value to ratepayers is to invest in improvements to the electricity system and in opportunities that would reduce emissions or energy costs. Several possibilities for such investments have been identified (CARB 2008b, 2010). Increasing use of renewable technology may require substantial investments to make improvements to the electricity grid. For example, expanded use of electric vehicles may require new infrastructure for charging batteries and billing customers. In addition, utilities or other groups could use investment funds to continue to act on opportunities to reduce emissions through energy efficiency improvements throughout the electricity system.

Utilities have in fact already made large investments to reduce GHG emissions. Notwithstanding the many advantages of renewable technologies, the cost of attaining the 33 percent renewable portfolio standard is expected to affect electricity bills more than will the cap-and-trade program. If further increases in electricity rates and electricity bills might be considered excessive, the idea that allowance value be used to abate further increases in rates or bills gains currency. Whether that or other approaches are preferable to further investments in the electricity system depends on the merits of the investments and how else they could be financed. The availability of allowance value might be a rare opportunity to make investments that are worthwhile but otherwise difficult to fund.

Box 1. Other Measures Affecting Ratepayers

Other GHG reduction measures will affect emissions and electricity prices.[5]

Renewable Portfolio Standard (RPS). The initial program required 20 percent of electricity generated for consumption in California come from renewable sources by 2020, and estimated to achieve a reduction of 12.0 $MMTCO_2$. A new standard of 33 percent is authorized by Senate Bill 1X2, and is expected to cut another 11.4 $MMTCO_2$ in 2020 (CARB 2011a). POUs are not required to meet this mandate, but many have their own RPS goals with similar targets.

The **California Solar Initiative (CSI).** Senate Bill 1 directed the CPUC to create the CSI in 2006. CSI consists of four major programs: (1) rebates to encourage the building of new solar photovoltaic capacity; (2) investment in solar thermal systems to heat water; (3) grants to solar research and development; and (4) providing solar incentives to low income multifamily housing. The program is funded by electric and gas ratepayers from the investor-owned utilities. The rebate program has a lifetime budget of $2.2 billion between 2007 and 2016 to install 1.94 GW of new solar capacity, and the solar hot water rebate program is allocated $250 million in funding between 2010 and 2017. The programs could save California 1.1 $MMTCO_2$ by 2020.

Energy Efficiency Programs. The 2008 scoping plan estimated that by 2020, California could avert 15.2 $MMTCO_2$ from expanded utility energy efficiency programs, more stringent building and appliance standards, and additional efficiency and conservation programs; and another 6.7 $MMTCO_2$ from expanded combined heat and power systems.

Low carbon fuel standard (LCFS) and **Electric Vehicles (EV).** In April 2010 CARB put into effect the LCFS, which requires a 10 percent reduction in the carbon content of transportation fuels by 2020 (a goal envisioned by Governor Schwarzenegger in Executive Order S-01-07). Suppliers of transportation fuels can meet this requirement with any combination of fuels or from LCFS credits they purchase. The standard also allows EVs to receive LCFS credits for electricity used to power low-carbon transportation (CPUC 2011b). It is estimated that the LCFS will cut emissions by 15 $MMTCO_2e$ by 2020. Court proceedings are addressing whether the standard violates the commerce clause of the U.S. Constitution by assigning a higher carbon intensity level to out-of-state ethanol than to in-state ethanol. CARB continues to develop and enforce the program while the case is on appeal.

[5] Numerous measures seek to reduce GHG emissions from other sources, such as transportation; see CARB (2008a).

Proposals on the Docket

Nearly 50 parties are involved in the CPUC proceeding for the rulemaking on how to use allowance value for the benefit of ratepayers. Some have collaborated, and 14 total proposals (summarized in Table 1) have been filed.

Table 1. Interest Groups with Proposals on Use of Allowance Value

Party	*Description*
Joint IOUs	Three largest investor-owned utilities in California.
Division of Ratepayer Advocates (DRA)	Independent consumer advocacy division of California Public Utilities Commission.
Joint Environmental Parties	Group of nonprofit organizations representing environmental, science, economics, law, and consumer protection interests.
PacifiCorp	Investor owned multijurisdictional utility with less than 2 percent of customers in California.
Solar Energy Industries Association	National trade association for solar energy industry.
Green Power Institute	Renewable energy program of Pacific Institute (environmental research nonprofit).
The Utility Reform Network (TURN)	Nonprofit electricity consumer advocacy group.
City and County of San Francisco	Publicly owned load-serving entity.
Marin Energy Authority	Community choice aggregator in California.
The Direct Access Customer Coalition	Group representing direct-access customers, which purchase energy directly from third-party energy service providers.
Tesoro Refining and Marketing Company	Independent refinery in California.
California Cogeneration Council	Association of natural gas cogenerators in California representing about 1.3 GW.
Large Users	Group representing large industrial electric customers, manufacturing, end-use generators, and customer generation interests.
Agricultural Parties	Group representing agricultural interests in California.

Table 2. Ranking of 7 Policy Objectives, by Interested Party

Proposals	Objectives						
	1	2	3	4	5	6	7
	Preserve the Carbon Price Signal	Prevent Economic Leakage	Distribute Revenues Equitably /Carbon Sink as "Public Asset"	Reduce Adverse Outcomes to Low Income Households	Correct for Market Failures	Maintain Competitive Neutrality Across Load Serving Entities	Achieve Administrative Simplicity
Joint IOUs	–	+	–	++	–	+	+
DRA	++	+	+	+	+	+	+
Joint Parties	++	+	++	+	+	+	+
Agricultural Parties	–	++	–	–	+	+	++
Solar Energy Industries Association	+	+	–	+	++	–	+
Pacificorp	–		–	++	++		++
Green Power Institute	+		+		+		+
California Cogeneration Council	+	++	–		+	+	
City and County of San Francisco	+		+	++		++	+
Marin Energy Authority	–		+				+
The Direct Access Customer Coalition						++	++
Large Users		++					
Tesoro		++					
TURN	++						

Most parties addressed the seven policy objectives (above) by assigning importance to each objective explicitly or by detailing a proposal encompassing them, summarized in Table 2. Dark green boxes (++) indicate that a party considered a policy objective of utmost importance. Light green boxes (+) indicate that a policy objective was considered important. Blank boxes indicate policies that were not addressed, and pink boxes (–) indicate policies deemed unimportant or difficult or impossible to achieve. Parties showed the greatest disagreement on Objectives 1 and 3, the importance of the preservation of the carbon price signal and the equitable distribution of the "public asset" (allowance value).

In addition to the objectives suggested by CPUC, the Joint IOUs proposal suggested two other policy objectives worth consideration: (1) mitigating cost increases for all customers and ensuring the cost-effectiveness of emissions reduction measures (while reducing adverse effects on low-income households); and (2) returning allowance revenues to customers in proportion to the costs they incur to achieve the fairest outcome. In addition, the DRA and Joint

Environmental Parties assert that educating customers about the effect of the cap-and-trade program on rates and how to mitigate the costs is also important.

Three Main Proposals

Three proposals were presented with particular completeness and gave clarity to the scenarios they presented. We summarize these proposals here, and then model their short-run consequences for residential customers.

Joint Investor-Owned Utilities: 100% Line-Item Return to Ratepayers

The Joint IOUs advocate a 100 percent return of allowance revenues from the electricity sector to ratepayers in all sectors. However, low-consumption customers and most low-income customers are protected from rate increases and would not receive any allowance value under this proposal. Revenue would be returned on a customer's electricity bill each month as a line-item reduction. This approach draws on the first conceptual option listed in Section 3. The refund to customers as part of their electricity bill over the course of the year would add up to $28 to $56 in the PG&E region, $26 to $76 in the SCE region and $27 to $47 in the SDG&E region.

Division of Ratepayer Advocates: 90% Rebate Check, 10% Investment

DRA calls for a return of 90 percent of allowance revenues to ratepayers in all customer classes through an off-the-bill rebate check on an annual basis. The size of the check would vary by region. For a household with average consumption, the annual payment would range from $25 to $51 in the PG&E region, $23 to $69 in the SCE region and $24 to $42 in the SDG&E region.

The DRA proposal would divert 10 percent of the revenue to finance long-term investments in energy efficiency through a consolidated financing program and to pay for administrative expenses related to bill relief. In 2013, the value allocated to this program would be roughly $102 million. DRA suggests that the California Alternative Energy and Advanced Transportation Financing Authority could head the financing program.

Joint Environmental Parties: 47% Investment, 53% for Industry and Ratepayers

The Joint Environmental Parties would use allowance revenues from the electricity sector for three purposes: (1) to invest in energy efficiency and carbon mitigation technologies; (2) to protect industries from leakage (i.e., by protecting industry from competitors not subject to an emissions cap); and (3) to mitigate residential rate increases.

First, the allocation to investment would be 75 percent of the product of the allowance reserve price in the auction multiplied by the number of allowances sold in the auction each year.[6] In 2013 the value would be $483 million, or about 47 percent of total value according to our calculations.[7] Linking this revenue to the reserve price would provide a predictable and stable level of funding. The remaining 53 percent would be divided to the other two purposes. Emissions-intensive, trade-exposed industries would receive revenues through a calculation involving historic consumption, leakage risk, and the incremental increase in generation-related costs from cap-and-trade. Remaining revenues would be returned to residential retail ratepayers in a separate, off-the-bill rebate check. The revenue would be returned in equal payments per customer account, but payments would vary based on geography and if household heats with electricity. The proposal does not specify whether those payments should occur on an annual basis or more often.

How Will Each Proposal Affect Households?

The decision by CPUC about how the IOUs should return allowance value to the benefit of ratepayers is expected by June. Proposals filed before CPUC would each yield quite different effects on ratepayers and households. This section demonstrates the effects on customers of the three major proposals, using the rate impact model provided to CPUC by the Joint IOUs.[8] We begin, however, with a brief description of California's electricity rate structure, which has important implications for the model results.

Rate Structure

California has a complex electricity rate structure; not every kWh of electricity costs the same everywhere at every time. However, the rate structure is built on the simple concept of a baseline quantity of electricity consumption. The baseline quantity varies by region of the state

[6] The allowance reserve price is $10/MT in 2013 and rises by 5 percent plus inflation per year thereafter.

[7] $483 million = 0.75 * ($10/ton) * 64.5 million tons.

[8] The CPUC and Administrative Law Judges' Scoping Ruling ordered the development of a rate impact model to better understand how the return of allowance revenue would affect rates by baseline region and customer class. The rate impact model uses input information on GHG compliance costs and allowance revenues by IOU, and yields estimated rate impacts by customer classes for different revenue return scenarios. This analysis utilizes the rate impact model in conjunction with current electricity rates, baseline quantities for each territory, allowance allocations, allowance prices, and estimated GHG compliance costs for each IOU (CPUC 2011c).

(because of climatic differences), time of year (summer and winter), and customer type (basic service or all-electric, including heating). There are 10 baseline territories in the PG&E service region, for example, 9 in the SCE region, and 4 in the SDG&E region. The rates for the baseline territories for the three major IOUs are listed in Table 3.

Table 3. Estimated Average Monthly Residential Usage, by IOU, 2013[9]

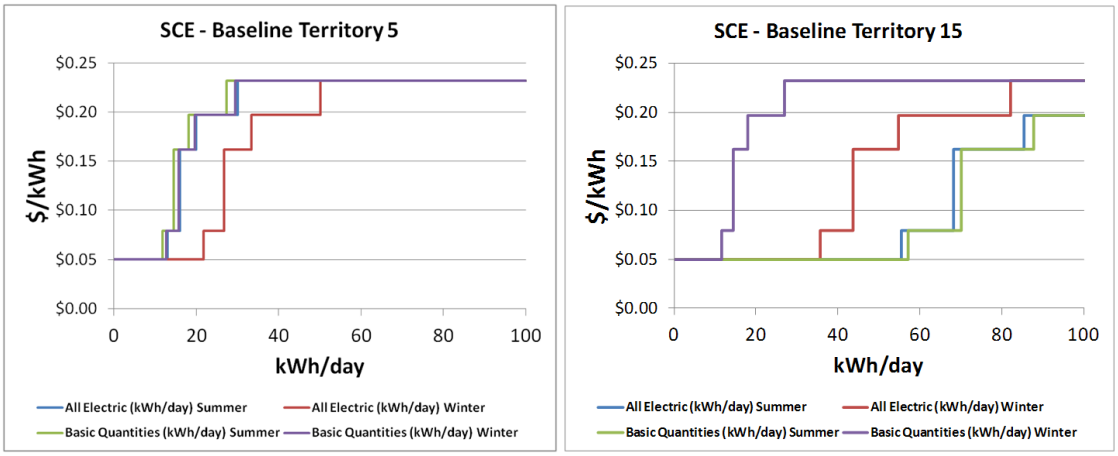
	Average Monthly Use (kWh)				
		Basic Service		*All-Electric*	
	Region	*Summer*	*Winter*	*Summer*	*Winter*
PG&E	P	847	703	996	1587
	Q	415	647	504	904
	R	946	647	1157	1414
	S	847	664	996	1339
	T	415	504	504	787
	V	664	753	1074	1564
	W	1024	603	1301	1068
	X	609	647	570	904
	Y	647	731	780	1438
	Z	437	587	620	1054
SCE	5	504	542	553	782
	6	509	531	553	759
	8	564	509	553	759
	9	769	581	935	1129
	10	885	581	963	1129
	13	1029	609	1605	1536
	14	891	587	1123	1381
	15	2429	498	2363	1283
	16	636	603	791	1335
SDG&E	Coastal	531	559	542	777
	Inland	620	598	609	857
	Mountain	819	764	957	1335
	Desert	908	620	1079	1030

The baseline quantity defines the first tier in the electricity rate structure. Each kWh consumed up to the baseline quantity has the same price, which is the Tier 1 rate. Tier 2 is defined as 101 to 130 percent of the baseline quantity and has a higher price. Consumers in Tier 2 pay the Tier 1 rate for the baseline level of consumption and the Tier 2 rate for consumption

[9] Average monthly use was computed by dividing baseline quantities by 0.55 for basic service customers in the summer and winter and for all-electric customers in the summer and by 0.65 for all-electric customers in the winter.

beyond the baseline. Similarly, Tiers 3, 4, and 5 are defined as 131 to 200 percent, 200 to 300 percent, and more than 300 percent of the baseline quantity, respectively, and each tier has a higher price than the last. Figure 5 provides an example of the rate structure in the "5" and "15" baseline territories in the SCE service area, which are the territories with the lowest and highest summer baseline quantities for basic service.

Figure 5. SCE Residential Rate Structure for Baseline Territories "5" and "15"



An important aspect of the rate structure is that state law restricts electricity rate increases for consumption in the Tier 1 and Tier 2 categories, while prices are allowed to rise for higher tiers.[10] This policy is intended to promote energy conservation. It reflects the idea that incremental units of electricity consumption are the most expensive for the system and raise the average costs for other customers. In addition, it embodies an equity goal because it protects baseline levels of consumption from rate increases.

A second important feature of the rate structure is the California Alternative Rates for Energy (CARE) Program, which protects low-income households from rate increases. The CARE program provides a monthly discount on energy bills for income-qualified households

[10] The California Public Utilities Code Section 739.9 limits the increase in rates charged to residential customers for usage up to 130 percent of baseline quantities (Tier 1 and Tier 2) to the annual percentage change in the CPI plus 1 percent, but not less than 3 percent and not greater than 5 percent. http://law.onecle.com/california/utilities/739.9.html.

and housing facilities. Qualifications are based on the number of people living in the home and the total annual household income.[11]

Those two features, the tiered rates and the CARE program, provide a backdrop for understanding how electricity customers might be affected by the cap-and-trade program. Customers with low levels of consumption or low income will not carry the costs of the program; customers with high levels of consumption who are responsible for relatively more emissions will bear most of the costs.

Results under Each Proposal

Results from the rate impact model can be divided into the costs of the cap-and-trade program and the benefits coming from the use of the allowance value. The cost of the program varies across IOUs depending on the emissions intensity (tons CO_2/MWh) of electricity consumed, the baseline territory in which customers reside, and their level of electricity use. Table 4 presents the costs for summer and winter for an average residential customer in each IOU region.[12]

This analysis assumes that the cost of the program, before accounting for allowance value, will be the same under each proposal.[13] However, the net effect on each residential customer could differ in big ways depending on how allowance value is returned or used. To illustrate these differences, we use the rate impact model from the rulemaking proceeding to estimate the bill impacts of the Joint IOUs, DRA, and Joint Environmental Parties proposals. The

[11] Information on PG&E and SCE is available at http://www.pge.com/en/myhome/customerservice/financialassistance/care/index.page and http://www.sce.com/residential/income-qualified/CAREFERA/care-fera-rate-programs.htm

[12] The estimated costs are calculated for the average household in each baseline territory for each IOU. The table reports estimated average monthly residential electricity usage in each baseline territory, by season. CPUC mandates that the baseline quantity for each territory (for basic service customers in the summer and winter, and for all-electric customers in the summer) be set between 50 and 60 percent of average usage for those customer groups; baseline quantities for all-electric customers in the winter are set at 60 to 70 percent of average usage. The average usages were imputed using the assumptionassume that the baseline quantity for each territory was 55 percent (65 percent for all-electric in winter).

[13] The estimated costs of the cap-and-trade program were calculated using the Rate Impact Model from the CPUC's Proceeding R1103012. The costs are estimated as total revenue multiplied by bundled sales divided by total sales and total roughly $903 million in 2013. See Rate Impact Model for PG&E, SCE, and SDG&E submitted on Dec. 1, 2011 available at http://docs.cpuc.ca.gov/efile/MISC/155681.pdf. Additionally, we assume that baseline quantities and electric rates in 2013 will be the same as those in 2012..

allowance price used in this analysis is from the 2011 Market Price Referent, and is assumed to be $15.90 (current year dollars) in 2013.

Table 4. Cost of Cap-and-Trade for Average Residential Customer before Accounting for Allowance Value

	Utility	Summer			Winter		
		Average Monthly Use (kWh)	Average Bill ($/month)	Estimated Gross Cost of C&T ($/month)	Average Monthly Use (kWh)	Average Bill ($/month)	Estimated Gross Cost of C&T ($/month)
Basic Service	PG&E	415 to 1024	$77 to $189	$2.24 to $5.52	504 to 753	$93 to $139	$2.71 to $4.06
	SCE	504 to 2429	$46 to $221	$2.28 to $10.98	498 to 609	$45 to $55	$2.25 to $2.75
	SDG&E	531 to 908	$96 to $165	$2.43 to $4.15	559 to 764	$99 to $135	$2.56 to $3.49
All-Electric	PG&E	504 to 1301	$93 to $240	$2.71 to $7.01	787 to 1587	$125 to $251	$2.31 to $4.65
	SCE	553 to 2363	$50 to $215	$2.50 to $10.68	759 to 1536	$55 to $112	$1.86 to $3.78
	SDG&E	542 to 1079	$99 to $196	$2.48 to $4.94	777 to 1335	$126 to $217	$1.93 to $3.32

Table 5 presents our estimated impact of the proposals on residential customers across the state. A range of estimates is presented representing the range of impacts on the average residential customer account in each baseline territory for summer and winter.

The first block of results in Table 5 (“Credit per Customer”) shows the value of the credit under the three proposals. The proposals differ with regard to whether customers would receive the credit through reduced electricity bills or through rebates in a separate envelope, but this is not reflected in the table. The estimates vary largely because DRA would devote 10 percent of allowance value to investment in efficiency, and the Joint Environmental Parties would devote 47 percent to efficiency investments and an additional amount to preventing leakage (see Figure 6, which illustrates the relative proposed investments in energy efficiency by each proposal).

The second block of results in Table 5 (“Net Change after Credit”) reports the percentage net change in the customer’s spending on electricity after accounting for allowance value. The payments are proportional to costs incurred under the Joint IOU and DRA proposals; in contrast, they vary for each customer account under the JEP proposal based on geography and if household heats with electricity.

Table 5. Net Cost of Cap-and-Trade for Average Residential Customer after Accounting for Allowance Value

		Summer					
		Credit (Benefit from Auction Revenues) per Customer ($/month)			Net Change in Customer Costs After Credit (%)		
Service Type	Utility	Joint IOU	DRA	Joint Enviro. Parties	Joint IOU	DRA	Joint Enviro. Parties
Basic Service	PG&E	$2.25 to $5.56	$2.03 to $5.00	$1.19 to $2.94	0.0%	0.3%	1.4%
	SCE	$2.31 to $11.13	$2.08 to $10.01	$1.22 to $5.88	-0.1%	0.4%	2.3%
	SDG&E	$2.41 to $4.11	$2.17 to $3.70	$1.27 to $2.17	0.0%	0.3%	1.2%
All-Electric	PG&E	$2.32 to $4.69	$2.09 to $4.22	$1.23 to $2.48	0.0%	0.2%	0.9%
	SCE	$2.53 to $10.82	$2.28 to $9.74	$1.34 to $5.72	-0.1%	0.4%	2.3%
	SDG&E	$2.46 to $4.89	$2.21 to $4.40	$1.30 to $2.58	0.0%	0.3%	1.2%
		Winter					
Basic Service	PG&E	$2.73 to $4.09	$2.46 to $3.68	$1.44 to $2.16	0.0%	0.3%	1.4%
	SCE	$2.28 to $2.79	$2.05 to $2.51	$1.20 to $1.47	-0.1%	0.4%	2.3%
	SDG&E	$2.53 to $3.46	$2.28 to $3.12	$1.34 to $1.83	0.0%	0.3%	1.2%
All-Electric	PG&E	$2.32 to $4.69	$2.09 to $4.22	$1.23 to $2.48	0.0%	0.2%	0.9%
	SCE	$1.89 to $3.83	$1.70 to $3.44	$1.00 to $2.02	0.0%	0.3%	1.6%
	SDG&E	$1.92 to $3.29	$1.72 to $2.96	$1.01 to $1.74	0.0%	0.2%	0.7%

It is noteworthy that if all of the allowance value were returned (e.g. the Joint IOU proposal) the average customer would break even. This is the conscious result of CARB's approach to allocation that recognizes measures to promote energy efficiency and early action among the IOUs and POUs. "As a matter of policy the approach to allocating allowances to the electric sector has been to ensure that each utilities allocation is at least equal to their customers' total expected cost burden in each year" (CARB, 2011b, p.6). If 90 percent of it were returned (e.g. the DRA proposal) the average customer would realize a small net increase in electricity

payments due to the cap-and-trade program, at least until the benefits of investment choices with the remaining 10 percent of allowance value came to fruition.

The idea of an equal payment per customer account is embodied in the proposal from the Joint Environmental Parties but only in an approximate way. Table 6 reports the outcome of a strictly equal payment (dividend) per customer account under each proposal.[14] These payments differ across IOUs because CARB has already implemented a formula determining the allowance value returned to IOUs. Though this approach resembles the payment of dividends, these payments would not vary with the number of individuals in the household.

The first block of results in Table 6 ("Dividend per Customer") reports the monthly value of equal payments per customer account under each proposal. The second block of results ("Net Change after Monthly Dividend") lists the percentage net change in customer costs when the equal monthly dividends are used to offset the costs of cap and trade. From Tables 3 and 4, one can see that the costs vary substantially across baseline territories but the payment reported in Table 6 does not; this explains why the percentage net change ranges from negative to positive values.

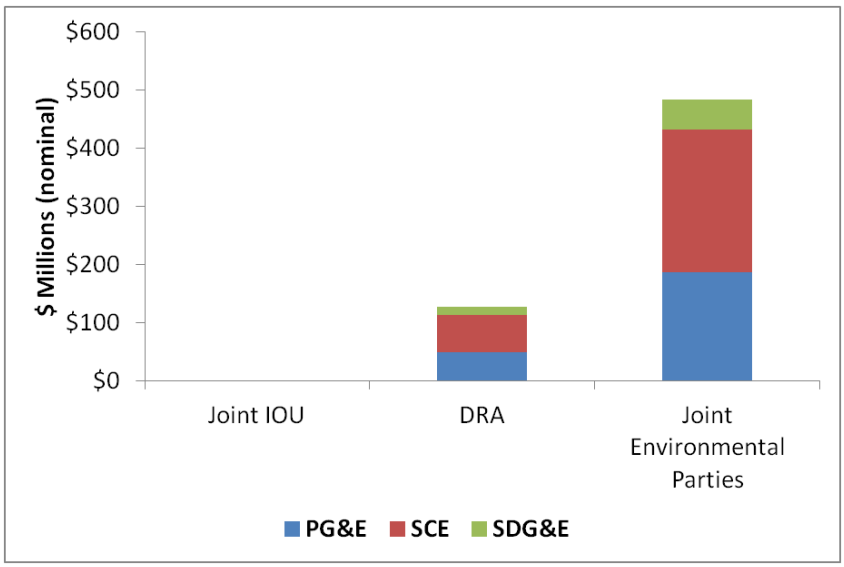
Tables 5 and 6 also highlight a broader set of trade-offs. To return all of the allowance value to customers through reductions in their bills would leave no revenue for investments in efficiency. The DRA proposal calls for 10 percent of estimated allowance revenues to be spent on investments, and the Joint Environmental Parties calls for substantially more. Figure 6 illustrates the amount of revenue that would be available for investment under each of the three proposals.

[14] Advocates of a dividend approach might suggest that the payments should not be distinguished by IOU service territory.

Table 6. Net Cost of Cap and Trade for Average Residential Customers

		Summer					
		Dividend (Average Benefit from Auction Revenues) per Customer ($/month)			Net Change in Customer Costs After Monthly Dividend (%)		
Service Type	Utility	Joint IOU	DRA	Joint Enviro. Parties	Joint IOU	DRA	Joint Enviro. Parties
Basic Service	PG&E	$2.51	$2.26	$1.33	-0.4% to 1.6%	0.0% to 1.7%	1.2% to 2.2%
	SCE	$3.64	$3.28	$1.92	-3.0% to 3.3%	-2.2% to 3.5%	0.8% to 4.1%
	SDG&E	$2.67	$2.40	$1.41	-0.2% to 0.9%	0.0% to 1.1%	1.1% to 1.7%
All-Electric	PG&E	$2.51	$2.26	$1.33	-0.2% to 0.9%	0.0% to 1.0%	0.8% to 1.3%
	SCE	$3.64	$3.28	$1.92	-2.3% to 3.3%	-1.5% to 3.5%	1.2% to 4.1%
	SDG&E	$2.67	$2.40	$1.41	-0.2% to 1.2%	0.1% to 1.3%	1.1% to 1.8%
		Winter					
Basic Service	PG&E	$2.51	$2.26	$1.33	0.2% to 1.1%	0.5% to 1.3%	1.5% to 2.0%
	SCE	$3.64	$3.28	$1.92	-3.1% to -1.6%	-2.3% to -1.0%	0.7% to 1.5%
	SDG&E	$2.67	$2.40	$1.41	-0.1% to 0.6%	0.2% to 0.8%	1.2% to 1.5%
All-Electric	PG&E	$2.51	$2.26	$1.33	-0.2% to 0.9%	0.0% to 1.0%	0.8% to 1.3%
	SCE	$3.64	$3.28	$1.92	-3.2% to 0.1%	-2.6% to 0.4%	-0.1% to 1.7%
	SDG&E	$2.67	$2.40	$1.41	-0.6% to 0.3%	-0.4% to 0.4%	0.4% to 0.9%

Figure 6. Estimates of Proposed Energy System Investment



Conclusion

California is leading the nation in implementing policies to address climate-disrupting GHGs. The decisions that still loom large deal with how to use allowance value from the cap-and-trade program.

In proceedings before CPUC, several parties have proposed approaches to accomplishing this goal. Three ideas emerge as most prominent. The utilities propose using allowance value to reduce electricity bills. California's Division of Ratepayer Advocates proposes spending a small amount on investments and would direct the rest to customers in proportion to their costs in an annual check. A third approach, suggested by environmental parties, would make investments in energy efficiency and other measures the top priority, protect industrial customers from unfair competition from out of state, and return the rest of the value to customers as equal payments per customer account, adjusted for geography and whether the house is heated with electricity, in an off-the-bill rebate.

The use of allowance value under cap and trade is arguably the most important feature in determining the distributional outcome of the program. In the absence of allowance value, the gross change in electricity costs for the average customer across territories could range from $25 to nearly $80 in 2013. This range reflects the diversity of electricity use in different climate conditions and the different carbon intensity across utilities. Low-income customers and those

who consume less than average would carry no or few costs under the program. On the other hand, customers who consume more than average would carry most of the program costs.

The allowance value assigned to the electricity sector under this program can offset all of the changes in electricity costs due to cap and trade. However, how this allowance value is used for the benefit of ratepayers or returned directly to ratepayers is an important issue in the program design. Insulating customer bills from the costs of cap and trade might be politically safe in the short run but might help to prevent the achievement of program goals and introduce economic inefficiency in the long run, especially if households and businesses perceive different costs to be associated with energy use in different sectors of the economy. Facing these tradeoffs is an important issue that should be of concern to all Californians and will be closely observed by political leaders across the globe.

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