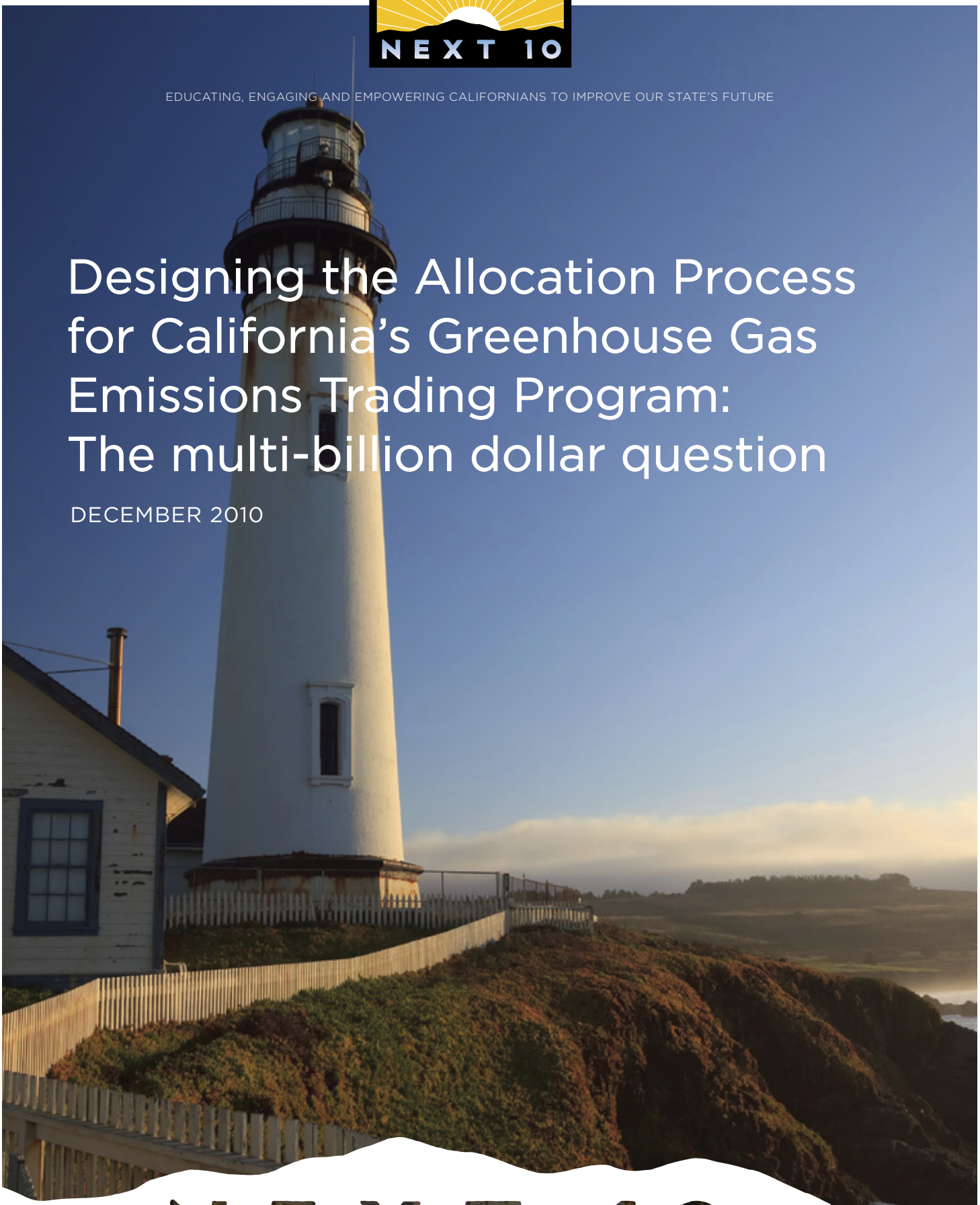
NEXT 10

EDUCATING, ENGAGING AND EMPOWERING CALIFORNIANS TO IMPROVE OUR STATE'S FUTURE

Designing the Allocation Process for California's Greenhouse Gas Emissions Trading Program: The multi-billion dollar question

DECEMBER 2010



NEXT 10

About Next 10

NEXT 10 IS A NONPARTISAN, NONPROFIT ORGANIZATION THAT EDUCATES, ENGAGES AND EMPOWERS CALIFORNIANS TO IMPROVE THE STATE'S FUTURE.

Next 10 is focused on innovation and the intersection between the economy, environment, and quality of life issues. We provide critical data to help inform the state's efforts to grow the economy and reduce global warming emissions.

Designing the Allocation Process for California's Emissions Trading program: The multi-billion dollar question summaries five research papers commissioned by Next 10 from leading academic experts to address how California should distribute greenhouse gas allowances and resulting revenue. All five studies and this summary can be found at www.next10.org.

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David Roland-Holst
Adam Rose, Dan Wei, and Fynnwin Prager
Richard Morgenstern and Eric Moore
Jamil Farbes and Daniel Kammen
Dallas Burtraw and Ian Parry

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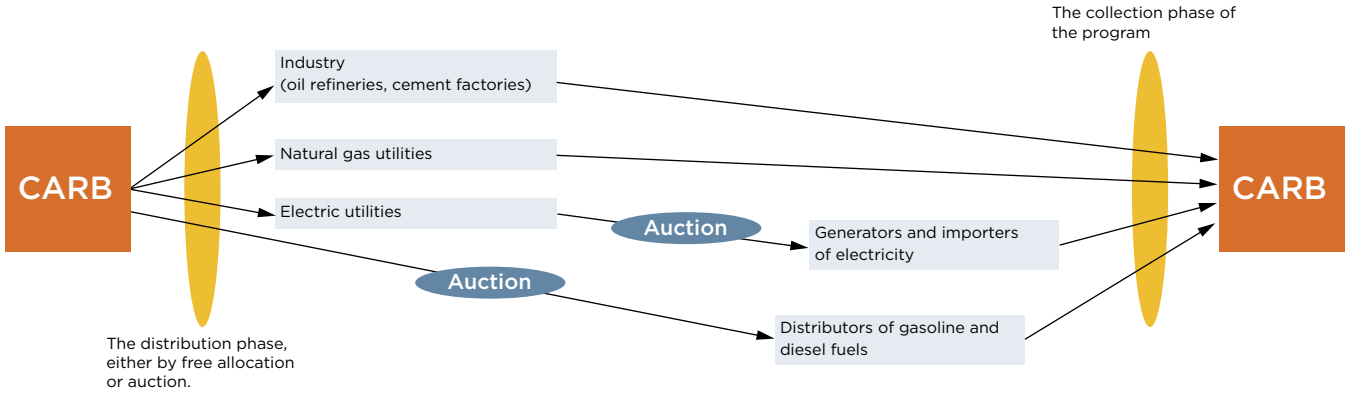
How should California distribute greenhouse gas (GHG) allowances and resulting revenue? To support more informed discussion of this important issue, Next 10 helped convene a small workshop in April 2009 comprised of national experts, California decision makers (including members and staff of the California Air Resources Board) and stakeholders. Workshop participants offered a broad range of perspectives on how California should distribute GHG allowances and resulting revenue. The summary report, "Allocating AB 32 Allowances and Fees: Perspectives & Findings" outlines key questions for further research.

In response to these key questions, Next 10 commissioned a set of five research papers[1] from leading academic experts to examine the following questions:

- What are the economic impacts of the distribution of tradable emission permits (allowances), whether by auction or distribution without charge?
- If auctioned, what are the economic impacts of various distribution approaches for the resulting revenue?

These important design issues will decide by whom and how tens of billions of dollars will be used, both of which will greatly influence the market incentives operating in California's greenhouse gas emissions trading program. For more information about the draft proposal for a California emissions trading program from the California Air Resources Board, please see Appendix II. Figure 1 provides a simplified flow diagram of the proposed process for distribution and collection of allowances.

Fig. 1 A schematic of allowance (tradable permit) distribution and collection as proposed by CARB.



This illustration captures the main dynamics but is a simplification and does not represent all the intricacies.
The year 2015 is represented, after natural gas and gasoline and diesel have begun to be covered by the program.

[1] David Roland-Holst:
Real Incomes, Employment, and California Climate Policy
University of California and Mills College

Adam Rose, Dan Wei, and Fynnwin Prager:
Aggregate and Distributional Impacts of Alternative AB 32 Allocation Strategies
Rose and Associates

Richard Morgenstern and Eric Moore:
California Industry Impact of a Statewide Carbon Pricing Policy with Output-Based Rebates
Resources for the Future

Jamil Farbes and Daniel Kammen:
Government Investment in a Clean Energy Future
University of California, The World Bank

Dallas Burtraw and Ian Parry:
Options for Returning the Value of CO_2 Emissions Allowances to Households
Resources for the Future

Bios for all authors can be found in Appendix I

BACKGROUND

As the first decade of a new century draws to a close, California is continuing its leadership in climate policy. California's approach includes a mix of clean energy, energy efficiency standards and incentives, as well as an emissions trading (or "cap and trade") program.

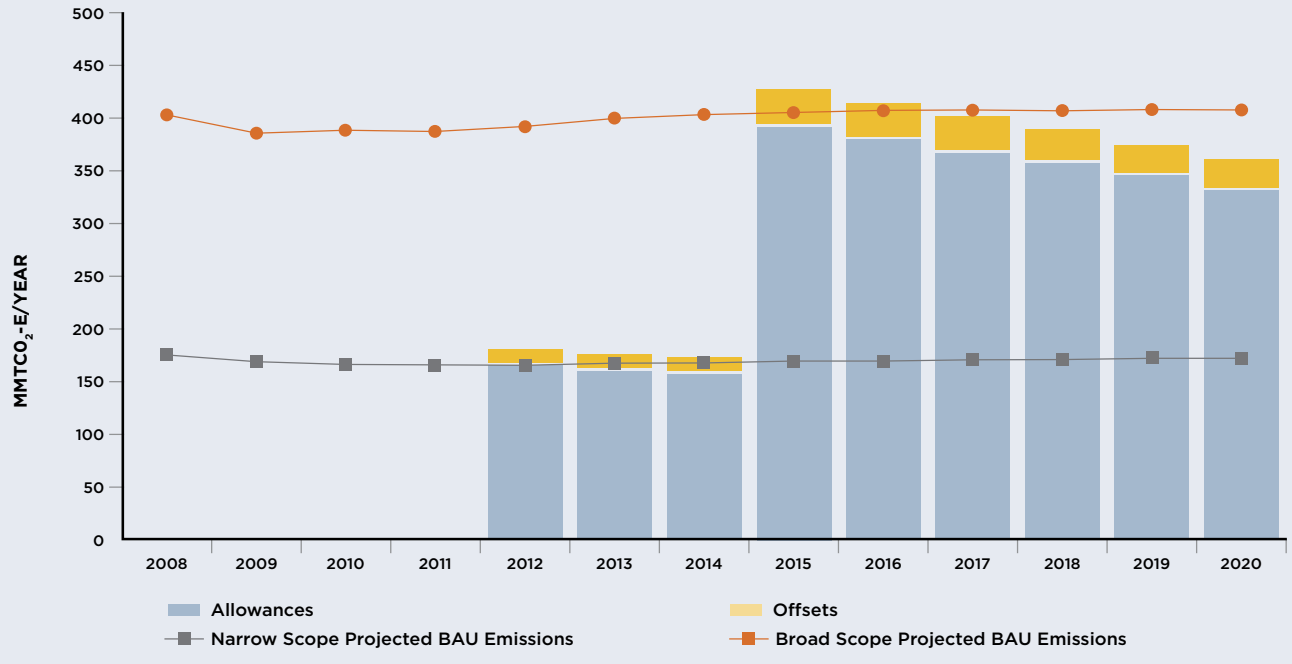
Under an emissions trading program, the largest polluters, like power plants and factories, are required to obtain permits to cover their greenhouse gas emissions. Each permit, often called an allowance, enables the holder to use a pubic resource, the atmosphere, to emit one ton of carbon dioxide (or the equivalent of one of the other greenhouse gases covered under the program). The allowances or pollution rights are tradable, and this flexibility encourages more cost-effective emission reductions where they are least costly. The state limits the total number of allowances issued each year. Gradually and over time, the amount of allowances made available is reduced, and this forces reductions in the overall level of pollution.

One alternative way businesses covered under an emissions trading program can comply is to obtain offsets, or reductions in emissions by projects in sectors not directly covered by the program, like forestry or agriculture. Figure 2 illustrates that by 2020 the program reduces emissions by about 15 percent below business-as-usual (BAU) levels. It depicts the gradual character of the pollution cuts that will be required, and the phasing in of additional sectors of the economy in 2015. The program starts with a "narrow scope," but more than doubles in size in 2015 when it expands to the "broad scope."

One of the central questions in designing an emissions trading program is how to distribute the allowances that are the currency of compliance under such a policy. Allowances can be auctioned or they can be given at no charge to businesses that are to be covered by the emissions trading program (also known as free allocation). The emissions trading program operating in the northeastern states of the U.S., known as the Regional Greenhouse Gas Initiative, has chosen to auction most of the allowances. The European Union's Emission Trading Scheme started out with most allowances given away for free, but has been increasing the amount of auctioning.

Over the current time horizon for the emissions trading program, 2012-2020, California's plan calls for the creation and distribution of 2,675 million allowances (CARB 2010, Appendix E, p. 13). Nobody knows exactly

Figure 2: Projected GHG Emisions Relative to Allowance and Offset Levels



how much these allowances will be worth. Using one example of $20 each, which is consistent with ARB estimates, it is implied that a total of over $50 billion dollars is at stake. As Dallas Burtraw and Ian Parry report[2]: "The projected value of allowances for 2012 is $2.5 to $7.5 billion, rising to $7.3 to $21.9 billion in 2020 (2007 dollars)."

In May 2009 CARB appointed a sixteen member Economic and Allocation Advisory Committee (EAAC), comprised of economic, financial, and policy experts, to provide advice on the allocation of allowances and use of their value. While this research project originated before the creation of the EAAC, the research commissioned by Next 10 proceeded concurrent with and was informed by the EAAC's deliberations. The EAAC report offered some clear recommendations but left some important questions unanswered. In particular, estimating the empirical effects of AB 32 policies on California was largely beyond the scope of the EAAC. Appropriate modeling to estimate such effects can be a complex task, and in this case it is made more complex by uncertainty about when neighboring non-California jurisdictions also will begin to reduce emissions. The studies undertaken here estimate effects during the 2012-2020 period under the assumption that other jurisdictions are not making comparable efforts. As a generalization, the effects in California will become more positive as these jurisdictions begin to make comparable reductions.

The EAAC recommended that most or all of the tradable permits be auctioned, though some free allocation might be needed: "[t]o address "emissions leakage," i.e., increases in out-of-state GHG emissions generated by California's climate policy[i]. The need for free allocation to address emissions leakage is likely to be small."[ii] Next 10 sought to shed more light on the following questions:

- What is the best mix of auctioning and free allocation? What are the macroeconomic impacts of alternative approaches? What are the impacts on people in different income groups?
- Is it possible to further characterize the risk of leakage and what industries are most at risk of this?
- How should the state prioritize government options for investment of auction revenue?
- What are the economic impacts of different methods of returning auction revenue to Californians (e.g. tax relief, equal per capita dividends)?

In an effort to address these questions, researchers working with Next 10 examined five different issues, which relate directly back to EAAC recommendations:

1. Modeling the macroeconomic impacts on the state economy under a variety of different allocation scenarios
2. Seeking insights into competitiveness concerns, including emissions leakage and border adjustments
3. Considering various means of consumer protection, and possible benefits of returning revenue to households by offsetting existing taxes
4. Analyzing how redistributing allowance value[iii] as transfers to households can be done in a manner that incentivizes households to reinvest dividends to further AB 32 goals
5. Identifying priority government investments, as well as attempting to operationalize an aggregate social net return criterion to provide insight into the appropriate level of government investment.

RESEARCH OVERVIEW

Two papers, *Real Incomes, Employment, and California Climate Policy (Roland-Holst)* and *Aggregate and Distributional Impacts of Alternative AB 32 Allocation Strategies (Rose et al)* model macroeconomic impacts across sectors of the economy and across different income groups that would result from different mixes of free allocation and auctioning of allowances for the emissions trading program as a whole. These two studies employ a common set of allocation scenarios that range from 100 percent free allocation to 100 percent auction of allowances. Their scenarios also compare the return of auction revenue to households through two distinct approaches, (1) personal income tax cuts and (2) equal payments to each adult citizen of California. The latter is referred to as a "dividend" approach to returning auction revenue to the people of California.

[2] Dallas Burtraw and Ian Parry: *Options for Returning the Value of CO_2 Emissions Allowances to Households* Resources for the Future

California Industry Impact of a Statewide Carbon Pricing Policy with Output-Based Rebates (Morgenstern and Moore) examines the impacts on California industries (including oil refineries, cement factories, and oil extraction) of a state-level carbon pricing policy. Morgenstern and Moore apply the formulae for allocating emission allowances to energy-intensive industries that is embodied in national legislative proposals, i.e., American Clean Energy and Security Act (ACES or H.R. 2454) that was passed by the United States House of Representatives in July 2009, to California-specific data for different industries. It should be noted that there are critical differences between the ACES Act and California's proposed scheme. ACES is an upstream system that prices virtually all CO_2 emissions at the time that fossil fuels enter the economy. The fact that it is upstream simplifies the modeling. California's proposed scheme is a downstream system that does not cover smaller producers below a certain emission threshold. Modeling the California scheme will require a more detailed representation of the economy than is currently being used.

Morgenstern and Moore find that in the short-run, firms may be less capable of adapting their production process as compared to the long-run. However, with an allocation of allowances to energy-intensive and trade-exposed industries, the aggregate effect of carbon pricing on industry output is likely to be small. It should be noted that Morgenstern and Moore assume that companies are caught unaware of an impending emissions trading program and therefore are less able to adapt.

Government Investment in a Clean Energy Future (Farbes and Kammen) explores prioritization for government investment of auction revenue. Their work illustrates the challenges of balancing the multiple objectives spelled out in California Assembly Bill 32 (AB 32), the law establishing the legal authority for an emissions trading program.

Options for Returning the Value of CO_2 Emissions Allowances to Households (Burtraw and Parry), analyze some of the more subtle dynamics that will determine the effectiveness of dividends (equal payments to people) as compared to income tax reductions. This was an area where the EAAC did not reach consensus. Each approach was recognized as having strengths and weaknesses by the EAAC.

SYNTHESIS OF FINDINGS

MACROECONOMIC IMPACTS

- The impacts of an AB 32 cap and trade system, combined with complimentary policies, on Gross State Product (the value of goods and services produced in California) will be very small. Each study finds that these impacts might range from very slightly negative to slightly positive depending on assumptions and policy scenario designs. (Roland-Holst, Rose et al)
- Leakage of business activity from California as a result of AB 32 is likely to be small. In particular, it is apparent that AB 32 adjustment costs do not outweigh the benefits of market proximity, network synergies, etc., currently enjoyed by firms resident in the state. (Roland-Holst, Rose et al)
- Changes in retail electricity prices resulting from AB 32 and the emissions trading system will be very small. (Roland-Holst, Rose et al)
- Most scenarios result in positive economic growth and net consumer income increases, with the exception of the case of free allocations. Economic growth as well as income distribution impacts range from slightly negative to positive depending on the extent to which the opportunity cost of free allowances will be passed to the consumer or not. (The models examine the extreme cases: The structure of Roland-Holst's model enables a significant amount of carbon price pass through; Rose et al assumes none of it will be passed.) If costs are not passed along, then there is estimated to be a net positive impact of free allocations on consumers and economy.
- Macroeconomic factors, such as changes in particular sectors of the economy, have a significant effect on the aggregate and distributional results. Some of the results are not readily apparent by looking only at the direct costs or cost savings of mitigation options, or by considering only the method used to return auction revenue to households, which is why macroeconomic modeling was undertaken. (Roland-Holst, Rose et al)

RETURNING REVENUE TO CALIFORNIANS

- When GHG emission allowances are auctioned and revenues are returned to California residents as proportional personal income tax relief or equal per capita dividends, employment will increase by about one-half of one percent (0.5%). Figures 3 and 4 below show the employment impacts predicted for each modeling effort across the different types of scenarios. (Roland-Holst, Rose et al)
- There is little difference in the aggregate (overall) impacts of the two approaches for returning auction revenue to households, i.e. the two strategies of personal income tax reductions and dividends. (Roland-Holst, Rose et al)
- Returning revenue to households through the dividend approach has a slightly more positive impact in terms of net employment growth. (Roland-Holst, Rose et al)
- Returning revenue to households through dividends reduces income inequality (as others have also found Kunkel and Kammen 2011; Kunkel and Kammen 2009; Boyce and Riddle 2009) because dividends improve outcomes proportionately more for the lower income groups, while tax reductions benefit high-income groups, because they typically pay more in taxes. (Burtraw and Parry)
- If funds from an allowance auction (or emissions fee) were used to reduce other taxes, economic theory suggest there would be an efficiency boost for the economy. (Burtraw and Parry)
- Past experience with rebate checks suggests rebates alone are not a strong economic stimulus. Creative approaches to using the stream of expected future rebate payments as collateral in loans for clean tech investments are offered. (Burtraw and Parry)
- There are disproportionate impacts on the highest income bracket in most of the scenarios with higher income individuals receiving the highest level of benefit when auction revenues are returned via tax rate reductions. The main reason is that this group has the largest per-household tax liabilities and profit income. (Roland-Holst, Rose et al)

IMPACTS ON INDUSTRY

- Even if industrial producers failed to respond to incentives to use cleaner technologies, and they continued to use the same energy mix after the introduction of an emissions trading program, the impacts to California's energy intensive and trade exposed industrial sectors would be small. (Morgenstern and Moore)
- Under the formula embodied in federal legislation that passed the House of Representatives in 2009 (ACES), the impacts average 0.43 percent of the value of production for the most energy-

Figure 3: Employment effects for Roland-Holst

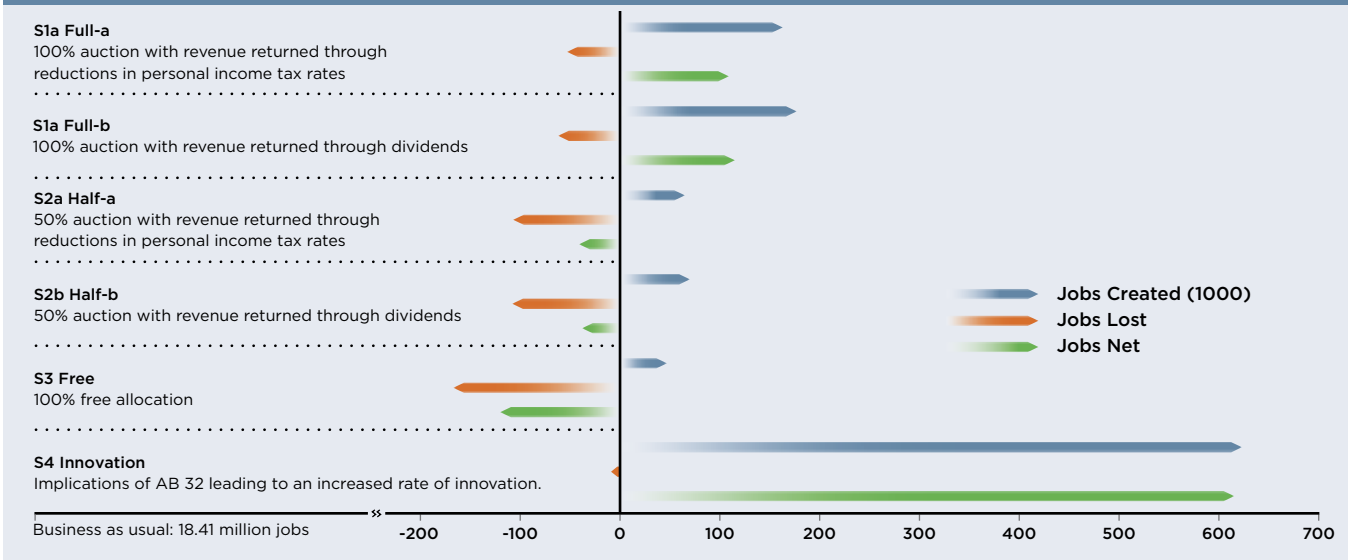
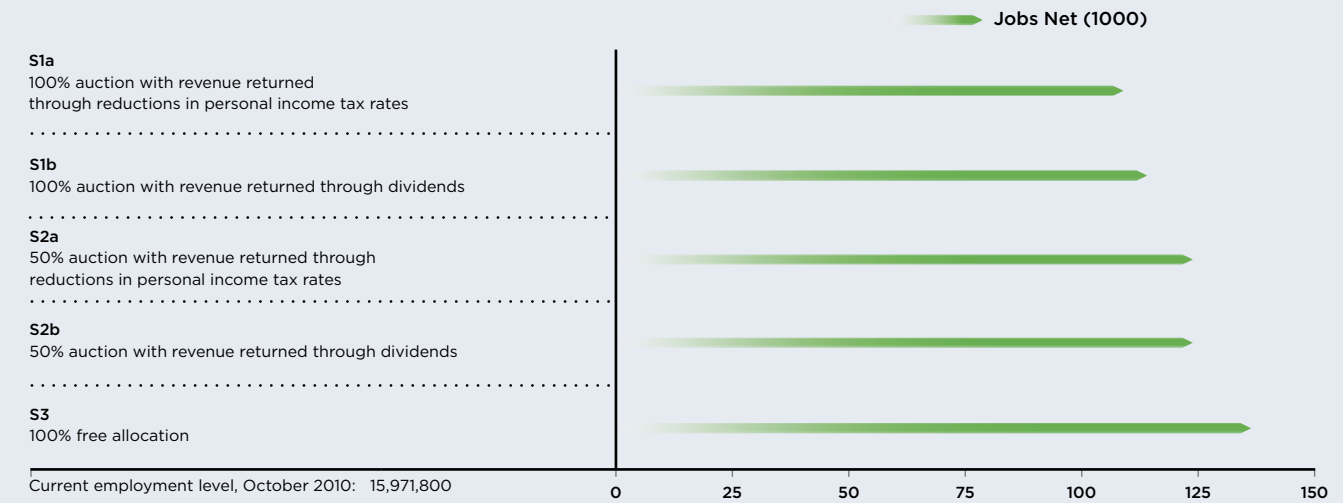


Figure 4: Employment effects for Rose et al



intensive industries facing the greatest international competition. Given CARB's stated intention to be more generous to these sectors than under the federal proposal, the anticipated impacts should be even smaller and some sectors could well enjoy higher profits as a result. (Morgenstern and Moore)

PRIORITIES FOR REVENUE INVESTMENT

- A clear priority is for government investment to facilitate the capture of low cost greenhouse gas emission reductions that the emissions trading program alone would not achieve. This enhances cost effectiveness by overcoming market barriers inhibiting the transformation to low carbon economy technologies that exist even after a price on carbon is established.
- In light of the above, and AB 32's mandate to ensure fairness in implementation and environmental justice in particular and the need for California to adapt to climate change to the extent some warming is inevitable, research identifies a number of priority investments: 1) Research, development and demonstration funding to speed the invention and commercialization of new advanced technologies, 2) incentives to bolster the diffusion of existing improved technologies, 3) investments in low income communities burdened by high pollution levels, to capture public health benefits there and to enhance the program's fairness, and 4) adaptation to climate change recognizing that some global warming is inevitable. (Farbes and Kammen)

DIFFERENCES BETWEEN STUDIES: OPPORTUNITY COSTS

While there is general agreement between the two macroeconomic studies. Some variability arises from differences in model types, data and assumptions. These include the following: 1) Roland-Holst uses a computable general equilibrium model, while Rose et al. uses a macroeconometric model; 2) Rose et al. uses ENERGY2020 and CARB data, while Roland-Holst uses a broader set of data sources that assume different carbon prices; and 3) the two studies use different data sources on the initial income distribution of the economy and the distribution of income payments from individual sectors.

The two macroeconomic studies differ primarily in their assessment of the aggregate and distributional impacts of the scenario characterizing the free allocation of GHG emission allowances. Roland-Holst's study finds that 100 percent auction provides the best outcomes in terms of both efficiency (macroeconomic results) and fairness, a result that resonates with related published research. This study assumes that firms will recognize and respond to the opportunity cost of free allowances—that they are valuable assets that can be sold at market value, and that the recipient firms that forego selling them must charge their customers for this lost revenue.[iv] The study by Rose et al assumes the opportunity cost of the

freely allocated allowances will not be passed along to customers of firms receiving the allowances because regulatory authorities will not allow it in cases such as electric utilities or that market pressures from competitors outside of California will stunt these pass-throughs in cases like petroleum refining and cement manufacturing. Put differently, Rose et al's assumption implies that free allocation will suppress price effects. Under these conditions, free allocation performs well in terms of macroeconomic indicators though income inequality is increased (becomes less fair) through this approach, with the lowest income group still benefiting but to a far lesser extent than the higher income groups.

It should be noted that both the EAAC and presentations made at the Next 10 April workshop concluded that companies will charge for the "opportunity cost" of allowances to the extent that they have the ability to do so, regardless of whether they pay for allowances through an auction or receive them for free. This led to windfall profits for recipients of allowances in the European Union.

SYNOPSIS OF FIVE STUDIES

DAVID ROLAND-HOLST — REAL INCOMES, EMPLOYMENT, AND CALIFORNIA CLIMATE POLICY

Roland-Holst's results indicate that the aggregate effects of AB 32 on the California economy are very small; amounting to less than three months deferred growth across a decade. This is true for all allocation scenarios assessed except one: Roland-Holst's innovation scenario (Scenario S4 below). The assumption in this scenario is that AB 32 delivers a small boost (one percent annually) to the rate of innovation in energy efficiency. Under these circumstances, which more accurately reflect California's four decades of prior experience with energy policy, implementation delivers significant growth dividends across the state. Under this scenario, AB 32 programs including the emissions trading program creates over 600,000 new jobs by 2020 and leads to increases in Gross State Product (the value of final goods and services produced in California of more than four percent.

The next table summarizes results across different scenarios, using the following labels:

- **S1a.** 100% auction with revenue returned through reductions in personal income tax rates
- **S1b.** 100% auction with revenue returned through dividends
- **S2a.** 50% auction with revenue returned through reductions in personal income tax rates
- **S2b.** 50% auction with revenue returned through dividends
- **S3.** 100% free allocation.

Roland-Holst finds that auctioning allowances can smooth the transition to a low carbon economy without

Table 1: Macroeconomic Impacts of Different Allocation Methods
(percent changes from baseline values in 2020)

	S1a Full-a	S1b Full-b	S2a Half-a	S2b Half-b	S3 Free	S4 AEEI
Total GHG*	-27.58	-27.67	-27.79	-27.83	-27.78	-25.96
Household GHG*	-31.47	-31.50	-31.48	-31.49	-31.48	-31.31
Industry GHG*	-25.33	-25.47	-25.66	-25.73	-25.64	-22.87
Real GSP	-0.23	-0.31	-0.52	-0.56	-0.67	4.44
Real Consumption	0.01	0.39	-0.95	-0.77	-1.97	3.97
Employment*	0.55	0.58	-0.21	-0.19	-0.61	3.10
Permit Price	$21	$19	$31	$28	$43	$18
Jobs Created (1000)	163	177	65	70	47	623
Jobs Lost	-53	-62	-107	-108	-167	-9
Net	109	115	-41	-38	-120	614
Income Per Capita	-103	-137	-231	-248	-296	1,959

Source: Author estimates.
Permit price in 2007 dollars per metric ton of CO_2 equivalent carbon, in 2020.

compromising long-term climate goals, employment, or equity. In particular, the research finds that:

- Auctioning permits and distributing the revenue to households can reduce the aggregate cost of climate policies and can increase statewide employment.
- Returning permit revenues to households using dividends (equal per capita lump sum transfers) is better for growth and total employment than with tax reductions.
- Dividends enhance the fairness of the income distribution after the program goes into effect, with the lowest income groups being helped the most. Dividends are more beneficial to the lowest income brackets.
- Free allocation of emission rights could reduce adjustment costs for individual polluting industries, but this increases costs for the population of California.
- The estimated risk of "leakage" posed by AB 32, either in terms of job losses or pollution transfers, is negligible.
- As a result of AB 32 implementation, households experience energy efficiency gains that reduce total energy expenses. In other words, the policy as written has a small positive net cost to the overall economy, but lowers energy expenses to households.
- Roland-Holst's assessment also finds that AB 32 will reduce aggregate criteria pollution, but might change its composition in ways that justify complementary, localized mitigation efforts. In all cases, however, the impacts are very modest. The EAAC envisioned this problem and suggested resources be committed to analyzing and resolving it.

ROSE, WEI, AND PRAGER — AGGREGATE AND DISTRIBUTIONAL IMPACTS OF ALTERNATIVE ALLOCATION STRATEGIES

Rose et al. conclude that AB 32 is a win-win-win policy. It has the potential to improve the State's economy, reduce income disparities and reduce the emissions of greenhouse gasses. Their analysis results in aggregate impacts of AB 32 that are very slightly positive, generally in the range of 0.3 to 0.5 percent increase of Gross State Product (GSP) in the Year 2020. Employment increases are estimated to be 0.5 to 0.7 percent in 2020, indicating that AB 32 is slightly more labor-intensive than the average operation of the California economy.

The authors find that the exit of industries from the state as a result of AB 32, also known as the "leakage" of business and greenhouse gas emissions, is likely to be minimal.

Consumer prices are estimated to increase by only 0.1 percent. Like Roland-Holst, Rose et al. find that consumers benefit from improved energy efficiency in their own homes and from businesses that lower their energy bills and therefore the cost of their products. These energy savings lead to more consumption of other goods and services that are produced in state, yielding an indirect macroeconomic boost.

Auctioning greenhouse gas emission allowances provides opportunities for recycling revenues:

- Auction revenues are estimated to be at most $7.9 billion in 2020, and, while this is a very small portion of the California economy, it is a significant portion of state government revenue that could be returned to businesses and households.
- Revenue recycling to households through proportional personal income tax relief or equal per capita dividends improves aggregate economic gains and slightly narrows the disparity in the overall distribution of income.

Allowances can also be granted for free to GHG emitters:

- Free allocation results in a widening of the disparity in the overall income distribution.
- Free allocation can result in an almost imperceptible decrease in GSP if the opportunity cost of allowances is passed on to customers and a very small gain in GSP if opportunity costs are not passed on.

The results of the macroeconomic studies indicate the importance of further exploration of the issue of opportunity cost pass through. Recall that when an allowance is granted for free, the use of an allowance represents lost revenue from a foregone sale of it. Will businesses be able to pass along this new cost is the question? To what extent does free allocation suppress price increases?

Rose, Wei, and Prager's work suggests that price suppression can have value in terms of improved macroeconomic performance under an emissions trading program. Their 100 percent free allocation scenario with no opportunity cost pass through performs best in terms

of overall Gross State Product and employment levels. That said, differences between the results of that scenario and the others are not very large.

The next table summarizes results across different scenarios, using the following labels:

- **S1a.** 100% auction with revenue returned through reductions in personal income tax rates
- **S1b.** 100% auction with revenue returned through dividends
- **S2a.** 50% auction with revenue returned through reductions in personal income tax rates
- **S2b.** 50% auction with revenue returned through dividends
- **S3.** 100% free allocation

MORGENSTERN AND MOORE— IMPACTS ON THE INDUSTRIAL SECTOR

Richard Morgenstern and Eric Moore's paper explores the impact of a carbon pricing policy on California's large industrial facilities, such as cement plants, refineries and oil and gas extractions, estimating the impacts on specific California industries by applying the ACES emissions trading program approach. This involves an upstream carbon pricing policy within the state along with an allocation of allowances (rebates) designed to cushion the impacts on energy-intensive and trade-exposed (EITE) industries. The cost of greenhouse gas pollution is assumed to be $15/ton of CO_2. However, the effects of carbon pricing in this model are linear, so cost would fall by half following a halving of carbon prices.

The authors conclude that pricing greenhouse gas emissions via a comprehensive statewide cap-and-trade system, as called for under the California Air Resources Board's Scoping Plan and detailed in the recent draft regulation, is an efficient means of reducing emissions. They further conclude that free allowances for energy-intensive industries can mitigate a large amount of the adverse effect of pricing CO_2 emissions. Even in the absence of rebates, the declines in industry output that result from a carbon pricing policy are likely to be small on average, though a few selected sectors see larger impacts.

California's potential vulnerabilities to interstate and international trade are examined through the use of alternative assumptions about demand elasticities, i.e. assumptions about how consumer demand responds to price increases. Two time horizons are considered, the "very short run" and the "short run", neither of which allow firms to alter their input mix or invest in new technologies.

To better understand what is meant by the "very short run" and "short run", consider that businesses covered under a cap-and-trade program will respond in at least three ways:

(1) ***Smart energy use and clean energy:*** They will use energy in smarter ways and will invest in cleaner energy.

(2) ***Acquire allowances:*** They will acquire allowances (or offsets, an alternative form of compliance not focused on here).

(3) ***Cost pass through:*** They will pass along any cost increases to consumers to the extent they are able to do so profitably, which will depend on how consumer demand responds to price changes and the extent of trade exposure.

Table 2: Impacts of AB 32 in Year 2020 under Alternative Revenue Recycling Scenarios

Macroeconomic Indicator	Level in 2020					Percentage Change from Baseline in 2020				
	S1a	S1b	S2a	S2b	S3	S1a	S1b	S2a	S2b	S3
GSP (billion 2007$)	2,477	2,478	2,480	2,480	2,482	0.3%	0.3%	0.4%	0.4%	0.5%
Labor earnings (billion 2007$)	1,317	1,318	1,318	1,319	1,319	0.5%	0.5%	0.5%	0.5%	0.6%
Employment (thousands)	22,016	22,019	22,030	22,031	22,042	0.5%	0.5%	0.6%	0.6%	0.6%
HH Income (billion 2007$)	1,432	1,432	1,434	1,434	1,436	0.4%	0.4%	0.5%	0.5%	0.7%
Consumption (billion 2007$)	2,242	2,242	2,245	2,245	2,249	0.7%	0.7%	0.8%	0.8%	1.0%
CPI (2000=100)	160	160	160	160	160	0.1%	0.1%	0.1%	0.1%	0.1%

Morgenstern and Moore's "very short" run only allows for alternative 2 above, acquire allowances. Covered businesses do not change the way they use energy or their energy mix. They do not try to raise prices to account for the introduction of a cost for the pollution they release (see alternative 3 above, cost pass through), though this is allowed in the "short run" scenario. As a result, none of the following results reflect implementation of greater energy efficiency or clean energy that are the ultimate goals of the emissions trading program. Because of this, the cost estimates here should be viewed as upper bounds. Actual costs would be expected to be lower.

Overall, the authors find quite small impacts on EITE industries, especially with the rebates in place. The average post rebate EITE output reduction is 0.43 percent, rising to 0.55 percent in the worst-case assumption about California demand elasticities. If the funds were fully returned to households instead of being partially rebated to EITE industries, the overall impact on the California economy would be slightly lower, although the costs for the EITE industries would be slightly higher.

Despite the relatively small impacts on EITE industries with the rebates in place, there is considerable variation in effects among the different industries. The most heavily impacted industry is fertilizer manufacturing, where the short run output loss is 3.2 percent with the rebates in place, down from 4.7 percent without the rebates. Under the worst-case elasticity assumption, the post rebate output loss for fertilizers is 4.0 percent. The authors also find that the ability to pass on costs, as assumed in the short run case, reduces adverse profit impacts to less than 1.5 percent in most cases, regardless of the rebate scenario.

It must be emphasized that these results are based on a federal proposal and not on CARB's proposed emissions trading program, which is much more generous in its free allocations both in terms of what sectors are eligible and how many allowances each receives. This is evident from the fact that when Morgenstern and Moore apply the federal approach, eleven California industries are not eligible for any free allowances. Yet under CARB's proposal, these eleven industries would be eligible for free allowances in an amount equal to 90 percent of their recent emission levels.

FARBES AND KAMMEN — PRIORITIES FOR GOVERNMENT INVESTMENT

Farbes and Kammen identify four priority areas for government investment, each addressing one or more of the multiple objectives of AB 32. Clearly the purpose of AB 32 is to reduce greenhouse gases and doing so cost-effectively is a primary goal. Two of the investment categories aim to promote this through policy approaches that bolster cleaner, smarter energy use in the market.

- ***Research, Development, and Demonstration (RD&D)***: RD&D are steps in the innovation cycle before commercialization. This involves an invention in a lab, which can move to a pilot phase. Private research would not be expected to take the public benefits of clean energy into account. Such spillovers have long been recognized as a reason that private sector research alone cannot be expected to achieve socially optimal levels of funding. Demonstration projects, the last step before commercialization, have recently been recognized as helping technology advance past the "valley of death" to successfully penetrate the market.
- ***Incentives and other support***: These are aimed at bolstering the commercialization of new technologies or providing funding for scaling up currently available low carbon technologies. The authors identify as particularly important investments those where early action yields large lasting effects and reductions that would be expected to be unresponsive to a carbon price signal. They point to transportation as an important area where these conditions both exist.
- ***Supporting environmental justice goals and avoiding adverse impacts***: Farbes and Kammen support the inclusion of a community benefits fund to invest in projects that bring benefits to disadvantaged communities, those burdened by high poverty and pollution levels. These can also overlap with projects aiming to reduce greenhouse gas emissions. Following the EAAC, they also argue for the creation of mechanisms to counter any negative environmental impacts that might be created by the introduction of the emissions trading program. Such guarantees are explicitly called for under AB 32.

- ***Adaptation to climate change***: Though California's efforts can help avert the most dangerous climate change damages, some global warming is inevitable. The authors encourage investment to ensure adequate maintenance of the State's resource base and infrastructure, for example in the critical area of water.

The authors emphasize RD&D as an opportunity for California. Investment in RD&D targeting clean technologies is important and offers meaningful job creation, wealth creation, intellectual property, and returns on the investment. With the lack of greater progress in energy policy at the federal level, California has a window of opportunity to invest in this important sector that offers both local benefits and would position California business well to compete in this growing global market. The sudden loss of federal energy RD&D momentum is coming at a challenging time with many clean energy companies looking to grow as the economy recovers. Many of these companies are looking to China for funds and launch opportunities given the weakness now in the U.S. Yet California remains at this moment a world-leading venture capital community, that is a hub of green company launches. The State can use a mixture of incentives (these may not be directly economic given the State's fiscal situation) to bolster a clean energy market that has received strong private sector backing. The results would be to energize added growth in this sector within the state.

Farbes and Kammen also explore the issue of the optimal timing of government investments. They embrace the EAAC recommendation of front-loading investments. They point to the need to test potential investments ability to tolerate volatility in funding streams if the amount was large enough or if rank amongst priorities was not that high.

BURTRAW AND PARRY — HOW BEST TO RETURN MONEY TO HOUSEHOLDS

Burtraw and Parry consider two options for returning the value of allowances to households. A "tax shift" would use revenues from an auction to reduce pre-existing, distortionary taxes. A second approach would refund allowance value in equal lump-sum cash transfers, or dividends. These were the two options recommended by the EAAC.

The dynamic of cost pass through provides the rationale for returning auction revenue to households. Burtraw et al assume people, consumers, families – households – will face some of the costs of putting a price on greenhouse gas pollution. There is a fairness argument for returning some allowance value directly to households, but also an economic argument illustrated by Roland-Holst's work. Returning auction revenue to households provides a demand boost for the macro economy. This is particularly important for maintaining customer demand for small businesses and the job-intensive service sector.

The authors explain that economic theory predicts that reducing existing taxes would be more efficient than a establishing a new system of transfer payments. Using allowance value raised in an auction to reduce preexisting taxes would have employment benefits and (slightly) alleviate biases in the tax system created by preferential treatment of specific types of expenditure in the tax code. However, caveats apply in practice; foremost is California's slack labor market at present, which can dampen the employment gains from lower incomes taxes.

Refunds of allowance value as dividends would reinforce equal share ownership of and responsibility for natural resources. It is consistent with the concept from economic theory that views the atmosphere as a common property resource. Furthermore, refunds are progressive over the income distribution. Low-income households would do relatively well, and nearly half of all households would be net winners under this approach. A tax rebate, however, could be regressive. For example, a proportional reduction in income taxes would benefit households who pay the most taxes. A tax rebate would have to be designed carefully, or combined with other compensation policies, to achieve neutrality over the income distribution.

The EAAC specifically recommended against protecting households through lower electric utility rates. The Committee disliked that this approach blunts the incentive for conservation that occurs when the cost of greenhouse gas pollution is reflected in the price of electricity. CARB has recommended a hybrid approach where reductions in electricity bills are achieved through a lump sum payment (i.e. payments not tied to the level of electricity consumption) for electricity consumers. This would be in effect a dividend for electricity consumers.

In the long run when unemployment falls to historic levels, the increase in product prices under cap and trade coupled with a refund could lessen labor supply, slow economic growth and raise overall cost. In fact, according to economic theory, it is even possible that well-designed direct regulation could be less costly to the state's economy than an emissions trading program with a refund approach. If refunds are used, they might be combined with other policies to provide incentives for households to direct these monies toward investment in program-related goals such as energy efficient technologies.

CONCLUSION

On the important emerging policy issue of allowance allocation for AB 32's emissions trading system, Next 10 has sought to better inform the public dialogue by commissioning a blue ribbon set of research reports. This multi-billion dollar question has complex incentive, efficiency, and fairness implications that merit careful consideration. This research project sheds new light, but also illuminates the need for more research, for example in the area of industrial sector allocations. Given the complexity of these issues, CARB's finding in favor of adaptive management makes sense for the state economy and for the environment.

Next 10 will continue to explore these issues in our efforts to contribute to the public interest and the long-term sustainable prosperity of the State of California.

DIRECTIONS FOR FUTURE WORK

Naturally, in exploring a topic as complicated as this, unanswered questions remain despite the progress made by this research project.

More research needs to be done to understand the risk of leakage in the industrial sectors of the California economy. The work of Roland-Holst and Rose, Wei, and Prager find little evidence of leakage risk for the economy as a whole. Their findings are consistent with new research by Kahn and Mansur (2010) and empirical evidence emerging from the European emissions trading program (Grubb et al. 2009). However, macroeconomic models such as those employed by Roland-Holst and Rose, Wei, and Prager need to be augmented by sector-specific studies that drill down on particular technologies, trade patterns, demand characteristics, and other factors that will determine the risk of leakage.

Morgenstern and Moore show that after measures like those proposed at the federal level are taken into account to cushion the effects, even the most energy-intensive industries face very small impacts. More work needs to be done to understand the implications of the particular free allocation program that CARB has proposed for industry, which will be more generous than the ACES program analyzed by Morgenstern and Moore. The issue of windfall profits has been a central one in the allocation debate. If industry profits increase substantially due to cost shifting to consumers under an emissions trading program, this could damage public support for the effort. The EAAC recommended that avoiding leakage should be the only reason for free allocations. CARB also included transition assistance as a goal for free allocations. The tradeoffs between this use for allocation value and others deserve further study.

Farbes and Kammen make progress on the question of how to prioritize government use of auction revenue. The EAAC suggested that the notion of an aggregate social benefit curve could guide these decisions. Such a curve would take into account as many of the costs and benefits of investments as is feasible, in particular expanding beyond current analysis to include consideration of non-market effects like public health benefits due to improved air quality. It is not clear if this concept, which is attractive in theory, is the right construct for moving forward. It is a static concept and does not solve the issue of how to sequence investments over time. More thinking also needs to be done to respond to the challenge created by the fact that the amount of auction revenue that will be available cannot be known with certainty.

More work remains to be done:

- To characterize market failures being addressed by government investment;
- To quantify and estimate the value of the costs and benefits of greenhouse gas reductions beyond those that are already expected to be achieved through AB 32 policies;
- To establish formulae to direct the use of auction revenue within broadly agreed categories identified by the CARB draft regulation;
- To develop approaches that manage the variability of revenue that auctions will yield.

The EAAC recommended a roughly 75 percent/25 percent split between returning auction revenue to households and using it for government investment. Next 10 had hoped to provide more insight into this by integrating government investment scenarios in the macroeconomic studies, but in the end it proved too difficult with the time and resources available. Future research should further investigate the optimal balance between these approaches.

While the State debates the issues of allowances, auctions, and the possibility of significant revenue, another conversation is continuing about how to manage California's large budget deficit.

That is an area in which Next 10 has significant expertise resulting this area because of our Budget and Infrastructure work. Recent record budget deficits have been in the range of tens of billions of dollars. That is a similar scale to the level of permit revenue projected for each year by 2020 under an emissions trading program. Some have raised the prospect that revenue from fees on greenhouse gas emissions could help the State put its fiscal house in order. Legal constraints on the use of auction revenue are themselves the subject of debate among lawyers.

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APPENDIX I

AUTHORS OF ORIGINAL RESEARCH PRESENTED IN THIS SUMMARY REPORT

Dallas Burtraw[3] is one of the nation's foremost experts on environmental regulation in the electricity sector. For two decades, he has worked on creating a more efficient and politically rational method for controlling air pollution. He also studies electricity restructuring, competition, and economic deregulation. He is particularly interested in incentive-based approaches for environmental regulation, the most notable of which is a tradable permit system, and recently has studied ways to introduce greater cost-effectiveness into regulation under the Clean Air Act.

Jamil Farbes is a PhD student in the Energy and Resources Group at UC Berkeley. His research focuses on climate policy, effective carbon market regulation and risk in carbon markets. Jamil has previously worked on deploying renewable energy on tribal lands as well as energy efficiency and demand response.

Daniel M. Kammen[4] is the Chief Technical Specialist for Renewable Energy and Energy Efficiency at The World Bank and Class of 1935 Distinguished Professor of Energy for The Energy and Resources Group, Goldman School of Public Policy at the University of California, Berkeley.

Eric Moore is a Senior fellow and research assistant at Resources for the Future.

Richard Morgenstern is a Senior Fellow with Resources for the Future. His research focuses on the economic analysis of environmental issues with an emphasis on the costs, benefits, evaluation, and design of environmental policies, especially economic incentive measures. His analysis also focuses on climate change, including the design of cost-effective policies to reduce emissions in the United States and abroad. Immediately prior to joining RFF, Morgenstern was senior economic counselor to the undersecretary for global affairs at the U.S. Department of State, where he participated in negotiations for the Kyoto Protocol. Previously he served at the U.S. Environmental Protection Agency, where he acted as deputy administrator (1993); assistant administrator for policy, planning, and evaluation (1991-93); and director of the Office of Policy Analysis (1983-95). Formerly a tenured professor at the City University of New York, Morgenstern has taught recently at Oberlin College, the Wharton School of the University of Pennsylvania, Yeshiva University, and American University. He has served on expert committees of the National Academy of Sciences and as a consultant to various organizations.

Ian Parry, a Senior Fellow at Resources for the Future, focuses primarily on environmental, transportation, tax and public health policies. His recent work has analyzed gasoline taxes, fuel economy standards, transit subsidies, alcohol taxes, policies to reduce traffic congestion and accidents, environmental tax shifts, the role of technology policy in environmental protection, the incidence of pollution control policies, and the interactions between regulatory policies and the broader tax system. In 2007, Parry was selected as the first appointee to the Allen V. Kneese Chair in Environmental Economics.

Fynnwin Prager is a Ph.D student at the University of Southern California, School of Policy, Planning, and Development. He received a Master's in Public Policy from the University of Southern California and a BSc in International Relations from the London School of Economics. His research interests are the economics of hazards policy, with a focus on terrorism and environmental policy. His recent projects include a comparison of public reactions to terrorist attacks on transportation systems, an operationalization of transportation system resilience, and the use of CGE modeling to estimate the distributional impact of a U.S. cap and trade policy for carbon emissions.

David Roland-Holst is an Adjunct Professor in the Departments of Economics and Agricultural and Resource Economics at UC Berkeley. Dr. Roland-Holst has extensive research experience in economics related to environment, development, agriculture, and international trade, authoring three books and over 100 articles and chapters in professional publications. He has served in academic posts in the US, Europe, and Asia and conducted research in over 40 countries, working with US and foreign national governments, the Asian Development Bank, Inter-American Development bank, Organization for Economic Cooperation and Development (OECD), World Bank, and several United Nations agencies. Professor Roland-Holst holds a Ph.D. in Economics from UC Berkeley.

Dr. Adam Rose is principal of Adam Rose and Associates. He is also Research Professor at the University of Southern California School of Policy, Planning, and Development. Dr. Rose's major research areas are the economics of energy and climate change policy. He is the author/editor of several books and more than 100 professional papers on these subjects, including most recently *The Economics of Climate Change Policy*. Dr. Rose has pioneered and applied methodologies to examine the efficiency and equity of environmental policy instruments and to estimate their macroeconomic impacts for the United Nations, U.S. EPA, and numerous state government agencies. Dr. Rose has served on the editorial boards of *Resource and Energy Economics*, *Energy Policy*, *Resource Policy*, *Pacific and Asian Journal of Energy*, and *Journal of Regional Science*. He has served as the American Economic Association Representative to the American Association for the Advancement of Science, and on the Board of Directors of the American Association of Geographers Energy and Environment Specialty Group. He is the recipient of a Woodrow Wilson Fellowship, East-West Center Fellowship, and American Planning Association's Outstanding Program Planning Honor Award.

Dr. Dan Wei's research focuses on analyses of state/regional climate action plans, modeling of economic impacts of greenhouse gas (GHG) mitigation policies, design of market-based GHG mitigation policy instruments, and other technical issues related to policy assessment of GHG control strategies. She has participated in the analysis of cap and trade and/or carbon tax policies for several regions, and applied the REMI Policy Insight Model to analyze the macroeconomic impacts of climate action plans for several states. She is currently participating in a U.S.-China cooperative project to facilitate capacity building of low-carbon development planning in Guangdong Province, China. Dr. Wei is currently a Postdoctoral Research Associate in the School of Policy, Planning and Development at the University of Southern California. She holds a BE degree in Engineering Physics and an MSc degree in Public Policy from Tsinghua University, and a Ph.D. in Geography from The Pennsylvania State University.

[3] Dallas Burtraw is a member of the EAAC and a presenter at Next 10's 2009 workshop.
[4] Daniel M. Kammen is a member of the EAAC.

APPENDIX II: THE CALIFORNIA AIR RESOURCES BOARD DRAFT PROPOSAL

OVERVIEW

On October 29, CARB released a draft proposal for a California emissions trading system. On December 16, the Board is scheduled to vote on this proposed regulation.

Details of the proposed system include:

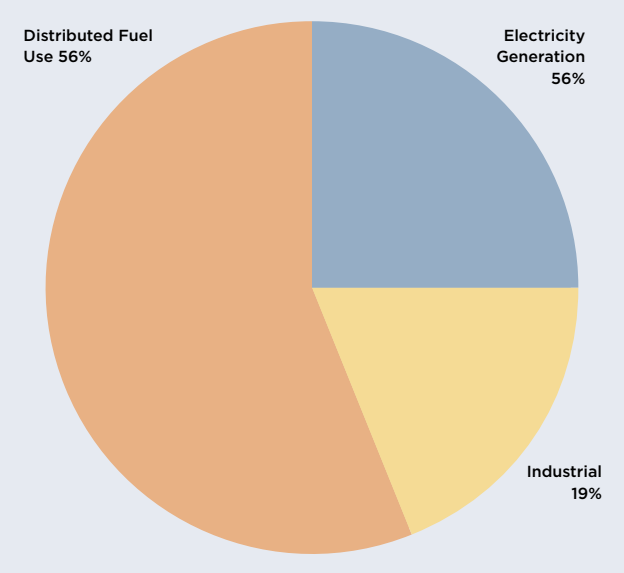
- Covering fossil fuel combustion, starting with electricity generation and other large industrial facilities in 2012, and expanding in 2015 to distributors of transportation fuels, natural gas and other fuels. By 2015, the program covers 360 businesses, responsible for 600 facilities.
- In the first year of the program, the level of the cap, which can be also thought of as the sum of all allowances created under the program, will be set at the emissions forecast for that year. For the first three years of the program, the cap declines at about 2 percent per year. After this initial three year gradual start, in 2015, emissions reductions ramp up to approximately 3 percent per year. Overall, the emissions trading program is designed to lower greenhouse gas emissions by about 15 percent by 2020.

Based on the detailed 2008 inventory data collected by CARB, the emissions covered by the program can be divided as shown in Figure 5:

PROPOSED ALLOWANCE DISTRIBUTION

CARB proposes different allowance distribution strategies for each of category of emissions. These vary, largely, on the anticipated extent of cost pass through, the risk of leakage, and options for consumer protections (i.e. the existence of price-regulated or publicly-owned utilities delivering electricity and natural gas).

Figure 5: Program coverage based on 2008 emissions.



- All industrial sources will start with free allocation in 2012. CARB's proposal is for each industrial sector to receive free allowances in an amount equal to about 90 percent of their recent historical emissions levels. CARB has separated different industrials into categories of high, medium and low risk of leakage. After 2015, the amount of assistance will decline over time for those in the medium and low risk category. Whereas the EAAC recommended that free allocation should be given only to avoid leakage, CARB's proposal also calls for transition assistance to underwrite adoption of low carbon technologies by California industrial producers.
- Electricity generators in California and importers of electricity will hold allowances under the emissions trading program. Under CARB's proposed regulation, electric utilities will receive allowances, but they will be required to sell them to generators on behalf of their customers in a consignment auction. There is some overlap between the generators of electricity and the utilities that deliver the electricity. Utilities own some of their own generation capacity but there are also a significant

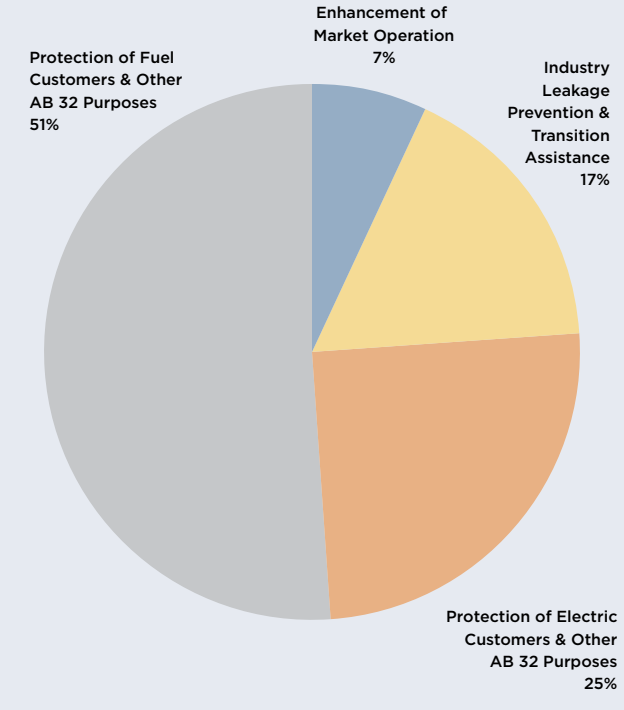
number of independent electricity producers. The CARB draft regulation calls on the California Public Utilities Commission (CPUC) and California Energy Commission (CEC) to weigh in on how utilities are to use auction revenue. They will have significant discretion, though CARB's draft regulation indicates a preference for lump sum bill relief, which would keep bills low but retain the incentive for smarter energy use. In addition, the draft regulation suggests that some auction revenue could support investments in smarter energy use. This complicated combination of free allocation and auctioning illustrates the point that allowances and auction revenue are fungible. Either can be used to achieve policy objectives.

- Distributed fuel use includes both natural gas delivery and distribution of transportation fuels like gasoline and diesel. Starting in 2015 when natural gas is covered, CARB proposes to use the utilities as a vehicle for customer protection as would be the case for electricity. This option is available for electricity and natural gas because such utilities exist either under oversight from public utilities commissions or are publicly-owned entities. As such, they offer an effective vehicle for using allowance value to achieve consumer protection. Put differently, the CPUC/CEC are in a position to require utilities to use the revenue for bill relief or incentives for smarter energy use, or publicly owned utilities can decide how to use the revenue for the citizens they serve.
- No such vehicle exists for directing allowance value for the benefit of consumers of transportation fuels. CARB's draft regulation calls for auctioning the allowances to transportation fuel distributors. Proceeds would then be used for "AB 32 purposes," which could mean payments to households (such as the tax reductions or dividends that Burtraw and Parry discuss), government investments to achieve the objectives of AB 32 (as Kammen et al discuss), or some combination of the two. This is one of the areas of the regulation subject to further development. CARB has indicated a preference for further guidance from the legislature and governor.
- The foregoing are the principal uses of allowance value, but another category of use is enhancement of market operations. Allowances in this category would be used in two ways. About four percent of all allowances would be put into a strategic reserve for cost containment. These would be available at set prices only to businesses regulated under the program. There will be some early auctions of allowances from future time periods. These would serve the purpose of providing information about future prices. Finally, CARB has called for the inclusion of a reserve price for allowances sold at auction that would be set at $10 per ton of carbon dioxide initially. This serves as a type of price floor and as a guard against over allocation.

Figure 6 tells this story visually by showing the objectives intended for each category receiving allowances under the draft regulation over the life of the program (2012-2020).

Next we illustrate the distribution of allowance value across different objectives over time. Figure 7, below, uses slightly different terminology. The first two categories – strategic reserve and forward auctioning – reflect the purpose of market operation enhancement. Auction proceeds for AB 32 purposes refers to the plan to auction allowances that would be needed by fuel distributors. The last four categories track free allocation

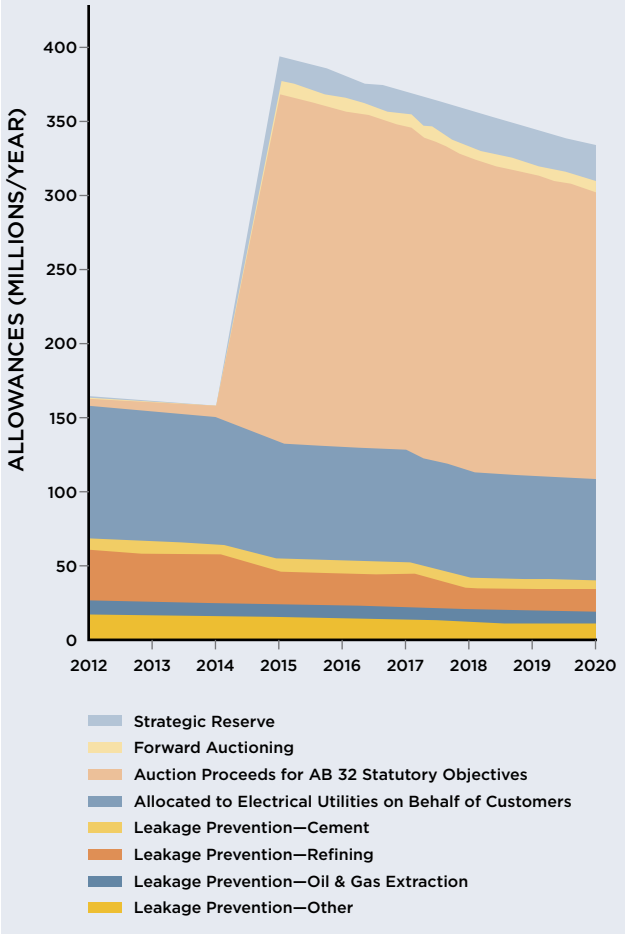
Figure 6: Allowance distribution to different objectives over 2012-2020



to industry, with the three largest recipients separated from all others.

The jump in the number of allowances from 2014 to 2015 reflects the expansion of the emissions trading program to cover delivery of natural gas and distribution of gasoline and diesel fuels.

Figure 7: Allowance distribution to different objectives over 2012-2020



ENDNOTES

i Leakage refers to the potential for businesses and emissions associated with this economic activity to relocate in an effort to avoid greenhouse gas regulation. Assembly Bill 32, California's Global Warming Solutions Act, explicitly calls for the avoidance of such leakage. If leakage should occur, environmental goals would not be achieved and at the same time the California economy would be negatively affected.

ii Key EAAC report recommendations, quoting from page 3 of the report:

- The ARB should rely principally, and perhaps exclusively, on auctioning as a mechanism for distributing allowances (that is, for putting allowances into circulation). Auctioning is an especially transparent mechanism for allowance distribution, and it facilitates discovery of the actual costs associated with emissions abatement. It has the same potential as free allocation for achieving distributional or fairness objectives, since nearly every objective or conferral of allowance value sought through free allocation of allowances can be achieved through auctioning and the associated use of auction proceeds. In contrast with free provision, auctioning yields revenue and thereby can reduce the extent of the government's reliance on ordinary taxes for financing expenditures; this can help reduce the overall costs of AB 32.
- The ARB should rely on free allocation as a distribution mechanism only where necessary to address "emissions leakage," i.e., increases in out-of-state GHG emissions generated by California's climate policy. The need for free allocation to address emissions leakage is likely to be small, for two reasons. First, as a share of total allowance value, the share needed to deal with potential leakage is small. Second, other mechanisms such as border adjustments sometimes offer a more cost-effective way to address leakage.

iii ***Allowance value vs. cost of emission reductions:*** Allowance value is not the same as the cost of reductions in greenhouse gas emissions. The value of allowances created under AB 32 will far exceed the cost of reductions achieved. In 2020 when reductions required are at their greatest, reductions amount to 15 percent below the 2012 cap while allowances will cover 85 percent of the initial cap

level. Emissions allowed under the program are much larger than required reductions. If the program is working as intended, the reductions should cost less than allowances are worth. This is because if an allowance cost less than a reduction, a business covered under the program could choose to buy an allowance instead of making the reduction. For more explanation, see Farbes and Kammen (p. 4), CARB (2010, Appendix J, p. 7), EAAC (2010, pp. 22-23).

iv Two insights into the economics of cap-and-trade programs that have emerged from the research literature Next 10 has reviewed are that free allocation does not suppress carbon prices and, even under free allocation, consumers may see prices change to reflect the introduction of a carbon price through an emissions trading program.

The research we studied suggests that free allocation will not suppress the price of carbon – that the price of an allowance will be mostly unrelated to the method of distribution, all else equal. [1] The price of an allowance will be driven by the usual fundamentals that drive markets, namely supply and demand. Supply depends on the number of allowances created. Demand will reflect the need to obtain allowances for compliance and how easy or hard it is to make reductions.

In the same way that free allocation does not suppress the price of carbon, free allocation may not protect consumers. This is due to the economic concept of opportunity cost. If a business receives an allowance for free, it still has value, reflected in its market value. So, if the business uses the allowance to cover its emissions, it is incurring a cost. The cost of the revenue not gained by selling the permit. This is the opportunity cost.

Empirical evidence from the European emissions trading program has shown that businesses will pass along the opportunity cost to consumers if they are in a position to do so. However, if businesses in California face stiff competition from out-of-state or foreign companies, they might not be able to pass through the price of carbon. This is true whether allowances are auctioned or freely allocated.

CARB offers Table J-1 (CARB 2010, Appendix J, p. 10) that details whether or not cost pass through is expected in different parts of the economy covered by the emissions trading program. In the areas of electricity generation, dispersed natural gas use, and the use of transportation fuels like gasoline and diesel, CARB expects that the price of carbon will be passed through to consumers. The exception is the various industrial sources covered by the program. The degree of cost pass through is uncertain in this instance, largely due to the diversity and complexity of these sectors of the economy. Where there is cost pass through, this creates the rationale for using allowance value to protect consumers.

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