Options for Cap and Trade Auction Revenue Allocation:

An economic assessment for California

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Introduction

This report provides a macroeconomic assessment of alternative strategies for allocation of auction revenues from California's Cap and Trade program for greenhouse gas emissions reduction. Using a dynamic economic forecasting model, we evaluated a set of eighteen heuristic alternatives for auction revenue allocation. These were derived from a series of expert consultations to represent the leading alternatives being considered in the current AB32 policy dialog, and represent the interests of a broad spectrum of leading stakeholders.

California's leadership in climate policy will not only benefit the state's economy and the quality of life for those who live there, it offers a unique opportunity to broaden public awareness of these complex issues, to design more effective and forward looking policies, and to set global standards for a new generation of integrated environmental policies. Although the present results are best interpreted as indicative, they demonstrate that evidence-based policy innovation and determined commitments to energy efficiency can translate into higher economic growth and job creation.

Many studies emphasize the costs of policies that deal with climate change because they emphasize narrowly focused direct adjustment costs and do not take account of extensive indirect policy benefits. Technical details about the scope of market failures and the scope for effective government policy can support extensive future research, but we need general guidance regarding macroeconomic impacts to choose policies that support growth and job creation for California as a whole. To date, relatively little has been done in terms of analyzing the results of different allocation choices within macroeconomic modeling of AB 32. In fact, the only studies to look at this question have been sponsored by Next 10, which has commissioned a strand of research that looks at variation across the options of government investment/spending, tax reductions, and equal dividends to citizens.

This study finds that policies promoting environmental quality and energy conservation *save money* and *increase employment* overall because their *indirect and incentive effects* propagate efficiency benefits across the economy. These overall benefits only become apparent when the economywide implications and innovation potential of the policies are taken into account. For example, we shall see below that energy savings allow consumers to increase other spending, largely on in-state goods and services, and this stimulates California growth and employment. Industry-specific and bottom-up studies of GHG polices fail to capture these indirect benefits, giving disproportionate emphasis to direct costs. An economywide perspective reveals that the supposed tradeoff between higher environmental quality and economc growth is a fallacy, and with careful and determined policy innovation, California can have both.

A number of next steps would productively build on the findings of this work. A next step in the research dimension would be more detailed analysis of the costs and benefits across an array of options. The Economic and Technology Advancement Advisory Committee developed the concept of maximizing net social benefit to help guide the development of packages. Then packages of investment options could be developed. Developing such packages helps solve the problem of nearly infinite combinations of options, and will produce results that are more easily digested by policymakers and the public. These investment packages could be compared against each other, as well as against spending on dividends or tax reductions.

The Assessment

This report provides an economy-wide assessment of alternative strategies for allocation auction revenues from California's Cap and Trade program for greenhouse gas emissions reduction. The state's AB32 legislation is expected to generate billions of dollars in revenue from auctioning emission permits. This new revenue source can be used for a broad array of fiscal purposes, such as "recycling" rebates to taxpayers, public investments in sustainable growth, further emission reduction, etc. How the revenues are allocated will have important consequences, but also differential impacts on the composition of economic activity and employment. The work builds on prior Next10 research into cap-and-trade allocation and into state budget issues as well, and concludes with suggestions for next steps that could further inform the questions at hand. A comprehensive assessment of both direct and indirect effects is needed to fairly appraise the public interest in such policies. The focus of this study is on

emission permit allocation choices and in particular the efficiency and equity tradeoffs these entail as well as their macroeconomic implications.

The assessment tool used in this study is the Berkeley Energy and Resource (BEAR) model. BEAR is a detailed and dynamic economic simulation model that traces the complex linkage effects across the California economy as these arise from changing policies and external conditions. BEAR has already been used to produce estimates for the California Environmental Protection Agency, and its projections are quoted in the Executive Order establishing AB32. Because it follows detailed interactions between California consumers, enterprises, and the state's fiscal activities, BEAR captures the myriad of indirect effects that can arise from more narrowly targeted expenditure decisions. Taken together, the indirect effects often outweigh initial fee collections or disbursements, in many cases in opposite or partially countervailing directions. For example, an emission fee may impose direct costs on polluters, but the economywide benefits, including energy savings, averted public health costs and even climate damages, may be much larger.

The goal of this work is to elucidate the potential benefits of different allocation strategies, with particular attention to the sustained growth and prosperity of Californians. Generally speaking, we find that AB32 generally, and Cap and Trade marketed emission permits in particular, can contribute positively to both our quality of life and our livelihoods. Our detailed results reveal, however, that the choice of specific implementation strategies matters a lot, however, and we strongly recommend a careful and consultative approach to choosing exactly which allocation strategies are implemented, as well as what ex poste performance criteria might be applied to them as this policy evolves over the coming decades. The environmental impacts of Cap and Trade are intuitive and relatively well understood by both the policy and public communities. The economic implications of implementation strategies are, as is apparent from our results, more complex and require careful analysis and interpretation.

This work is intended to strengthen the basis of evidence in this area, particularly to contribute independent research to the policy dialog about how to sustain and propagate the benefits of a more carbon-efficient future. There are complex dynamics, in terms of both efficiency and equity. In 2010, Next10 underwrote five research teams looking at allocation choices and summarized this research as *The Mutli-Billion Dollar Question.* We made progress on the some of the larger questions, in particular supporting CARB's proposal to do significant auctioning of emission permits. We explored the question of the

relative merits of using allowance value to lower tax rates or provide a dividend check to California citizens. The dividend option performed surprisingly well: the small increased incentive to work from reduced tax rates was not as stimulating to economic growth. The dividend, also more equitable, shifts spending to lower income levels, which has a more favorable pattern of spending on in-state goods and services.

The question of how to optimally spend auction revenue is a thorny one for a quantitative analyst to confront. The potential changes to spending levels and combinations of potentially dozens or hundreds of potential spending options quickly become impossible to manage. That said there is surely a role for analysis to aid decision-making. Building on prior work by Farbes and Kammen (2010) and a survey of experts in the field, we have tested the macro effects of spending on a set of eighteen options for recycling revenues from auctions for GHG emission permits,

Five salient insights emerge from the BEAR economic analysis:

Table ES1: Main Findings

1. ***California has a wide array of options for recycling revenues from auctions for GHG emission permits, each of which can contribute to long-term economic growth and job creation.***
2. ***Most of the allocation options considered return more to economic growth than their cost, and in the process increase state revenue, but net benefits differ significantly.***
3. ***The most pro-growth options invest auction revenue in expanded household-level EE and renewable technology diffusion, and all these generate additional new state revenue.***
4. ***Allocations that merely offset existing fiscal commitments, while still fostering some growth, do not yield benefits comparable to committing new revenues to efficiency measures.***
5. ***New employment benefits generally increase with GDP, but vary depending on the demand patterns affected by the policy. Again household efficiency promotion is the most employment-intensive allocation strategy.***

These general conclusions are supported by a myriad of more detailed information, the elucidation of which can be essential to design and implement efficient policies. Rigorous policy research tools like the BEAR model can shed important light on the detailed economic impacts of energy and climate policies. By revealing detailed interactions between direct and indirect effects across a broad spectrum of stakeholders, simulation methods of this kind can support more effective policy responses to climate change.

Scenario Development

Regulatory fees are often levied with specific expenditure goals in mind, such as user fees for public access and infrastructure (parks, bridges, toll roads, etc.). In the case of atmospheric emission permits, there is little precedence for either the collection of or or determining optimal expenditures of such fees. Because California is at the forefront of such policy development, a myriad of options are under consideration, including free allocation of rights, rebates of fees to households, and a wide array of targeted expenditures. Indeed, the policy dialog on this issue now includes so many stakeholders that in all likelihood there will be a variety of approaches adopted in concert.

This study does not advocate any particular approach to auction revenue collection or allocation, but instead strives to better inform public and private audiences regarding the economic impacts of realistically available options for recycling auction revenues into the economy. To do this, we developed a representative set of generic allocation scenarios and assessed them with a statewide economic forecasting model. Of course we assumed that some permits would indeed be auctioned as part of a Cap and Trade market mechanism, but we have attempted to develop a series of generic allocation options that reflect those under active consideration and discussion. The final list of eighteen alternatives was produced in a two-step process, using a combination of expert opinion and stakeholder consultation. In the first phase, we convened and consulted a group of climate policy experts and developed an extensive list of allocation options, these were then reviewed for consistency and diversity, and then submitted to a wider audience of stakeholders in an online survey, the results of which are summarized in an annex below. Finally, we returned these results to the expert panel, synthesized and refined the scenarios into the eighteen alternatives listed in the following table.

The scenarios are discussed in greater detail in a separate section after the economic assessment results, while here we only discuss the selection process

and how to appropriately interpret the scenario analysis. The eighteen options below comprise a very diverse set of approaches, each with their own objectives, advocates, and possible critics. To make sensible comparisons of them in terms of real economic impacts, we had to develop a scenario approach that reflected the state's diverse objectives and interests. It is more likely that, over the life of Cap and Trade policies, several and indeed many allocation options like those below will be exercised, sometimes in concert. For this reason, we assessed allocation to each alternative as a hypothetical commitment of an equal fraction of expected permit revenue. Again, we do not do this because we advocate any specific financial commitment for any specific option, but only to facilitate (apples to apples) comparison of equal allocation.

Table ES2: Auction Revenue Allocation Scenarios

1	Revenue rebates to taxpayers.
2	Energy efficiency improvements on state owned buildings, which could offset General Fund expenditures.
3	Offset General Fund expenditures through new financing approaches.
4	Energy efficiency actions to upgrade residential lighting.
5	Energy efficiency actions including appliance efficiency upgrades and replacements. Example: Rebates
6	Energy efficiency actions to upgrade residential building efficiency.
7	Financing program for renewable energy installations at residential properties.
8	Industrial EE: retrofits and compliance investments for utilities and large industrial activities (energy, cement, etc.)
9	Commercial EE and distributed generation programs.
10	Small business EE - financial and other supporting services to overcome technology adoption and compliance hurdles
11	Programs that provide financing for, or directly fund conservation and EE upgrades in low-income and middle-income dwellings.
12	Financing programs for commercial, industrial and manufacturing facilities to reduce greenhouse gas emissions by investment in EE, energy storage, and clean and renewable energy projects.
13	Accelerated deployment of advanced technology vehicles.
14	Low-carbon goods movement, freight vehicle technologies, public transportation, and infrastructure development.
15	High Speed Rail project - specific to the bookend projects
16	Improve water supply through more efficient storage, conveyance, and management infrastructure.
17	Financial assistance for local governments to implement their Sustainable Community Strategies developed to meet the goals of SB 375.
18	Green Bank or a recurrent Low Carbon and Energy Efficiency lending program.

It also should be emphasized that the approach of this study is relatively aggregate in nature, meaning our scenarios are not based on detailed program specifications but general assumptions about aggregate financial flows, average behavioral responses, etc. For this reason, our results should be interpreted as indicative of general macroeconomic impacts. Our objective is to compare a diverse set of alternatives in terms of more generic differences. Certainly it would be desirable, with more time and diligence, to examine at least some of these options more intensively, particularly to improve targeting, effectiveness, and to anticipate distributional issues.

Authoritative estimates of total permit revenues run into billions of dollars annually. To accommodate the possibility of multiple allocations running simultaneously, we used a hypothetical allocation of $100 million dollars per year over the period 2013-2020. This amount is well within the level of permit revenue expected by most independent observers, and would allow several of these options to run at the same time. To make scenarios comparable, however, we assume that only one option is exercised in each case. Potential policy interactions are not captured in our results in the sense that a single policy – investing $100 million – is run through the model separately for each impact assessment.

In all scenarios, we assume that residual permit revenues (beyond the $100M/yr allocated in the scenario) are recycled into the state's general fund. In reality, all permit revenues might be allocated to new initiatives or used to offset more specific existing expenditure commitments, but again we need simplification to elucidate the macroeconomic impacts of each of the eighteen alternatives considered. It should also be emphasized (as discussed more extensively in Section 4) that these are macroeconomic expenditure scenarios, not project evaluations. In particular, the proposals that we model are not fully fleshed out in terms of their structural details. Much more technical work, as well stakeholder and community work would need to be done to go beyond these illustrative results. . For example, when we evaluate the so-called Green Bank scenario (18), this does not comprise a detailed lending program such as has actually been implemented by several states, but only an aggregate fiscal commitment to reduce the aggregate private cost of energy efficient technology adoption over the time period being considered. Thus we are evaluating macroeconomic impacts of macroeconomic policies, not detailed climate policy initiatives. Having said this, the structural detail of the BEAR model (50 sectors, 8 household income groups, etc.) is such that these alternatives exhibit quite diverse macroeconomic performance.

Given the differences we see, in terms of macroeconomic performance, among the options considered here, more detailed research into higher yield alternatives would seem to be justified. Such focused programmatic analysis is outside the scope of this study, but could be quite important to the overall effectiveness and sustainability of revenue allocation programs.

Economic Results

For the scenarios discussed above, the BEAR macroeconomic assessment effects are presented in Table 3 below. Estimates are presented for each allocation scenario (rows), showing impacts from three economic perspectives. All these are statewide aggregates, measured as annual difference from the Baseline scenario trend in the year 2020. The Baseline is a hypothetical trend where AB32 is adopted, but emission permits that do not expire are distributed at no charge and traded privately thereafter.[1] The first column estimates overall state economic growth, as measured by real Gross State Product (GSP), in units of inflation adjusted (2012) millions of dollars. The next column measures the net effect on California's total (state and local) fiscal revenues, in the same units as real GSP (2012 constant millions). Finally, the last column measures the policy-induced change state employment, measured in units of Full Time Equivalent (FTE) jobs across all sectors of the economy.[2]

Two general findings are immediately apparent across these results. Firstly, any of these policies would stimulate economic growth and employment in California, but the degree of stimulus varies considerably. This makes policy selection a higher priority. Secondly, all scenarios make some contribution to fiscal revenues because they contribute to GDP growth generally, without undermining the average tax rate in a way that might reduce net revenues. Again, we see important diversity in this respect, and some policies yield higher revenues for state and local government coffers, despite the fact that it is making the same ($100M) to each alternative. Given the high premium on no-load (i.e. no new tax) revenues in California at the moment, selectivity among these alternatives would again seem to be important.

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[1] Technically, the baseline is calibrated to macroeconomic trends published by the California Department of Finance, which are assumed to incorporate existing state policies only. The actual calibration process is described in detailed BEAR model documentation, available from the author on request.

[2] It should be noted that we do not report emissions impacts of individual scenarios because the state economy is operating under a cap on total GHG output, and it is not possible to decompose the net contribution of an individual scenario under this constraint.

Table 3: Macroeconomic Impacts
(changes from baseline values in 2020)

	Scenario	Real GSP (2010 $Millions)	State Revenue ($M)	Employment (FTE)
1	Rebates to taxpayers - Equal per capita	486	46	4,814
2	Offset Public Building EE Programs	83	6	467
3	Offset Funds with New Finance	285	26	1,710
4	Residential Lighting Energy Efficiency	997	58	6,902
5	Residential Appliance Energy Efficiency	896	92	7,328
6	Residential Building Energy Efficiency	875	56	8,751
7	Residential Renewable Energy Promotion	664	57	6,765
8	Industrial Energy Efficiency	157	12	1,364
9	Commercial EE and Dist. Generation	143	10	1,100
10	Small Business Energy Efficiency	468	10	6,480
11	Low-Mid Income Residential EE	838	102	6,620
12	Lower Industrial GHG Emissions	142	11	1,162
13	Advanced Vehicle Deployment	739	41	4,157
14	Low Carbon Goods Movement	154	12	1,156
15	High Speed Rail Bookends	442	31	2,651
16	Water Supply Energy Efficiency	181	11	1,962
17	SB 375 VMT Reductions	305	18	2,496
18	Loan Support for EE and Renewables	813	74	5,628

Source: Author estimates from the BEAR model.
Notes: GDP and state budget impacts in constant (2012) millions of dollars.
Employment in FTE headcount.

Two general findings are immediately apparent across these results. Firstly, any of these policies would stimulate economic growth and employment in California, but the degree of stimulus varies considerably. This, and the large sums of money derived from access to a public resource, makes thoughtful and evidence based policy selection a higher priority. Secondly, all scenarios make some contribution to fiscal revenues because they contribute to GDP growth generally, without undermining the average tax rate in a way that might reduce net revenues. Again, we see important diversity in this respect, and some policies yield much higher revenues for state coffers, despite the fact that the same amount ($100M) is allocated in each scenario. Given the high premium on no-load (i.e. no new tax) revenues in California at the moment, selectivity among these alternatives would again seem to be important.

Turning now to more diverse aspects of the results, a few observations are worthy of emphasis:

1. Scenarios that offset expenditure have lower growth performance. This is of course because the original fiscal stimulus effect is absent in these cases, i.e. auction revenues are "standing in" for other expenditures rather than creating a new source of demand in the economy. Still, these measures contribute to growth because they represent expenditure shifting from those who pay for the emission permits to the government (in the case of new spending) or the average taxpayer (in the case of fiscal offset). In either case, the growth effect is positive because both the government and the average tax payer spend money in ways that have higher multiplier effects than the average buyer of emission permites. For this reason, the new income from their demand greater than that of the polluter's costs, and the state economy grows because of this fiscal transfer.[3]

2. Subsidizing efficiency and renewables for households (4-7, 11, 13, and 18) generates more GDP and employment growth, directly and indirectly, than doing so in the public or private enterprise sectors. There are two basic reasons for this, one on the supply side and one demand side. Firstly, household EE and renewable measures are more distributed and therefore more job-intensive. Generally, the scale of household EE investments, whether for transportation, appliances, or building, is smaller and further down supply chains, increasing the labor content of both the goods and services involved. Secondly, when households save money on energy, their spending on alternative goods and services is about 16 times more job intensive than the energy fuel supply chain and also more so than enterprise or average public sector spending. Thus the highest "multiplier" growth effects of auction revenue allocation come from measures targeted at households.

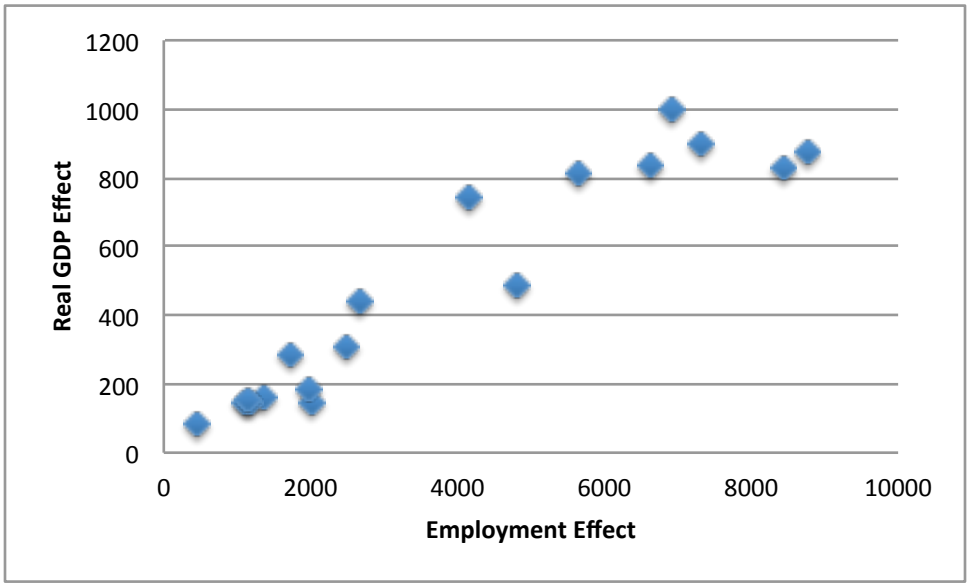
3. Because they promote economic growth, all programs would raise more new long term revenue for the state, suggesting that indirect rebates of revenue value could be part of a growth oriented policy package as long as the rebates are deferred until permit revenue have first been invested in EE or mitigation programs. This finding suggests

[3] It is also worth emphasizing that we get this macroeconomic net benefit without any consideration of the oft-cited innovation dividends of trading schemes that put a price on emissions.

a way to address the regulatory ("Sinclair") requirements for direct permit revenue allocation, without giving up the prospect of returning the value of environmental royalties to the public. In other words, some of the incremental (and indirect) future revenue resulting from these programs could be rebated to taxpayers or others without contradicting the regulatory intent of the auction revenue mechanism.

4. Employment benefits generally increase with GDP, but vary depending on the demand patterns affected by the policy. As the following figure suggests, some policies (household targeted) policies are also more job-intensive, making the job gains even more significant.

Figure 1: Aggregate Employment Impacts
(Changes from 2020 Baseline in $Millions and FTE jobs)



Source: Author estimates from the BEAR model.

1.1 Individual Scenario Results

The diversity of scenarios chosen means that macroeconomic effects will differ for complex reasons. For the package of GHG mitigation policies that comprise AB32, macroeconomic effects will from structural linkages that transmit economic impacts across the state economy. A consistent feature of such complex processes is the importance of cumulative indirect and linkage effects, which in many cases far outweigh direct effects. Although the majority of the GHG responses and direct (adoption and monitoring) costs are easily identified, economic benefits of these policies extend over long supply and expenditure chains. The cumulative effect of all these can only be assessed with methods like the one used here.

The same reasoning applies to any fiscal outlay, that, regardless of its initial intention or direct beneficiary, will lead to extensive demand spillovers and other structural adjustments. These are too complex to be discussed exhaustively for eighteen different scenarios, but we summarize some of the main features of each here to clarify interpretation and, where it seems appropriate, to identify opportuntities extensions of this research. For more detailed descriptions and background on individual scenarios, the reader is refered to Section 4 below.

1 Rebates to taxpayers - Equal per capita

This policy has been studied extensively by this and other authors, and its properties are relatively well understood. As others have found, it has strong multiplier effects (and signficiantly more so than the next scenario), but the legality of direct rebates for an environmental fee is an open question at the time of this writing.

2 Offset Public Building EE Programs

As an offset policy, this one has limited initial impact because it merely substitutes for preexisting expenditure. Our assumption for this scenario is that $100M is allocated from permit revenue to existing spending, meaning the same amount can be returned proportionately (not per capita) to taxpayers. It's contribution to growth is weak but positive, as a wealth transfer from permit buyers

to the average taxpayer, it leads to net positive multiplier effects on GSP and employment.

3 Offset Funds with New Finance

Because this program uses the new revenue to defer current financial obligations, it has a greater growth dividend than fully offsetting current expenditure. However, if the current time interval (2013-2020) were extended to cover all debt service, this benefit might be more limited. In any case, borrowing against the future, as long as the funds are committed to productive current investment, can stimulate growth.

4 Residential Lighting Energy Efficiency

Lighting is well known to be a potent source of EE, with savings of up to 75% in simple incandescent-LED replacement studies. Because of this technology's effectiveness, and the prominent role of households in the overall economy, this scenario provides the strongest growth stimulus of any $100M commitment. It is worth noting the risk of saturation with such a policy, however. It is likely that successive commitments to this approach would have lower marginal benefits, and that this policy should be considered a first, but not exclusive choice for revenue allocation.

5 Residential Appliance Energy Efficiency

Lighting also offers large employment stimulus, but not as much as residential appliances and infrastructure. The reason for this has to do with their respective upstream supply chains. When households replace a light bulb, it is usually purchased directly from a retailer, most often made out of state, and installed by the homeowner. For larger residential appliances and building infrastructure, many local trades are usually involved in fabrication, delivery, and installation, and maintenance.

6 Residential Building Energy Efficiency

In terms of economic stimulus, this category benefits from labor intensity in both residential demand (from energy savings) and the building services and materials supply chain. It does not generate

as much employment as appliances, mainly because building installations have a longer life than most consumer durables.

7 Residential Renewable Energy Promotion

As part of California's general commitment to distributed generation, a variety of renewable energy incentive schemes have targeted households. It would appear from the current results that, by leveraging the multiplier effects of energy saving and more labor intensive installation and management, this category of renewable energy confers significant growth dividends on the rest of the economy.

8 Industrial Energy Efficiency

Efficiency saves money, so enterprise efficiency and renewable deployment can stimulate state economic growth through fuel savings just like households. The main differences, however, are generally higher cost and less labor-intensive technology adoption. The present analysis, however, may be overestimating net effects because the financing horizon for enterprise technologies (20-30 years) reaches beyond that of this study.

9 Commercial EE and Distributed Generation

Again the results mirror residential gains, but are more muted because of how these technologies are installed and the energy savings are spent.

10 Small Business Energy Efficiency

Small businesses, simply put, are more like households, and in this way both their adoption costs and expenditure from energy savings will be intermediate between residential and commercial energy users. After households, they should be a high priority for growth oriented permit revenue allocation.

11 Low-Mid Income Residential EE

While the results for this group look like those for households generally, there is apparently a strong case for public intervention in this category. Indeed, it has been argued by many (and repeated in Section 4 below) that there are reasons to fear that these benefits

will not be realized without determined public commitments to overcome financial hurdles.

12 Lower Industrial GHG Emissions

Because energy consumption is linked to 83% of GHG emissions, the two are nearly synonymous. Thus the results for this scenario strongly resemble those of Scenario 8, as does their interpretation.

13 Advanced Vehicle Deployment

As discussed in more detail below, CARB has stepped up their commitment to more efficient vehicle deployment in the state, and this would lead to quite substantial reductions in gasoline use by comparison to baseline trends. These savings would be channeled back into the economy, primarily via household spending of its fuel savings on more job-intensive, in-state goods and services. As was mentioned earlier, California household expenditure is, dollar for dollar, 16 times more employment intensive than the carbon fuel supply chain. One dollar saved at the gas pump will thus be recycled into strong net job creation.

14 Low Carbon Goods Movement

The complex array of CARB-sponsored measures to reduce transport energy intensity would, if enacted in their entirety, stimulate economic growth and employment through technology adoption, energy savings, and reductions in trade and transport margins.

15 High Speed Rail Bookends

The high speed rail project will neither be fully financed by auction revenues, nor does its existence depend on Cap and Trade. If, however, auction revenues contribute the costs of this project (particularly its early, endpoint or “book end’ components), and are thereby credited with growth dividends of that investment, our estimates suggest this can be justified on economic grounds. Not only are the growth benefits comparable to other uses; the EE/emission benefits of public transit meet the standards of public benefit associated with AB32’s mitigation objective.

16 Water Supply Energy Efficiency

As many authors have already observed, systems of water generation, retention, conveyance, and use in California are prime candidate for EE improvements. Our estimates suggest this kind of investment would have a higher macroeconomic return than some industrial measures, and that is could stimulate significant employment creation.

17 SB 375 VMT Reductions

Because vehicles produce about half the state's GHG emissions, mostly in very localized transportation service, the VMT reductions envisioned in SB 375 could make a big contribution to reducing state gasoline demand. As observed by Rosenfeld and others, energy conservation is the cheapest form of EE, and driving less generates very direct energy savings that translate (16 to 1) into greater in-state income and employment.

18 Loan Support for EE and Renewables

A long-term loan program for efficiency and renewable development is one of the highest performing expenditure scenarios. The reason for this is the so-called "wonder" of compound interest.[4] Take $100M of public funds, commit these to capitalize a long term, revolving lending facility for productive (energy) investments, and have a much higher yield program than one that hands over public funds for on-time technology adoption. Essentially a green credit union mechanism, this kind of program leverages future energy savings for higher long-term rates of technology adoption and efficiency growth.

While the scenario comparisons above are quite instructive, a few important caveats must be born in mind. Firstly, we are measuring growth responses to relatively small fiscal stimulus ($100M), and it is not clear for the individual strategies considered that these impacts would be scalable to billions of dollars. Generally, the interpretations above hold for reasonable increases in these spending commitments, as would their ordering. It is unlikely, however, that it would be appropriate or even desirable to concentrate permit revenue allocation

[4] You don't have to be a genius to understand this, but it helps. "Compound interest is the eighth wonder of the world. He who understands it, earns it ... he who doesn't ... pays it." – Albert Einstein.

in only one or two of these categories, as diminishing returns could set in as technology diffusion progresses.

What we recommend over the long term is periodic reassessment with comparable empirical methods, identifying new opportunities and re-ordering older ones. In any case, the present analysis clearly reveals that, among the many options open for allocation, there are diverse outcomes and care should be taken to commit these new public funds effectively.