A Golden Opportunity: Strengthening California's Economy through Climate Policy

Redefining Progress's comments on the *Draft Climate Action Team Report to the Governor and Legislature*

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I. Introduction

Governor Schwarzenegger's proposed emissions reduction targets, and similar initiatives being explored in the legislature, provide an extraordinary opportunity to rewire California's energy system, incorporating cutting-edge technology into a world-class system that better positions us to continue our history of rapid innovation, economic growth, and global leadership. The draft report of the Climate Action Team (CAT) is an excellent first step toward a well-designed climate policy that would accomplish this end. We appreciate the leadership and vision that the Governor has shown in setting these bold goals; commend and thank the CAT and the staff team that labored so long and hard to assemble the elements of this plan on a very tight time horizon; and look forward to working with the legislature and the Agencies to further strengthen the plan as it moves toward implementation.

A well-designed climate policy:

- strengthens the economy and creates jobs;
- improves the competitiveness of CA industries, even the most energy-intensive;
- secures us from global price shocks and domestic market manipulation;
- reduces the energy bills for California consumers, and
- improves the economic well-being of ordinary working families, and of the most vulnerable among us.

This is good news. In fact, our preliminary analysis suggests that a greenhouse reduction program on order of the Governor's can create upwards of 150,000 jobs and gross state product by a quarter to a half a percent, while at the same time reducing household energy expenditures by $500 to 1,000. The lower increase in GSP and employment forecast by the CEPA staff are a consequence of the failure to properly integrate market mechanisms with the suite of technology policies proposed there. We note that the CAT's own report, as well as analysis by the veritable "Who's Who" of climate economists assembled by the U.C. Berkley/LBL team, support our contention that such integration would find lower costs and increased benefits in both the short and the long term.

So what is a good climate policy? Based on a comprehensive review of the economics analysis and concrete field experience with climate policies and market mechanisms in the U.S and Europe, there are basically five simple lessons:

1. cap and trade systems and technology policies work best together;
2. auction permits, don't grandfather them;
3. implement a cap immediately, and phase it down gradually;
4. permits should focus on California consumption, not CA production;
5. a comprehensive system yields the highest rewards; and
6. Don't omit major benefits from the economic calculus.

II. The technology-based measures in the report should be combined with a market mechanism such as an emissions cap.

A. The cap provides certainty of achieving emissions reduction targets not offered by the remaining suite of policies in the CAT report.

The primary purpose of a cap on greenhouse gas emissions is to achieve emissions reductions that are certain at the least possible cost. In marked contrast to traditional regulatory regimes, our experience with a wide range of cap and trade programs suggests that compliance rates approach 100

percent, much higher than estimated compliance with conventional regulatory approaches --with a few exceptions that offer important lessons in design of an effective problem.[12]

Moreover, although the CAT report identifies potential emissions reductions that exceed those required to meet the Governor's targets, we believe that it is unlikely that those targets, or any targets that are comparable or lower, will be achieved without a cap. Historically, regulatory measures have suffered frequent delays at every stage —drafting, public hearings, review, promulgation, and implementation – as a result of a wide range of factors including technical problems, political opposition, lawsuits, and market barriers. Many of the measures listed as being put in place this year have not yet had draft regulations issued, and we are informed that the drafting process has not even begun for some of them. Some of the measures listed arguably require additional legislative authority to implement, and it appears that the plan has not allotted any time for the legislative process. Thus a cap is necessary to deal with likely shortfalls in emissions reductions from other policies.

For this and other reasons, the consensus position statement issued by the states leading environmental organizations demands that the climate action plan include immediate implementation of a mandatory emissions cap.

B. The combination of market mechanisms with technology programs reduces the costs and increases the benefits from achieving emissions reductions.

As has been demonstrated by the recent economic analyses by CEPA, the team assembled by the California Climate Change Center at UC Berkeley (UC Berkeley), and the Center for Clean Air Policy (CCAP), significant reductions in global warming pollution can be achieved at a net economic benefit through technology-promotion measures alone, a benefit that is reflected in reduced energy bills, increased consumer spending for non-energy goods, increased GSP and higher employment. However, modeling results have generally shown that the greatest economic benefit comes from the combination of regulatory measures to promote energy-efficiency and renewable energy technologies and market mechanisms that

Market mechanisms achieve emissions reductions at lowest total cost, provided the relevant markets function adequately. This is not always the case, especially in information/technology markets and in the presence of externalities. Market mechanisms can internalize the externalities, but additional technology policies are probably necessary to effectively deal with the problems of imperfect information and informational public goods like basic science.

1. Market mechanisms promote technological development.

Improved energy-efficiency and renewable-energy technologies allow us to produce energy services (such as passenger-miles, rooms heated, goods manufactured, kWh, etc.) with a lower total cost. This must be distinguished from mere substitution effects, where capital, labor or materials are substituted for energy (say, by installing insulation),

[1] An exception to this rule which occurred under the ozone-depleting chemical cap and trade system (and the related ODC tax) provides an informative lesson on the design of such systems. For a time, there was a significant problem with smuggling of ODCs into the U.S. These chemicals would then be sold labeled as recycled. Recycled chemicals were exempt from the cap. The smuggling problem was solved through a combination of criminal enforcement against smuggling rings, a new system of shipyard inspections, and improved tracking and certification of recycled chemicals. This experience suggests two things. First, caution must be used when the exemption of some uses is combined with trading, as the trading system allows any criminal who finds a way to fraudulently label a product as exempt can then sell the mislabeled product at a substantial profit. Te second is that the audit function under a substantial trading system should usually include physical monitoring of imports and exports.

[2] The most important instance of a trading program with significant compliance problems is RECLAIM. Under RECLAIM industry made extensive use of estimated rather than actual emissions, estimates that proved wildly inaccurate. Trading systems fo not function well unless there are reliable audited monitoring systems in place. RECLAIM also suffered from severe design problems, the most notable of which were as an initial allocation of permits far in excess of current emissions in the early years, and the failure to restrict trades resulting in toxic hot spots.

but the total cost of the service including the cost of the additional purchase of capital, labor and materials does not go down, and indeed goes up. Technological improvement has an unambiguously positive effect on the economy by increasing productivity, so that the same input of labor, capital, energy and materials produces a greater output. Technological improvement, both directly and through increases in the quality of inputs (more sophisticated machinery and equipment, workers educated or trained with more advanced knowledge, high-tech materials, etc.) is in fact the primary engine of growth, accounting for more than half of the total GDP growth in the US.

There is now considerable evidence that flexible, market-based approaches to emissions reduction stimulate the development of new technologies.[3] Regulatory approaches can also help to accelerate the introduction of new technologies, but typically work by accelerating the diffusion of existing technologies.

Moreover, research into how managers make environmental decisions shows that a cap increases effectiveness of a wide range of technology promotion policies, including voluntary measures, public-private partnerships, research consortia, DSM programs, etc. One example of this is provided by our study of US Ozone-Depleting chemicals policy.[4] The U.S. ODC policy, which included a cap and trade system, was extremely successful. It succeeded in phasing out ODCs ahead of schedule and at less then half of the cost originally projected by the EPA. We interviewed dozens of managers about their decision-making process. What those managers told us was that the cap gave them certainty that change was coming. Manager after manager told us that the existence of the cap encouraged them to seek out opportunities for reduction that were not yet mandated by law, and to participate in programs that would help them cut their emissions. Under a cap, such programs look like help. Without it, they are sometimes seen as costly impositions that should be fought or avoided.

2. Combining market mechanisms with technology policies produces better results than market mechanisms alone.

Hoerner and Bosquet surveyed studies of market-based approaches to reducing greenhouse gas emissions, and found that the combination of "no-regrets" technology policies and market mechanisms produce better GDP and employment outcome than market mechanisms alone.[5] One explanation of this finding can be found in the following section.[6]

[3] Jaffe, A., and R. Stavins (1995). "Dynamic Incentives of Environmental Regulations: The Effects of Alternative Policy Instruments on Technology Diffusion." *Journal of Environmental Economics and Management* 29: S-43-S-63.

[4] Some of these results were reported in Elizabeth Cook, ed., Ozone Protection in the United States: Elements of Success, Washington DC: World Resources Institute (1996).

[5] Hoerner, J. A. and B. Bosquet (2000). *Environmental Tax Reform: The European Experience.* Center for a Sustainable Economy Report; Available from Redefining Progress at http://www.rprogress.org/programs/sustainableeconomy/eurosurvey.pdf (Oakland CA: Redefining Progress).

[6] See especially Krause, DeCanio, Hoerner & Baer at footnote 7.

III. Permits should be auctioned, rather than allocated based on historical emission levels, output, or any other system.

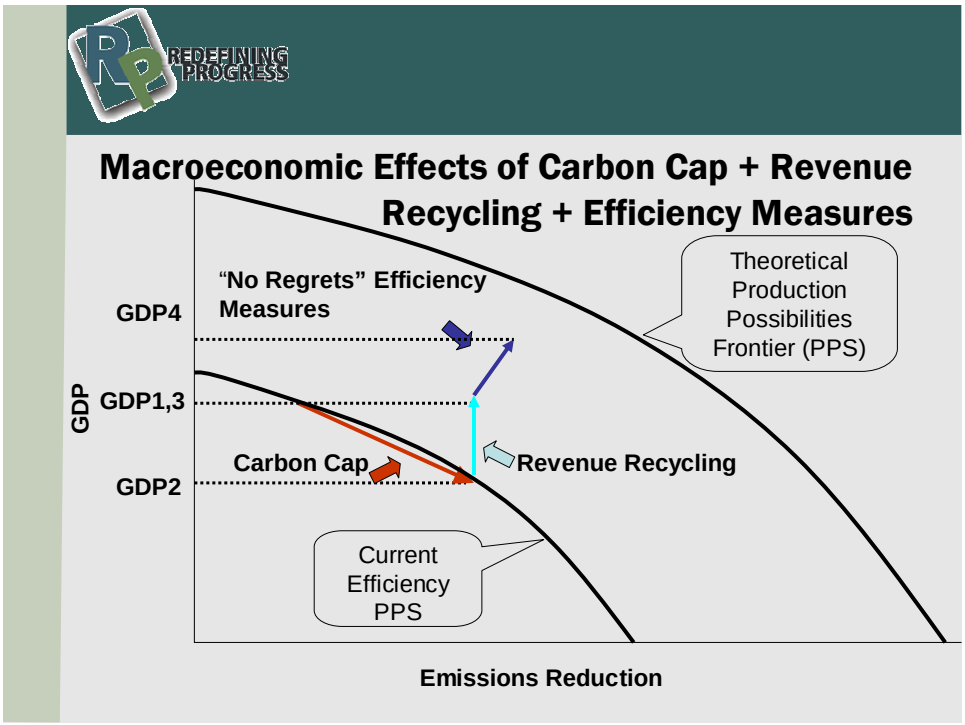
A. Auctioned permits achieve emissions reductions with the lowest social cost and the greatest social benefit.

There are many possible approaches to allocating permits to use atmosphere's limited capacity to absorb greenhouse gasses without generating dangerous anthropogenic climate change. These include auction, grandfathering (defined as an allocation based on some percentage of historic emissions levels), output-based allocation (a system of providing permits based on generation or sale of electricity), or population- or household-based allocations such as the Sky Trust proposal.

Any permitting system by its nature reduces the amount of fossil fuels supplied to consumers of that fuel. When you cut the supply, the price goes up. For a given reduction, in supply the increase in price, the revenue collected from California consumers, and the economic burden, all three, are the same, whether the permits are auctioned, grandfathered, or distributed based on population. (Output-based allocation works differently, as described below). This is because using any of the three systems to achieve the same reduction in emissions cuts the supply of fossil fuels by the same amount, and so increase price by the same amount by the usual rules of supply and demand. But in auctioned systems, the revenue can be allocated in a way that reduces most, all, or more than all of the economic cost of achieving te emissions reduction. This is worth stressing: using the revenue, whether to cut other taxes, invest in new clean technology, reduce the deficit or invest in high-value public investments like education, offsets the economic burden of the permit system. When technology promotion measures are added, nearly all studies find a net economic benefit, rather than a cost.

One way of understanding this is by a simple graphical analysis. The curves in the graph below represents the conventional tradeoff between emission reductions and GDP, i.e. the highest level of GDP the economy can achieve with a given level of emissions reduction and a specified stock of technology.[7] The lower curve shows this tradeoff under current technology. The higher curve represents the tradeoff under a better, future technology – with technology improvement, you can get more GDP **and** lower emissions.

[7] Krause, F, DeCanio, S, Hoerner, J.A., and Baer, P (2003) "Cutting Carbon Emissions at a Profit (Part I): Opportunities for the United States," *Contemporary Economic Policy*, 20(4) 339-65.



The brown arrow represents the result of a cap and trade system, either auctioned or grandfathered. It does not improve technology, but it is efficient, so it moves you from a point with higher GDP and more emissions to another point on the production possibilities frontier with lower GDP and less emissions.

This second, light blue arrow represents the benefits from investing the revenue in an auctioned system (or from other revenue-raising approaches such as emission fees.). This graph assumes the revenue goes to non-environmental investments, so you get an increase in GDP without any change in the environmental outcome, though of course it would also be possible to invest in new clean technology. You can see that the investment of revenue just about offsets the GDP cost of the cap. That's a good reflection of the literature. Depending on exactly how you spend the money, some studies find the economic benefit from investing the revenue is a little more than the cost, some a little less, but virtually everyone agrees that the two are nearly comparable, whether this is based on theory[8] or on surveys of modeling results.[9] Most models find that the economic benefits are greatest if the revenues are recycled to cut the more distorting taxes or invested. Investments can be in energy efficiency and renewable energy, human capital (education), physical and financial capital, essential infrastructure such as roads and schools, or in research and development. General labor tax cuts also perform quite well, especially if the economy is not initially at full employment.

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[8] Goulder, L. H. 1995. Effects of Carbon Taxes in an Economy with Prior Tax Distortions. *Journal of Environmental Economics and Management* **29:** 3 (September); Parry, I.W.H., and A. M. Bento 2000. Tax Deductible Spending, Environmental Policy and the Double Dividend Hypothesis. *Journal of Environmental Economics and Management* **39**:1 January; Parry, I. W. H., Roberson, R. C. and Goulder, L. H. (1999). When Can Carbon Abatement Policies improve Welfare? The Fundamental Role of Distorted Factor Markets," *Journal of Environmental Economics and Management* **37:** 1 (January) pp. 52-84; Mabey, N and Nixon 1997. Are Environmental Taxes a Free Lunch? Issues in Modeling the Macroeconomic Effects of Carbon Taxes. *Energy Economics* **19**:1 (March).

[9] Repetto, R. and D. Austin 1997. The Costs of Climate Protection: a Guide for the Perplexed. Washington, DC, World Resource Institute; Mabey, N., S. Hall, C. Smith, and S. Gupta 1997. *Argument in the Greenhouse*. (London: Routledge); Shackleton, R., M. Shelby, A. Cristofaro, R. Brinner, J. Yanchar, L. Goulder, D. Jorgenson, P. Wilcoxen, P. Pauly, and R. Kaufmann. 1996. The Efficiency Value of Carbon Tax Revenues. In D. Gaskins and J. Weyant, Editors, *Reducing Global Carbon Emissions: Costs and PolicyOptions*, Energy Modeling Forum, Stanford University, Stanford, CA; Zhang, Z. X. and H. Folmer 1998. Economic Modeling Approaches to Cost Estimates for the Control of Carbon Dioxide Emissions. *Energy Economics* **20**: 101-120; Hoerner, J. A. and B. Bosquet (2000). *Environmental Tax Reform: The European Experience*. Center for a Sustainable Economy Report; Available from Redefining Progress at http://www.rprogress.org/programs/sustainableeconomy/eurosurvey.pdf (Oakland CA: Redefining Progress).

Finally, we add no-regrets efficiency measures, those that cause emission reductions at a net economic savings. Many of the measures in the CAT report are of this type. These technology improvements **both** improve GDP and reduce emissions, and so the arrow moves toward the higher efficiency curve.

When you look at these three arrows together, you see that the net result is both a stronger economy and a cleaner environment. Again, this is an accurate reflection of the literature for this sort of combination policy. And the increase in jobs is even more robust across studies than the increase in GDP. A few years ago we surveyed 103 studies of carbon charges (taxes or auctioned permits) and found that 85 percent of them showed net job gains.[10] And most of those studies did not even include the additional benefits of cost-effective technology policies.

If you grandfather, the second arrow is missing. The environmental benefit is the same, but the cost to the economy is much higher. Quantitative analysis has suggested that the welfare cost of a national grandfathered system is four or more times the cost of an auctioned system.[11] Few studies show net economic benefits from such policies, measured relative to no policy, without including the value of the environmental improvement. There are, of course, still efficiency benefits from grandfathered permit systems relative to trying to hit the same targets through regulation alone.

For state-level systems, the difference in macroeconomic costs and benefits will be even greater. This is because, under a grandfathered system, the money collected from in-state consumers goes to mainly out-of-state shareholders of big energy companies, draining dollars and jobs from the state economy. Under an auctioned system, the same amount of revenue is collected from consumers, but the money is re-spent in the state, creating jobs and strengthening the economy.

B. Auction provides revenue to offset the burden on low and moderate income households and to finance incentives for efficiency and renewable and other climate-related public investment programs.

1. Auction provides revenue essential to offsetting the burden of emission permitting costs on low- and moderate-income households

We normally expect the cost of greenhouse gas emission permits to be added to the price of the fuels and then passed on to consumers. The burden of such price increases is distributed against annual income in a highly regressive manner,[12] although the regressivity is not as severe against lifetime or multi-year measures of income.[13] In

[10] Hoerner, J. A. and B. Bosquet (2000). *Environmental Tax Reform: The European Experience*. Center for a Sustainable Economy Report; Available from Redefining Progress at http://www.rprogress.org/programs/sustainableeconomy/eurosurvey.pdf (Oakland CA: Redefining Progress).

[11] Lawrence H. Goulder, Ian W.H. Parry and Dallas R. Burtraw "Revenue-Raising vs. Other Approaches to Environmental Protection: The Critical Significance of Pre-Existing Tax Distortions" *RAND Journal of Economics* 28,4 (Winter 1997): 708-731; Goulder, Lawrence H., Ian W. H. Parry, Roberton C. Williams III, and Dallas Burtraw, 1998. "The Cost-Effectiveness of Alternative Instruments for Environmental Protection in a Second-best Setting." *Journal of Public Economics* 72(3): 329-360.

[12] Casler, S. & Rafiqui, A. "Evaluating Fuel Tax Equity," *National Tax Journal* 46(2)197-205; Howard Chernick and Andrew Reschovsky. "Who Pays the Gasoline Tax?" *National Tax Journal*, 50(2): 233-59 (June 1997); French, Mark. 1990. "Efficiency and equity of a gasoline tax increase." *Energy Systems and Policy* 13 (March): 141-155; Metcalf, Gilbert E., "A Distributional Analysis of an Environmental Tax Shift" (May 1998). NBER Working Paper No. W6546. Hanson, Jean and Margaret Walls. 1999. "Distributional Aspects of an Environmental Tax Shift: The Case of Motor Vehicle Emissions Taxes. *National Tax Journal* 52(1), 53-65; Metcalf, Gilbert E. 1999. "A Distributional Analysis of Green Tax Reforms." *National Tax Journal* 52(4): 655-681.

[13] James M. Poterba, "Is the Gasoline Tax Regressive?" NBER Working Papers 3578; (published; D. Bradford, ed., *Tax Policy and the Economy*, Vol. 5, 1991, pp.145-164; Don Fullerton & Diane Lim Rogers, "Distributional Effects on a Lifetime Basis," *NBER Working Papers* 4862, National Bureau of Economic Research, Inc. (1994);

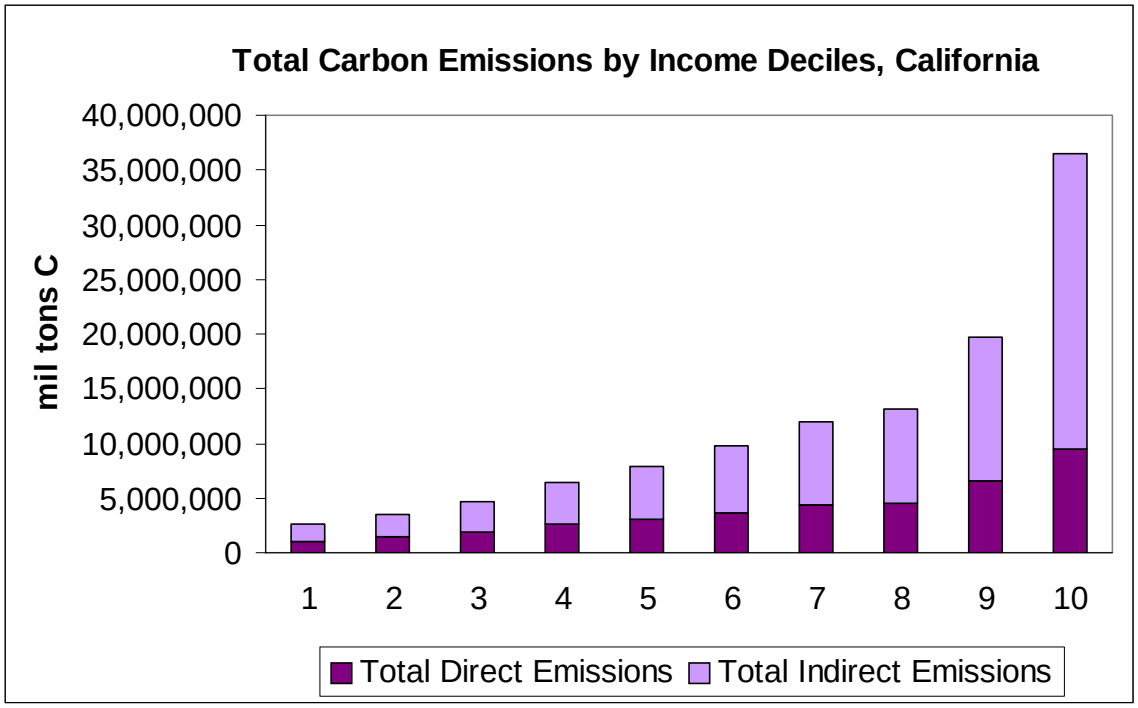
addition, a small number of consumers have disproportionately high energy demands as a result of extremely inefficient housing, special needs, or other factors.

The package of household-level energy-efficiency programs that have been proposed in the CAT report, if enacted promptly and implemented effectively, is more than sufficient to offset the average burden on households and turn it into an average savings. However, there is considerable reason to believe that the benefits of such programs may not be taken up by low-income populations fast enough to offset the burden of permit-induced price increases. It is notoriously difficult to get uptake of efficiency programs in rental property, where most low-income households live; low-income families often have used cars and appliances that are older and have not incorporated the newer efficiency standards. Moreover, even when the penetration of new technology is high enough to offset average burdens, it is still not enough to eliminate the burden on the occasional low-income household with very high energy requirements.

These problems require a mix of policies to address them adequately. We suggest that the average burden on households in the bottom deciles be fully offset through changes in tax and transfer policy, primarily by increases in the Earned Income Tax Credit. For low and moderate income households that have unusual energy demands, we suggest increases in Weatherization, in Low-Income Home Energy Assistance Program (LIHEAP)-style payments, and in related programs.

The graph below shows total carbon emissions from the state of California by income decile. The “direct” portion of each bar shows the CO2 emissions from fuels consumed by households, including the utility emissions from the production of electricity purchased by households. The “indirect” portion of each graph shows the CO2 emissions associated with the production of non-fuel goods and services consumed by households. The sum of the carbon emissions by decile is carbon emissions for the state.

The graph below shows that the bottom four income deciles are responsible for about 15 percent of CO2 emissions. Therefore, if greenhouse gas emission permits are auctioned, you can see from the graph that about 15 percent of the revenues would suffice to offset the entire burden for the bottom four deciles, or the direct burden for the bottom eight deciles. This estimate assumes, conservatively but somewhat unrealistically, that 100 percent of the indirect burden of the charge would be passed through to households. If there were only partial pass-through by firms that sell their product in national or global markets, then a smaller percentage of the revenue would be required to offset the indirect burden.



Source: calculations by the author based on the Survey of Consumer Expenditure, the State Energy Data System of the Energy Information Administration, and the BEA input-output accounts data.

2. Auction provides revenue to finance investments in energy efficiency and renewable energy

The burden of a carbon permitting system can be greatly reduced, and in many or most cases become a net benefit, if a portion of the revenues are used to promote low-cost energy efficiency and renewable energy sources. If the percentage reduction in energy use is equal to or greater than the percentage increase in energy price from the permit sales, these measures can reduce the actual energy bills of businesses and consumers. Preliminary analysis suggests that this can be accomplished through the expenditure of 15 to 25 percent of the revenues from the permit sales.

Examples of instruments that have sometimes been found to be highly efficient ways to promote productivity-enhancing technologies include tax credits, revolving loan funds, grants, investment in fundamental energy research, and other cost-effective measures to reduce energy expenditures.

C. Auctioning is administratively simpler than grandfathering.

1. Auctioning is easy to administer.

The procedures for auctioning in an upstream or midstream markets are particularly simple to administer. Covered entities submit bids, say on a quarterly basis, which consist of a schedule of the quantity of permits that they would like to buy at various prices. The administrator then sums the quantities demanded at each price level, giving the aggregate demand schedule. The price is set at the level where the aggregate demand equals the supply of permits for that quarter. Each entity then receives the number of permits that they requested at that price. The system is simple, foolproof, and virtually ungameable without illegal collusion.

2. No baselines required

Under grandfathering, extensive historical data must be collected in order to establish baselines for the covered entities. This is particularly true under a downstream system, where the covered entities are large emitters. Under such a system good historical data is necessary for many thousands of entities, potentially rising to the tens or even hundreds of thousands if the scale of covered emitters were subsequently reduced so as to expand coverage. This data does not currently exist, implying that the cap can not be put in place for an unspecified number of years. If the CAT implies that it needs downstream inventories to implement a cap, this provides firms with a much stronger incentive to oppose mandatory reporting, further delaying implementation. Moreover, as discussed in section III.D.2 below, covered entities have a substantial incentive to exaggerate their emissions during the base period, making the establishment of reliable baselines difficult.

Under an auction, no baseline information is required. Auction relies on the market to allocate permits based on the covered entities' own estimate of their current requirements.

Although a cap must be enforced somewhere along the stream of fuels from mine-mouth or wellhead to ultimate consumer of energy services, this tracking does not necessarily have to occur at the entity level, and often should not.

We support the consensus position of the environmental groups that reporting based on Registry protocols should be mandatory for all stationary emitters with annual emissions greater than a specified cutoff level. This information is needed to help establishments understand their emissions profiles and emission reduction opportunities and to help the state establish benchmarks and identify best practices. However, as the consensus position states, it should ***not*** be assumed that this is the level at which a permitting system implementing a cap and trade would take place. The permitting system should be established at a level such that enforcement and compliance can be efficiently monitored by state agencies, that the system can be extended to cover the largest amount of emissions practicable, and that it best facilitates achieving emissions reductions at the least cost.

3. No updating issues

Grandfathered systems face a variety of thorny updating issues that are unique to it. The permit allocation creates an asset that is extremely valuable and well worth fighting over. This is true for all the allocation systems except for auction – under auction, the purchaser pays what the permit is worth, and because there is no windfall, the motive to fight over the allocation is eliminated.

Though the motive for dispute is similar for grandfathering, population-based or output-based allocations, the latter two are sufficiently unambiguous that they would not generate much dispute. For grandfathering, on the other hand, you need to have a system for determining how historic allocations are affected by mergers, divestitures, spin-offs – whole panoply of potential corporate reorganizations. This problem is particularly severe for downstream systems where the number of covered entities is large and the full range of reorganizations possibilities are likely to be observed. Other updating problems that arise under grandfathering include what to do about new entrants (who by definition have zero historic emissions), whether and how to adjust to dramatic changes in firm size, whether growth or shrinkage, and how permits allocations are treated in bankruptcy.

The upshot of all this is that the rules required to administer such a system will be complex, and that the combination of complex rules and having hundreds of millions of

dollars worth of permits at stake invites a massive and expensive wave of litigation. These costs should not be underestimated. A major reason why there is such widespread dissatisfaction with the Superfund is that it was demonstrated that for many years firms were spending more money litigating Superfund liability then they were on cleanup. An even closer analogy would be the broadcast industry's ultimate support for the move from administrative allocation of broadcast rights to auction of those rights, because it had found that the cost of litigation was higher than the cost of auction. Finally, and perhaps most tellingly, we are starting to see firms that are under the grandfathered greenhouse gas trading system in Europe come forward to say the allocation system is so opaque, political, and arbitrary that an auctioned system would be preferable.

4. No need for trading

Under an output-based or per capita allocation, trading is essential. These systems will result in very large and immediate cuts in the emissions allowable for some covered entities, and comparably large surpluses for the cleaner entities, which would eliminate all incentive for further emissions reductions. Immediate cuts of the magnitude implied would be catastrophically expensive and probably literally unfeasible.[14] Thus trading is required to cushion these abrupt changes. These trades imply very substantial cross-subsidization of the customers of the cleaner utilities by the customers of the dirtier utilities. We believe that the political and ethical consequences of these income transfers have not been properly considered or understood.

Because the demand for electricity and the generation mix change slowly, a grandfathered system can function without trading, at least in the short run. However, because the demand for electricity is not growing at the same rate for all load-serving entities over time, the disparity between the grandfathered allocation and a covered entity's need for credits will increase steadily over time, with the result that, absent trading, very expensive emissions reductions will be pursued by the faster-growing entities while much less expensive emissions reduction opportunities go begging in the slower-growing entities. This increases the total cost of achieving reduction targets, and the fairness of requiring more expensive and deeper cuts from areas that are growing more rapidly may be

Under an auctioned system, on the other hand, covered entities purchase a quantity of permits based on their anticipated need at the specified price. Emission reduction costs are equalized across utilities, not by trade, but by the initial purchase at a uniform price. Errors by a covered entity in forecasting its permit requirements can be corrected without trading by simply buying more of fewer credits in the next period.

Although we believe that a sufficiently carefully designed and monitored trading system can reduce the total cost of achieving emission reduction goals, there is no question that there have been instances where trading increased the opportunity to "game" market mechanisms with flaws in design or enforcement. Thus it may be regarded as an advantage of an auctioned system that it can be introduced without trading and still allocate reduction costs in a fair and efficient manner.

[14] The recent statement the CPUC that it would create a system without trading that could be based on grandfathering, output-based allocation or grandfathering is (we assume unintentionally) deceptive. At least in the short run, the only allocation systems that can function without trading are auction and grandfathering. Moreover, it is our belief that, were they faced squarely with a choice between auction with a sensible allocation of the revenue (based, say, on greenhouse gas reduction opportunities) and grandfathering, a majority of the parties to that proceeding would have prefer auction.

D. Grandfathering is a particularly poor system for allocating permits.

1. Grandfathering is unfair.

Grandfathering – distributing permits based on a percentage of historical emissions -- is unfair. First, it rewards the dirtiest producers and penalizes early actors. It allows dirty producers to remain relatively dirty into the indefinite future, and insists that those who have already devoted considerable efforts to reducing their emissions nonetheless must make further reductions of the same magnitude as dirty producers, or buy credits from those producers.

In addition, grandfathered systems are unfair because they create huge windfall profits for the stockholders of covered entities, profits reaped at the expense of California consumers, both households and businesses. Efforts in the literature to model the size of the windfall suggest that it is between eight and twenty times the actual cost to energy producers of the emissions reduction requirement.[15] Some have suggested that this problem can be neglected for a load-based, electricity-only system, because the regulated or public nature of the industry will preclude passthrough of costs in excess of the true costs. . However, in its assessments of various climate policies, the Department of Energy routinely finds that the costs of emissions reductions do in fact translate into higher prices for delivered electricity.[16] Further, an analysis by the Energy Research Centre of the Netherlands (ECN) for the Ministry of Economic Affairs in the Netherlands found that electric utilities were passing 60 percent of the increase in marginal cost through to customers, an amount far in excess of the actual cost of emission reductions to the utilities, concluding that a switch to auction would be much better for European economies.[17] The precise mechanism where by European utilities, which are, if anything, more heavily regulated than ours, accomplished this passthrough of costs is not known, but is seems foolhardy to assume that Americans are less influenced by market forces, or less ingenious, than their European counterparts.

For these and other reasons, the consensus position statement issued by the states leading environmental organizations condemns grandfathering as a system for allocating emission permits.

2. Grandfathering creates perverse incentives.

Grandfathering can create particularly perverse incentives when the use of grandfathering to allocate permits is announced before the baseline period has closed. Under this circumstance, covered entities have an intense incentive to increase their emissions during the baseline period. This is because they are then given a permanent --or at least very long-term –stream of permits, a stream that is will continue to increase in value over time. In addition to the incentive to increase emissions, there is a very strong incentive to exaggerate emissions. This was seen in RECLAIM, where exaggeration of emissions during the baseline period resulted in a glut of permits in the early years. This in turn led to negligible effort toward emissions reductions in those years – and to a much more severe

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[15] Goulder, L.H. & Bovenberg, A.L. "Neutralizing the Adverse Industry Impacts of CO2 Abatement Policies: What Does It Cost?"), in C. Carraro and G. Metcalf, eds., *Behavioral and Distributional Effects of Environmental Policies*, University of Chicago Press, 2001; Smith, A. E. and Ross, M. T. *Allowance Allocation: Who Wins and Loses under a Carbon Dioxide Control Program?* Report prepared by Charles River Associates for Center for Clean Air Policy, Washington, D.C., (February 2002); Burtraw, D., Palmer, K., Bharvirkar, R., and Paul, A. 2002. "The Effect on Asset Values of the Allocation of Carbon Dioxide Emission Allowances." *The Electricity Journal*, June, pp. 51-62.

[16] See most recently, *Impacts of Modeled Recommendations of the National Commission on Energy Policy* Energy Information Administration, Department of Energy. 2005. SR/OIAF/2005-02.

[17] Sijm, J.P.M., Bakker, S.J.A., Harmsen, H.W., Lise, W., and Chen, Y. CO2 Price Dynamics: The Implications of EU emissions Trading for the Price of Electricity, ECN Report ECN-C--05-081, (September 2005).

shock when the glut turned suddenly to a deficit. Thus **it is essential that the CAT announce that it will not use firm-level mandatory reporting as a basis for grandfathering credits to those firms.** Failure to do this virtually guarantees that any system that allocates permits based on the firm-level baselines so established will fail catastrophically.

This risk is much smaller for an upstream system that sets the permitting requirement where fuels are produced or imported, or a "midstream" system that imposes the requirement at the most administratively efficient point (often at "narrow points" in the fuel distribution chain, such as the terminal rack for motor fuels). The risk is lower because the number of covered entities is much smaller, so auditing can be much more comprehensive; because we have fairly good historic records of aggregate fuel consumption, which can be used as control totals; because we have fairly good historical information about fuel flows through the most important of these enforcement points, and so could set baselines retrospectively rather than prospectively. However, attractiveness of the greater ease of enforcement that upstream or midstream systems offer because of the smaller number of covered entities is substantially offset by fairness concerns, as the smaller number of entities implies that the benefits of the windfall profits discussed above are more highly concentrated.

A less severe but comparably perverse incentive is created under the so-called "rolling" baseline. Under this system, the baseline used for grandfathering is "updated" periodically by replacing the base period with a more recent baseline. Unfortunately, the rolling baseline has an effect similar to that of a prospective baseline. Because firms know that reductions achieved this year will result in a reduced permit allocation in subsequent years, the incentive that the cost of the permit provides to reduce emissions by a ton is cut from the full price of the permit to be only to be only the time value of reduced costs this year as versus a comparable increase in subsequent years.[18] In some cases, this can even turn a incentive to reduce pollution into an incentive to *increase* pollution. Although this has little effect on emissions in the short term, as total emissions remain set by a schedule of targets, updating causes the trading markets to fail, and costs are not equalized across covered entities or minimized for society. Moreover, this system substantially reduces the incentive to develop new technologies, reducing the productivity benefits from the cap and increasing the cost of achieving our long-term reduction goals substantially.

3. Grandfathering here would set a national precedent that would be bad for California.

California is a relatively clean state, from a greenhouse gas point of view. It has the fourth lowest carbon dioxide emissions per capita ,and the fifth lowest per dollar of GSP. Because California is not a typical state, different permit allocation mechanisms, if adopted nationally, will affect it quite differently. Auctioning would help California, because our cleaner economy will pay significantly lower rates, as would a population-based allocation. Output-based allocation, which would benefit relatively clean utilities within California, if extended to a national level would not benefit California by as much, because the benefit of our lower-than-average greenhouse gas emissions is substantially offset by the cost of our lower-than-average electrical use. (Note that output-based allocation can only be used in the electric sector, as other sectors lack an unambiguous physical measure of output on

[18] This was demonstrated with respect to similar rolling baseline provisions in a former version of the research and development tax credit by Bronwyn Hall, "R&D Tax Policy During the Eighties: Success or Failure?" **Tax Policy and the Economy** 7 (1993): 1-36. [NBER Working Paper No. 4240 (December 1992). Berkeley, CA: IBER Working Paper No. 93-208 (January 1993). Stanford, CA: Hoover Institution Working Paper No. E-93-1 (January 1993).]

which to base the allocation). On the other hand, grandfathering would result in a large transfer of assets from the citizens of California to states with coal-based energy systems.

Some have raised the question whether adopting a particular permit allocation mechanism in California implies that the chosen mechanism is substantially more likely to be chosen nationally. There is, of course, a long and proud history of environmental leadership by California, and many of California's climate-related initiatives such as our global warming pollution standards for cars are being actively examined and copied by states across the nation. Moreover, it seem likely that our policies will be adopted by relatively clean states, which constitute most of the states that support aggressive national greenhouse gas reduction goals.

E. Auctioned permits are not taxes.

Although auctioned emissions permits raise revenue, they are not taxes, economically, legally, or politically.

Auctioned permits are not taxes economically because they increase rather than decreasing economic efficiency. All (or nearly all) taxes are charges applied to a base of production consisting of some valuable activity or product – making sales, working for wages, earning profits, holding property for use, etc. These charges discourage the taxed activity, resulting in an additional burden beyond that of the tax revenue, referred to by economists as a *deadweight loss*. This burden arises from the lost value of the economic activity that the tax discourages. Unlike taxes, auctioned permits (and other charges and fees against pollution or depletion of natural resources, such as the public goods charge proposed in the CAT report) discourage "bads" rather than goods. Thus there is no deadweight loss, and in fact there is an efficiency gain from such charges, provided that they are no grater than the (marginal) social costs imposed by the activity covered by the permits. This has been known at least since the since the 1920 publication of The Economics of Welfare by Pigou. Although some kinds of pollution charges have occasionally been referred to as "pollution taxes," this label is deceptive, because it can mislead people into believing that they reduce efficiency, when in fact they increase it.

Auctioned permits are not taxes legally because their primary purpose is to reduce emissions of greenhouse gasses that cause costly and dangerous climate change, at the lowest net social cost, rather than to raise revenue. As discussed above, auctioned permits with efficient revenue recycling have a lower total social cost than other permit allocation mechanisms, and can produce a net social benefit.

Auctioned permits are not taxes politically because they are rightly seen primarily as an environmental measure rather than primarily as a revenue measure. They are closely analogous to two other classes of revenue measures that are often not regarded as taxes: user fees, which can constitute a charge for the use of a public asset in limited supply, like a park, road, or, in the case global warming pollution permits, the absorbtive capacity of the atmosphere; and "sin" taxes on activities that are self-destructive and impose costs on others, like smoking, drinking, or polluting.

IV. The CAT should recommend immediate implementation of a cap.

A. Immediate implementation of a cap is administratively feasible under any allocation system but grandfathering

Auction, population-based allocation, output-based allocation, and indeed, essentially all allocation approaches other than grandfathering are based on either readily available historic data (e.g. population), contemporaneously measured data (e.g. output), or direct firm assessments of anticipated need (e.g. auction). Thus there is no need to delay implementation of a cap until a mandatory reporting

system is in place, unless the permits are to be allocated by grandfathering. As discussed above, grandfathering is a very poor system for allocating credits and should be avoided. Therefore there is no reason to delay implementation.

B. Immediate implementation of a cap is necessary to assure that we reach the Governor's targets

As discussed in section II.A above, many of the measures contained in the draft CAT report are highly uncertain in their cost, the quantity of reductions that they would produce, and especially the rate at which they can be introduced.

C. Immediate implementation of a cap is necessary to achieve reductions at least cost and greatest benefit.

1. Gradual phase-in minimizes adjustment costs

A substantial literature has attempted to measure the cost of changing the relative intensities of inputs to production. It has found that, in addition to the costs that arise from substitution of one factor for another, there are adjustment costs that come from making rapid changes. Often these are described as the costs of learning new ways of business or production.

These costs have usually been found to rise with the square or some higher power of the rate of adjustment. Numerous studies have applied these analyses to the climate change arena, finding that a steady, gradual change is much less costly than a period of inaction followed by a more rapid change.[19] Indeed, failure to account for adjustment cast results in underestimating the cost of delay in implementation by a factor of seven or more.[20]

2. Gradual and predictable phase-in minimizes costs to households and businesses from capital-stock turnover

To change the energy-intensity of a production process it is often necessary to change the equipment used in that process. These equipment changes can be relatively low in cost when the change takes place at the end the equipment's useful life. The cost rises, however, as when equipment changes have to take place before a piece of equipment is worn out. As a result, the cost of moving toward greater energy efficiency can be significantly reduced when the reduction targets are known with sufficient certainty far enough in advance to take advantage of normal patter ns of capital stock turnover.

One way of capturing the higher costs of accelerated turnover is with "putty-clay" models, so called because capital in monetary form can be turned into any variety of investment, but once capital has been used to buy equipment, it hardens like clay and is no longer malleable. Applications of putty-clay models to greenhouse gas reduction policies have found that the cost savings from a gradual, smooth ramping down of emissions targets relative to more abrupt changes can be considerable, that that accounting for these effects can reduce estimated costs of emissions reductions by a factor of 6 or more.[21]

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[19] Grubb, M. 1997, "Technologies, Energy Systems, and the Timing of CO2 Emissions Abatement: An Overview of Economic Issues," *Energy Policy*, vol. 25, pp. 159-172.

[20] Grubb, M., Chauis, T., & Ha-Duong, M. 1995, "The Economics of Changing Course: Implications of Adaptability and Inertia for Optimal Climate Policy", *Energy Policy*, vol. 23, no. 4, pp. 417-431.

[21] Atkeson, A. & Kehoe,P.J. "Models of Energy Use: Putty-Putty vs. Putty-Clay," Federal Reserve Bank of Minneapolis, Staff Report: 230, 1997.

3. Gradual phase-in reduces costs by stimulating technological development

Efforts to model the process by which new commercial technologies are developed have generally found that technical knowledge is produced by some combination of time with economic resources such a labor and capital. As applied to a single technological problem for a fixed amount of time, the marginal productivity of the economic factors falls rapidly, so that budgetary increases produce less and less return. Despite this, many economic analyses of the cost of reducing emissions have used the "manna" model of technological improvement, in which technology "falls from the sky" rather than resulting from investment.

More realistic technology models imply that steady effort yields a larger amount of technological progress than a crash program with the same budget. Quantitative estimates suggest that the benefits of improved energy technology from continuous but moderate research effort can result in a net economic benefit relative to inaction.[22]

4. Early adoption of a cap with auction increases the net economic benefit from achieving a specified emissions reduction target.

See section III.A and IV.C above for discussion of this point.

V. A well-designed cap on emissions will enhance the competitiveness of emissions-intensive industries in the state while encouraging continued emissions reductions.

A. Emissions associated with the production energy-intensive should be treated as made where the goods are consumed (consumption-based) rather than where they are produced (production-based).

By designing the permit system so that it covers emissions associated with California's consumption of energy-intensive products, rather than California's production of those products, we can enhance the competitiveness of even our most energy-intensive industries.

In electric sector, a consumption system is referred to as "load-based." Under a load-based system, those who sell electricity (load) to in-state consumers need permits for greenhouse gas emissions produced in generating that electricity. This is true whether the generation takes place in-state or out-of-state. Load-serving entities must buy permits for electricity they import. No permits are needed for electricity sold to out-of-state consumers, again, whether generation is in or out of state. Exactly the same system can be used on other energy-intensive products besides electricity, such as oil refining and cement production.

This approach levels the playing field between domestic out-of state producers. It completely eliminates all competitive burden of the permitting system for the products that it covers. It also eliminates the problem of "leakage." This problem is that policies to reduce domestic emissions can be rendered ineffective by foreign emissions increases. This occurs when domestic policies increase the cost of producing goods domestically, and so encourage consumers to substitute imported goods. The increase in foreign production of goods causes a corresponding increase in foreign emissions. From a

[22] Dowlatabadi H. (1998), 'Sensitivity of Climate Change Mitigation Estimates to Assumptions about Technical Change', *Energy Economics*, 20(5-6), 473-493.

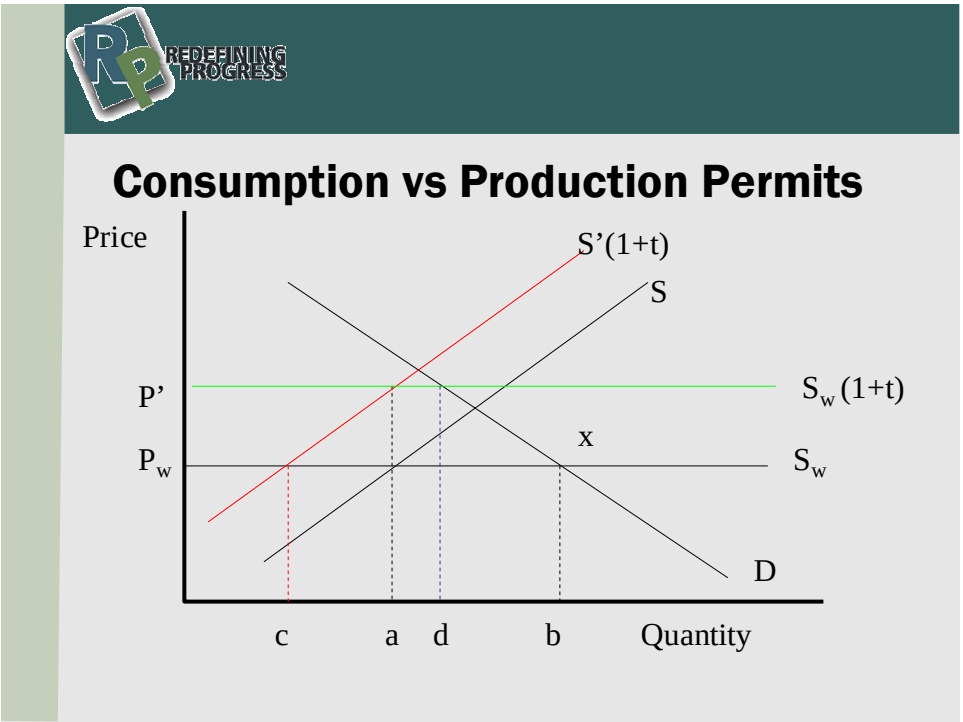
global environmental perspective, there is no benefit from driving production to unregulated jurisdictions where it is likely to be produced less efficiently with higher emissions (plus the additional emissions from transport). Instead, the environmental goal is to retain those industries and help them become cleaner.

It is easy to see why a load- or consumption-based system reduces the negative impact of a an emissions permitting program, but it is less obvious, but true, that it eliminates that burden entirely and, in conjunction with other policies, can actually increase the competitiveness of emissions-intensive activities. We can easily illustrate this using the graph below, which is actually far simpler than it at first appears. Think of this as the market for some product the consumption of which causes pollution, such as gasoline, which emits a fixed amount of CO2 per gallon consumed.

The lines labeled S and D are our usual supply an demand curves. One would think that a normal market would settle down at the point of intersection where supply equals demand without surplus or shortage. But actually, that would be a rather unusual market. The reason for this is that most markets are open to trade, a world supply curve Sw that lets you buy as much of the good as one wants at the world price Pw. The world price sets the price in the domestic market, which does *not* clear –at the world price firms supply only amount a, while consumers demand amount b. The difference, b-a, is of course imports.

Now suppose put a permitting fee on domestic *production* (i.e. supply) of oil in the amount t. This is added to the price of production, so that we have a new supply curve S' for which the price has been shifted upwards by amount t. However, the price in this market is still set by the world price Pw. As a result, domestic production falls from a to c; the difference is made up by imports, so leakage is 100 percent, and domestic consumption is unchanged. We just lost a lot of jobs with no environmental benefit.

Suppose that we now want to apply that permitting fee to domestic *consumption*. Recalling that consumption equals production plus imports minus exports as an accounting identity, we apply the same charge that we previously applied to production to imports as well. (I have shown a nation that is a net importer, but all of these arguments would apply just as well if world supply was above the intersection of supply and demand so that our country would be a net importer). This lift the worls supply curve up by the same amount, t, that we lifted the domestic supply curve. World supply still sets the price in the domestic market. But now, instead of imports being larger that the original amount, they have shrunk to only d-a, an amount smaller than the original amount. Consumption has fallen from b to d, so we have real emissions reductions, with no corresponding increase in imports, i.e. no leakage. And the amount supplied – the point where the new world price intersects the new domestic supply curve – is a, *exactly the supply with which we started*. If you look carefully you will see that this is inevitable, not accidental. Moreover, the price received by the domestic producers is the new world price, P'. After the producer pays the permitting fee t, the payment that s/he takes home is just equal to Pw – again, exactly the payment received in the no-policy case. The position of the domestic producer is entirely unchanged by a consumption-based permitting system.



This analysis, based on international trade is equally valid for interstate trade and demonstrates why California's climate policy, however stringent, will not harm California's oil refining industry.

A load- or consumption-based system is a relatively new idea in environmental policy, but well understood and has been extensively analyzed in the public finance literature, where the legal and administrative procedures that are required to turn a charge levied on domestic production into a charge levied on domestic consumption are referred to as border adjustment.[23] Virtually all consumption taxes are border-adjusted, e.g. the taxes on gasoline, alcoholic beverages, ODCs, sporting goods, Superfund Toxic chemicals, and the value-added taxes popular in Europe.

Border adjustments fully offset the cost of the permitting system, but do not offset benefits of efficiency programs. So under a consumption-based system, even -- or rather, especially -- the most energy-intensive industries becomes more competitive. This improvement in competitiveness takes place without watering down the incentive to reduce emissions. As a result, California's product is produced with lower emissions per unit of output than the foreign product displaced by our decreased imports or increased exports displace, so world emissions go down for this reason as well.

B. Consumption-based accounting is administratively feasible.

Industries that require consumption-based treatment are those that have significant increases in their output price relative to the baseline, after policy-induced efficiency improvements and revenue-recycling have been taken into account. When efficiency improvements are combined with revenue recycling, the result is that the vast majority of industry, in excess of 95 percent measured by value of gross output, or 98 percent measured by employment., have net price savings.

This analysis is based on a $50/ton carbon permit price. In our view, permit prices are unlikely to rise to that le are unlikely to exceed $30/ton in the forecast period, and will reach that level only if an implausibly high level of the technology promotion programs in the CAT report fail to be implemented or

[23] This is also sometimes known as the "destination system," because products that move in international trade are taxed in their destination state rather then their state of origin.

are ineffective. So the true figure for share of industries requiring consumption-based accounting is even small than those listed above.

This implies that only a very small percentage of industries need consumption-based accounting to preserve their competitiveness. The most important of these by far are the energy industries themselves: oil, coal, gas, and electricity. We believe that it is probable that the only industries that would need consumption-based accounting are the energy industries and cement. We suggest that other industries be allowed to apply for consumption-based treatment if the net impact of climate policy increases their cost of production by more than a specified amount, say one percent. Although we believe that there are unlikely to be any qualifying industries under this test, its existence could be a source of reassurance to energy-intensive industries that are unsure of the magnitude of efficiency savings that will prove feasible and economic.

See Appendix A. for a discussion of workable rules for attributing emissions to out-of-state electric generation; Appendix B. for further discussion of how the price impact of the climate actions plan should be measured and how consumption-based accounting could be implemented for industries other than electricity; Appendix C. for a discussion of the proper accounting system for emissions from interstate and international air travel; and Appendix D. on the validity of a consumption-bases system under the federal Commerce Clause and under GATT/WTO rules.

VI. A permitting system should have the most comprehensive base that is reasonably practicable.

A. Cover all sectors and every well-monitored gas

There is no reason to have a cap that is any less comprehensive than all emissions from fossil fuels, potent industrial greenhouse gasses, and such other emissions as we already monitor reliably.

B. Only comprehensive system provides full certainty of environmental benefit

A comprehensive or nearly comprehensive cap assures that the Governor's targets will be met. If a cap covers only a small part of the economy, emissions growth outside of the cap can overwhelm emissions cuts under the cap.

C. A comprehensive system is best for the economy

1. There are benefits of technology improvements and revenue recycling in every sector which are lost if that sector is excluded.

Analyses by CEPA, UC Berkeley, and CCAP have shown not merely aggregate benefits for the state, but also positive net benefits in every sector. In general those benefits are increased by market-based incentives and by permit-financed investment programs. Thus the exclusion of a sector from the cap and cap-financed benefits will work to the detriment of that sector.

We recommend that the CAT commission studies to measure these benefits and establish the magnitude of sectoral losses from exclusion from the cap.

2. Narrowing the base increases the cost of hitting a target and decreases the efficiency gains from trading.

Although modest emissions reductions can be achieved in every sector through technology policies and regulations alone, deeper cuts require that these policies be combined with market-based incentives and revenue-recycling in order to be achieved at a net benefit. As cuts continue to deepen, ultimately a point is reached where further cuts can be achieved only at a net cost, costs which rise at an accelerating rate as emissions are reduced toward zero. This is particularly true in time-frames that are too short for substantial technological innovation.

When using auctioned permits or a cap-and-trade system to achieve a specified cut in total state emissions, the depth of the required cut is inversely proportional to the breadth of the emissions covered. For example, in California the emissions cut required to achieve a specified emissions reduction would be about twice as deep if only the electric system was covered as it would be if both electric and gas utilities (which have comparable emissions) were covered. Thus, the broader the coverage the more likely we are to be in the range of reductions that can be achieved at a net benefit, or if we have tipped over into the range of net cost, the lower that cost will be. As a result, attempts to hit the Governors targets with a cap that covers only about

3. Partial system can result in missed opportunities for efficiency gains from technologies that cross sector boundaries.

For instance, one promising transportation tech is plug-in hybrids. Electricity-only system would block this option even though aggregate emissions go down, because decrease would be in un-covered sector and increases would be in covered sector. The same would be true for hydrogen cars if the transport sector is not covered and hydrogen is produced electrically or as a byproduct of coal gasification.

There are many, many examples of this phenomenon. For instance, high efficiency ground-source heat pumps are ruled out if electricity is covered and natural gas or the residential sector are not; building-scale combined heat and power applications could be ruled out if gas is covered but the electric sector, or the building sector are not; industrial district heating applications could be ruled out if the building sector but not the industry sector are covered, etc.

VII. Additional analysis should be conducted to remedy the understatement of the economic benefit of a California greenhouse gas reduction plan and to compare alternative implementations of an emissions cap

A. The Climate Action Plan will create a net economic benefit for the state

There have now been three different analyses by three different teams using three different models. All three of these teams have made quite similar findings of benefit to the state economy from the CAT policy set. Indeed, adjusting for the somewhat different coverage of elements of that policy set, the findings are well within one another's error bars.

Any one of these analyses would constitute the most comprehensive economic study of a state climate plan ever done. Taking the three together, no fair-minded person could possibly say that there has not

been enough economic modeling to establish that moving forward with the climate plan will benefit the state's economy.

We believe, however, that the current analyses grossly understate, by a factor of two to four at a minimum, the economic benefit from adopting a well designed plan. Our own analysis released last year of the California impact of a national climate plan that would achieve cuts of similar magnitude to those proposed by the governor, using the LIFT model, a well-respected, 97-sector macroeconomic model built by the INFORUM modeling group at the University of Maryland with a 20-year track record, found macroeconomic and employment benefits that were over twice what the CEPA found.

Based on our experience in comparing LIFT results to results from other models, we believe that these differences were probably caused by a different policy set rather than by difference in the reaction itself. Specifically, we used a slightly more aggressive efficiency package, but more importantly, we integrated market mechanism and revenue recycling into our model. Though both the U.C. Berkeley team and the CCAP team explicitly state that the inclusion of such measures would increase the economic efficiency of the package, this work is yet to be done, and our principle policy recommendation is to include such integration in the next round of economic studies.

B. Many of the economic benefits of the plan have not yet been measured.

Our second recommendation is simply to continue on path with analyzing the costs of climate change and the costs and benefits of the Climate Action Plan. In this section we simply list, with little comment, some of the analyses that remain to be done.

1. Assess the monetary values of avoided climate change.

Two methodological recommendations:

- In measuring this value, use the Golden Rule, I e. measure the value of the global benefits from California's reductions. We should do this because we want others to include the value of California's costs and benefits when they are assessing their own climate policies.
- Do a separate analysis of "central case" costs and the insurance value of extreme events

2. Monetize the value from reductions in co-pollutants.

Previous studies have tended to find the co-pollutant values and the climate values to be comparable.

3. Measure the value of the insurance provided by the climate plan against key economic risks

As a minimum, these should include the following four risks:

1. Reduced costs in the event of changes in the science that suggest faster or deeper emissions cuts are necessary
2. Insulation against price shocks caused by supply disruptions in domestic & foreign energy markets. We specifically urge examination of the literature on "fat tails" in the distribution of commodity prices (keywords: L-Stable, Cauchy distribution).
3. Insulation from macroeconomic risk from energy-shock-induced recessions (historically about six times the cost of the energy price increases themselves.

4. Risk of fundamental transformation in energy market from, e.g., peak oil, or a united radical Islam controlling Mideast oil production

4. Estimate the probable benefit of new and currently unanticipated technologies or technical improvement over the next 15 years, based on historical experience.

5. Estimate the value of new exports opportunities, or of the risk of export losses, for energy-producing and energy-using equipment and products.

Note here that all our major industrialized trading partners except for Australia are in Kyoto. What effect will this have on our ability to sell them gas-guzzlers and instant-on appliances that produce a constant power drain? In addition, the market for energy generation and transmission equipment in the developing world is incredibly large. The demand for electric generation and transmission equipment over the next decade in Asia is expected to exceed a trillion dollars. Moreover, both China and India are increasingly aware of the need to put more clean power in that mix.

6. Estimate the social value of the reduction in unemployment that the models forecast.

New jobs on the scale suggested by these models represents about a 10% reduction in the unemployment rate. Benefits from this reduction include the value of the social benefits, such as lower crime rates, reduced social service costs, and even a lower suicide rates.

7. Asses the long-term dynamical implications of the switch from a resource-intensive to a. knowledge-intensive economy.

Economies that are based on natural resource extraction must ultimately come face to face with Hotelling's Law, that in the long run resource prices must come to rise at the market interest rate. Information economies, on the other hand, enjoy positive feedback, in that it is not only not finite and self-limiting, but is in fact the primary input to the manufacture of more information.

C. Alternative implementation strategies for a cap should be studied

As mentioned above, the failure of the economic analysis to integrate market mechanisms into the economic study suggest that the economic benefit of the plan has been gratly understated. However, this benefit itself varies widely with alternative market approaches. We therefore suggest a series of analyses that, based on our experience, are likely to have large impacts on the outcome.

1. Compare the cost and/or benefit from achieving a specified emissions reduction using single-sector or multi-sector coverage.
2. Compare auction with grandfathering
3. Examine several alternative approaches to recycling the revenue from auction, such as:
    a. human capital investments
    b. cuts in labor taxes;
    c. cuts in taxes on capital;
    d. energy-efficiency investments; and
    e. investments in infrastructure
4. Assess the effect of the presence or absence of border adjustment on:
    a. Just the energy sectors
    b. The energy sectors and the most energy-intensive five percent of the economy

Conclusion

The Climate Action Team has made enormous progress, and the draft CAT report is an excellent document from which to continue the process of crafting a sound climate plan.

The report and supporting material establish that there is a plan that can strengthen the economy while making dramatic reductions in emissions. However, many questions remain to be resolved, and it is certain that flesh can be put on the plan's skeleton in such a way as to bring it to vibrant life, greatly increasing its economic promise and benefits for business while simultaneously making it more environmentally effective and more socially just and beneficial.

Appendix A **Attributing emissions content to imported electricity**

There are, broadly speaking, two methods of accounting for the emissions from electricity or other emissions-intensive products. These systems can be applied whether one is creating a cap-and-trade system, a system of emission fees or taxes, or simply an accounting system. The first of these systems is generation-based which measures or controls emissions associated with the *production* of power within the state. The second system is load-based which measures or controls emissions associated with *consumption* of power in the state. In the tax setting, the generation- or production-based system is known as the origin system, because the tax is imposed in the state where the taxed product originates, while the load- or consumption-based system is known as the destination system.

Note that, as an accounting identity, consumption equals production plus imports minus exports. A load- or consumption-based system need not, and probably should not, be administered at the consumer level – it is adequate to monitor producers, importers, and exporters. In some cases, a load- or consumption-based system might be most easily administered at an intermediate level. For example, a cap on emissions from motor fuels might be best administered at the terminal rack, the facility where tanker trucks are filled for distribution to gas stations. Because federal motor fuels taxes are collected at this point, much of the administrative apparatus for monitoring the sale of fuels is already in place.

Some have suggested that, because electricity is a uniform commodity bearing no trace of its origin, it is not currently possible to make a reasonable attribution of the emissions content of imported power. To assess if this is true, we must first ask what such a tracing system need do to be adequate for purposes of climate policy. Such a system should create the right incentives on the margin to construct cleaner new plants and discourage dirtier ones. It should provide an approximately correct result when perfect tracking of power to its generating plant is not available. It should not be possible to game the system through "bookkeeping" changes that attribute relatively clean power to exports to California without making actual changes in the corresponding emissions from the generating state. It should be administrable at a reasonable cost using currently available information. And it should not place a disproportionate or discriminatory burden on interstate commerce within the meaning of the Commerce Clause of the U.S. Constitution.

Although it is probably true that it is not currently possible to make a perfect estimate of the emissions associated with specified imports, it is fairly easy to produce sensible, non-discriminatory accounting rules that create the proper marginal incentives, generate reasonable results, are fairly "game-proof" and can be applied easily and immediately. One such set of rules is demonstrated below.

Before turning to the details of such a system, note first that electric power facilities fall into two broad categories that require separate treatment: plants built in the past and plants built in the future. For plants built in the past and currently operating, changes in ownership or in the terms of long-term contracts that do not result in shutting the plant down have no effect on the total emissions from the electric generating system. Thus, no transactions of this type should have any impact on the carbon content attributed to imports, which should be permanently fixed based on historic ownership or contracting arrangements. The only exception to this rule that should occur is when there really is a full tracking system that can determine precisely what emissions are associated with the generation of power that is imported, one that covers the entire power-pool from which imports are drawn so that "cherry picking" – using the tracking system only for power from cleaner plants – can be prevented.

For plants built in the future, on the other hand, the task is to assure that the benefits of clean power and the costs of dirty power are fully incorporated into the decision-making around the plant's construction. Thus, the attribution of emissions content to imports should be fully responsive to changes brought about by these decisions.

Finally, we shall need a fall-back rule for the residual of power which is neither fixed based on past contracts or ownership nor generated pursuant to ownership share or long-term contracts from plants built after the regulation goes into effect.

One way to achieve these various goals is to attribute greenhouse gas emissions to imported power according to the following four-tiered system:

First tier: Power from new facilities. For any out-of-state generating facilities built subsequently to the enactment of this program with financing in whole or part from a California entity subject to the cap, or based on a long-term contracts with such a California entity, the "allocated emissions" shall be equal to the annual emissions from that plant in CO2-equivilent tons times the ownership share. "Allocated power" shall be equal to the annual kWhs of generation from that plant times the ownership share, less average line losses in transmitting that electricity to the California border. Imports by the California entity up to the amount of allocated power shall be treated as having a carbon content per kWh equal to the allocated emissions divided by the allocated power. This rule creates the proper incentives on the margin with respect to investment in new generating facilities by California entities.

Second tier: Traceable power. A California entity's imports in excess of the allocated amount from Tier 1 shall be treated as having an emissions content equal to the share of annual emissions from facilities contributing power to the relevant power grid attributable to the production of those imports, divided by the amount of those imports. This section shall apply if and only if a reliable system for tracking the contribution of various plants to the production of imported power exists.

Third Tier: Power from pre-existing units. At the moment that the regulations are put into place a determination shall be made of the average quantity of electricity purchased from existing plants pursuant to ownership shares or long-term contracts, and of the average level of emissions from those plants times the share of their output being sold to California purchasers under those shares or contracts. Emissions intensity for this power shall be based on the ratio of these two quantities. Imports that have not had emissions allocated under the first or second tier shall be treated as having this level of emissions intensity up to the limit of the average quantity as specified above.

Fourth tier: Residual power. Remaining imports shall be treated as having an emissions content equal to the average emissions content of electricity generated in the state or power pool (emissions over generation less line losses) in the most recent year for which reliable emissions data are available. This average will be calculated after subtracting the output and emissions tracked under the higher tiers. The Secretary may issue regulations that provide a finer categorization of imported power under this subsection where there are identifiable categories of power with distinct market characteristics for which reliable emissions and power output estimates exist, subject to the requirements that (1) the emissions for the categories sum to the state emissions and the generation in the categories sum to the state generation, and (2) in the view of the Secretary, the resulting categorization more accurately reflects the variation in emissions from the exporting state properly attributable to the variation in export sales from that state.

Some have argued that the creation of a tracking system such as that described in the second tier would be a daunting task, and that we should forgo attributing emissions content to imports for this reason. However it should be observed that much of the required administrative mechanisms are already in place to assure that the correct generators are paid for the power they generate. Even if this were not true, it would be technically easy to track the relative contribution of power from various generation facilities by imposing very small "signature" variations of the power output of each plant, and then measuring the strength of various signatures at the point of import. The larger barrier is likely to be industry or governmental resistance in the exporting state. But in any event, the tracking system can operate just fine with only tiers one, three, and four until such time as the tier two tracking system is created.

Tier four's use of the state average to attribute emissions content to traded power is a fallback rule for power that cannot be attributed by the tier one and two rules. In its simplest form it can be easily calculated using published data from the U.S. Energy Information Administration.

Various refinements from this simplest approach are available. For example, we might divide imports into baseload capacity purchased under long-term contract and other purchases, where emissions content is estimated separately for baseload and non-baseload generation. Alternatively, it might be possible to identify baseload plants that would always be run regardless of export sales, and subtract their emissions and generation from the state totals in calculating a state average. Other refinements can no-doubt be developed, and considerable work along these lines has already been done by the Registry and the LBNL. See, e.g. Estimating Carbon Dioxide Emissions Factors for the California Electric Power Sector, C. Marnay, et al., Environmental Energy Technologies Division, LBNL (August 2002). However, it is important to note again that we need not wait on the development of such refinements to put the system into place. Any inaccuracies in the tier four emissions attribution will apply to only a small portion of emitted power, and will not affect decision-making about the construction of new plants. Thus the system can be implemented immediately, and then refined as time and resources permit.

Finally, we should observe that the sole purpose of this regulation is to allow California's load-bearing entities to properly measure the emissions content of the power they sell in the state. Provided that the system does not require the importer to purchase a larger number of emissions credits than would have been required if the same power were generated in the state, it does not impose any economic or legal burden that would violate the dormant Commerce Clause by discriminating against interstate commerce, and so passes the four-prong test of *Complete Auto Transit Inc. v. Brady*, 430 U.S. 274 (1977), and its progeny. (Congress has the power to regulate interstate commerce under the Commerce Clause. The courts have held that, in the absence of such regulation, the "dormant" commerce clause forbids states from placing undue or discriminatory burden on interstate commerce.)

Appendix B. Proper measurement of emissions from international and interstate air travel

The problem: Airlines are often able to choose whether to refuel their planes in California or at their previous port of call. As a result, the purchase of fuel in California is not a good measure of greenhouse gas emissions relating to California air travel, as total emissions from the flight are the same regardless of where refueling takes place. Indeed, if the effort to avoid the cap induces airplanes to load up with surplus fuel to cover the next leg of a flight, this will actually increase greenhouse emissions because of the additional fuel required to carry the increased load.

The solution: To avoid this problem, we propose that, for purposes of determining emissions under a cap, fee, or permitting system, emissions shall be measured by the plane's average emissions per mile times the number of covered miles. For flights between California ports of call, "covered miles" are defines as miles in California air space. For Interstate and international routes, "covered miles" are defined as one-half of the total distance between ports of call. Distance in every case shall be measured along the great circle routes between ports of call.

Average emissions shall initially be based on the fleet average for planes of the specified model type. The Secretary shall conduct a study to determine whether the variation in efficiency between planes of the same model type is sufficient to justify the additional administrative burden of determining plane-specific average emissions levels, or to otherwise vary the average emissions rate estimate based on age, equipment, load, or other factors, including hearings allowing a full opportunity public comment.

Background: This approach to measuring the emissions from air transport is similar to, and based on, the approach used by the International Fuel Tax Agreement (IFTA) to allocate fuel consumption from heavy trucks by state. IFTA was mandated by Congress in 1991 to assure that of motor fuel use taxation laws with respect to motor carrier vehicles that operate across state lines are uniformly administered. All the states, with the exception of Alaska and Hawaii, participate in the IFTA.

Under the agreement, states are able to act cooperatively in the administration and collection of motor fuel use taxes. This essentially allows motor freight carriers to base their operations in one state and report their taxable activities on one fuel tax report in that state, rather than file separate reports in each state in which they operate. Fuel tax collections are allocated to states proportionally to miles traveled in each state times their respective tax rates.

Appendix C. Administrability of a consumption-based system on emissions-intensive products

Non-fuel industries that might require consumption-based treatment are aluminum, cement (especially if non-fossil emissions are included), liquefied gasses, electroplating, chlor-alkali, nitrogenous fertilizer, asphaltic blocks and tile, and a few bulk industrial chemical like ethylene.

We suggest that other industries be allowed to apply for consumption-based treatment if the cost of permits associated with the energy they consume, less, first, the estimated value of industry-average net policy-induced efficiency savings and, second, the value of benefits to that industry of tax breaks or other services financed through the credit, exceed 1% of sales value. Note that estimated emissions and savings by industry are likely to be calculated as part of the state's planning process once mandatory firm-level emissions accounting is in place.

Consumption-based treatment for non-energy industries, should it prove necessary, could be implemented as follows: In-state producers would attribute a share of their actual emissions to exports based on the firms out-of-state sales as a share of total sales. Note that for companies with operations in more than one state, this number is already calculated in order to allocate corporate income across states, and the rules and procedures for doing so are well-established, well-known, and adequately audited. For out-of-state producers emissions content could be imputed an a per-dollar or per-physical unit basis based on national industry averages. Importers would be required to purchase permits based on the imputed value. In order to survive commerce clause challenges by out-of-state producers with emissions rates below the national average, a procedure should be established by which they could demonstrate their lower emissions rate, which should then be used for imputation for imports that firm.

Appendix D. Consumption-based accounting under auction does not violate the federal Commerce Clause or GATT/WTO trade rules.

When permits are allocated by auction, load-based accounting for electric emissions, and similar consumption-based accounting for other energy-intensive products, is allowed under the interstate commerce clause of the U.S. Constitution, nor is it barred by trade rules under the GATT/WTO.

The distinction between a load-based and a generation-based permitting system is closely analogous to the distinction between a production and a consumption base for excise taxes. In the later context the issue has been thoroughly litigated and thoroughly analyzed, primarily under the four-prong test of *Complete Auto Transit v. Brady*, 430 U.S. 274 (1977), and its progeny: that an economic instrument imposing a charge will be sustained "when the tax is applied to an activity with a substantial nexus with the taxing State, is fairly apportioned, does not discriminate against interstate commerce, and is fairly related to the services provided by the State." Compete Auto does impose one substantive constraint on the design of a permitting system: that it may not, if applied by both of two adjacent states, impose a

heavier burden on interstate than on in-state commerce. This means, for example, that if you require permits for the emissions associated with electricity imports, you must then exempt exports, and visa versa. It is permissible for two states to operate two different systems in such a way that double taxation occurs. For example, if state A uses a generation-based system and state B uses a load-based system sales from A to B are covered twice and sales from B to A are not covered at all. This is permissible.

There might be a colorable argument under in Quill *Corp. v. North Dakota ex rel. Heitkamp*, 504 U.S. 298, 306-08 (1992), -- the case that held that sending mail into a state did not, alone, constitute sufficient nexus to allow taxation of the sale -- that out-of-state electric generators with no property or personnel in California do not have adequate nexus to be covered. However, such an argument is unlikely to prevail, for two reasons. First, Quill is widely regarded as an aberration, based on the court's unwillingness to override a clear precedent, but inconsistent with the bulk of recent case law. The court has really bent over backwards to find some basis for economic nexus, such as the hiring of an independent contractor in the state, 1017 Tyler Pipe Industries v. Dept. of Revenue, 483 U.S. 232, 249–251 (1987), or upholding a use tax on fuels temporarily stored in the state prior to being loaded on a plane, 1018 United Air Lines v. Mahin, 410 U.S. 623 (1973).

Second, the requirement that in-state load-bearing entities purchase credits based on the estimated emissions per kWh times the number of kWhs sold, can probably not be successfully characterized as either discriminatory or as imposing an economic burden on out-of-state generators. On its face, the legal requirement is imposed on in-state load-bearing entities, not on out-of-state generators. Economically, the costs of the permits will be born primarily by California consumers, as explained in section V.A above. Even if the out-of-state generator could establish that the regulation burdens them, it would not appear to be a heavier burden than is imposed on similar in-state generators.

The Constitutionality of a load- or consumption-based system is less clear than under grandfathering, though we believe the weight of the law still supports it. Under grandfathering one would argue as above that the system does not impose any economic burden on the out-of-state generator. However, if the generator were to somehow establish burden, the case that the system is non-discriminatory is weaker then under auction, because whatever burden is imposed on in-state generators is much more than offset by the value of the permits allocated to those generators, while out-of-state generators bet no permit allocation.

This system of border adjustments described in the text is similar to that used under the ozone-depleting chemical cap-and-trade and tax systems and under the Superfund toxic chemicals tax to impute the content of ozone-depleting chemicals and toxic chemicals, respectively, in traded goods. It has withstood challenge under GATT/WTO rules.[24]

Some question has been raised about doing border adjustments for manufacturing inputs that are not physically incorporated into the traded good, such as process energy. Although these arguments continued to be made, the weight of the law supports the view that they are allowed when they do not impose a burden on foreign goods in excess of the burden on domestic goods or constitute a disguised form of subsidy,[25] and the European Parliament has recently adopted a resolution to "adopt border

[24] GATT Panel Report United States - Taxes on Petroleum and Certain Imported Substances, L/6175, BISD 34S/136, 154 ff., adopted on 17 June 1987.

[25] Demaret, Paul and Stewardson, Raoul. "Border Tax Adjustments under GATT and EC Law and

adjustment measures on trade in order to offset any competitive producers in industrialized countries without carbon constraints might have."[26] Moreover, even if they were found to violate the terms of the GATT/WTO agreement, such measures clearly fall within the scope of the environmental exemption to the agreement under GATT Article 20.

General Implications for Environmental Taxes," *J. World Trade* 28:4, p. 5 – 65 (1994); Hoerner, J. Andrew, and Frank Muller. 1996. *Carbon Taxes for Climate Protection in a Competitive World*. Swiss Federal Office for Foreign Economic Affairs (June 1996): Hoerner, J. Andrew. Available from http://www.redefiningprogress.org/programs/sustainableeconomy/swiss.pdf; *The Role of Border Tax Adjustment in Environmental Taxation: Theory and U.S. Experience*. Working Paper. Center for a Sustainable Economy, Washington, DC. Presented at the International Workshop on Market Based Instruments and International Trade, Institute of Environmental Studies, Amsterdam, (19 March 1998). Available from http://www.rprogress.org/newprograms/sustEcon/BTA.pdf; R. Ismer & K. Neuhoff. *Border Tax Adjustments: A feasible way to address nonparticipation in Emission Trading*," Cambridge Working Papers in Economics 0409, Department of Applied Economics, University of Cambridge (2004); Frank Biermann and Rainer Brohm, 2003. *Implementing the Kyoto Protocol Without the United States: The Strategic Role of Energy Tax Adjustments at the Border*. Global Governance Working Paper No 5. Potsdam, Berlin, Oldenburg: The Global Governance Project.

[26] European Parliament Resolution on the Seminar of Governmental Experts on Climate Change, 12 May 2005, B6-0278/2005