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# Designing for structural change: modification to the California Cap and Trade Program

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# Designing for Structural Change: Modification to the California Cap and Trade Program



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This paper proposes and analyses a modification in the current criteria for calculating target emission allowances and permit price trajectories for the California Cap and Trade program. As with other Cap and Trade programs, permit prices have fallen since the initiation of the program and little evidence exists in California that electricity generation has been induced toward more sustainable technology through the program's performance. The observed trajectory of California carbon permit trading has likewise dropped, suggesting that the sharing of pollution rights as a method for reducing adjustment costs associated with technological change has remained unused. The proposed alternative aims to enhance the achievement of the over-arching goal to reduce greenhouse gas (GHG) emissions on the level of long-run technical adjustment.

The general idea of Cap and Trade programs is to reduce the rate of permissible polluting emissions in the most cost effective manner possible for the energy sector. Trading schemes such as in California are considered efficient because they are hypothesized to promote the equalization of mitigation costs across different behavioral responses and establish a uniform price on emissions across different sectors covered by the regulation, with the key assumption of fluid-enough trading in associated financial markets. In other words, permits are tradable so as to allow more efficient transition for the industry as a whole and lower cost for individual producers under the assumption of quick and complete integration of permits and their derivatives into financial capital markets.

What the emission reduction rate should be, and how it should be determined, is a legitimately contested issue. The emission reduction rate has implications for prices and profitability in the energy sector and implications for our current and future ecosystem and extended socio-economic system. All potential procedures debated incorporate specific perspectives on relative importance of each of the many goals of the program. The procedure proposed here is designed to focus on long run technological change toward a zero emission level.

California legislation (AB32) has mandated "achieving the maximum technologically feasible and cost-efficient method" reducing greenhouse gas emissions to 1990 levels by 2020[1]. Emissions are to be reduced by 2% per year through 2015 and 3% per year between 2015-2020. Regulated entities receive free emission rights equal to 90% of their historic baseline and have access to a primary permit auction for additional pollution rights up to a CARB-determined level (the Cap), accessible to all entities regulated under the program. The permits are bankable for a specific time period and are tradable. The CARB program is designed with a flexible price collar; an auction price floor and a limited quantity of higher-priced reserve permits, as well as a policy safety valve for unanticipated price hikes. The initial auction floor for standard permits was $10 with a fixed 5% annual increase adjusted by an inflation factor. The types of entities regulated increase through time, with in-state and out-of-state electricity generation, and large industrial facilities covered first. CARB aims to have 85% of California GHG emissions covered by the time full implementation of the program is effectuated. The California Air Resource Board (CARB) is currently examining in detail a number of policy proposals with respect to the cap level as well as methodologies relating to how the cap should be set (what combinations of emission allowance and price trajectories may be feasible and cost effective).

CARB calculates the allowance and price collar under the assumption that tradability of permits implies an immediate integration into financial capital markets, thereby allowing the assumption of an annual percentage rise in permit prices equivalent to a forecasted return trajectory in financial markets[2] . CARB economic impact analysis includes endogenous emissions and prices, but the *rate* of permit price increase is exogenous. Experience has not validated the assumptions underlying this exogeneity. There are a number of potential reasons for this. One reason may be that the Cap was set above what was necessary for regulated entities to meet their primary product market rate of return, perhaps due to cheap capacity to fuel switch and to lower than expected demand. Another aspect could be that while, in theory, the opportunity cost of bankable permits should equilibrate toward the financial market rate of return, this value is adjusted for risk.

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[1] *Assembly Bill 32 Overview: What Are the Specific Requirements of AB32?* webpage. Available at http://www.arb.ca.gov/cc/ab32/ab32.htm

[2] *First Updated Economic Analysis of AB 32 Scoping Plan*, p.28 . Available at http://www.arb.ca.gov/cc/scopingplan/economics-sp/economics-sp.htm

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There is no reason to believe that these risk adjustments would be a constant linear transformation of a fixed percentage increase in the financial market rate of return, and there is no reason to anticipate that the assessed expected production cost risk does not change over time. The unknowability of risk adjustment factors may well contribute to inevitably guessing wrong on permit prices and therefore on optimal emission levels.

The alternative procedure proposed in this paper changes only one aspect of the current California criteria. Emission allowances are calculated so that the value of the right to pollute, rather than being pegged to a forecasted, fixed, rate of return on financial capital, is pegged to the cost of relevant clean alternative, for example, renewable generation capacity for the case of electricity. For this case, a price floor on the auction permit price is calculated incorporating an "externality fee", setting the per unit cost of emission such that the average variable cost of electricity generation by fossil fuels by best available technology equal (or slightly higher to) average total cost of renewables. Thus higher emitters would require more emission units and therefore face higher average variable cost. A similar strategy would apply to other covered emitters. A permit unit is defined in terms of carbon dioxide equivalent. Combinations of emission allowance and price increase trajectories are then solved for. The calculation question therefore becomes: given the price of corresponding "clean" technology, what would the price on emissions be that creates a similar (slightly higher) total average long-run cost for high polluting technologies. An additional benefit of the proposed methodology is that it re-orients the policy discussion to "green" technologies defined as standard rather than fossil fuels. It accomplishes this through more strongly encouraging long-run structural change while continuing to allow short-run fluctuation necessary for efficient adjustment. The paper explores what these values would be, given the other aspects of the CARB framework.

This procedure has a number of advantages for encouraging structural change. First, it forces an additional interdependence between clean and polluting activity. For example, linking the costs of the two types of generation encourages technological advances that reduce the cost of renewables generation because, by policy, the allowable cost of fossil fuel generation would also be decreased. This provides a long run incentive to "green" technology at the same time it maintains the short-run hypothesized adjustment efficiency driver of equalizing mitigation costs and uniform emission price. Secondly, it is easier to calculate because it requires less information. It avoids the necessity to impose strong and likely imprecise assumptions about producer adjustment factors on the rate of return on capital. The cost of technology is more predictable than the finance market rate of return. Thirdly, if the permit price sets the cost of "dirty" slightly higher than "clean", this premium could be expected to translate to a willingness on the part of financial investors to pay a higher price for permits, encouraging a derivatives market and potentially deepening the secondary exchange between pollution emitters, working toward improved efficiency of the system.

Social equity concerns are an issue with any rise in energy prices, acting similarly to a regressive income tax. To the extent that a carbon permit derivative market provides profits, income inequality is also likely to be increased (higher income households hold more financial assets). In contrast, cleaner energy tends to improve health and life quality relatively more for lower income households (who are more likely to be located in high-pollution areas). The proposed procedure outlined here does not include any change to California's current earmarking of 25% of Cap and Trade revenues for disadvantaged communities.

Using CARB data and following its modeling framework as closely as possible, this study will calculate what the above proposal would imply for carbon permit prices and emission allowances. The CARB analysis calculates an energy intensity factor in an energy model, then multiplies it in an economic model by the change in gross state product to provide an estimate of the change in emissions from a change in economic growth[3]. A stronger focus on long-run structural change would also be enhanced by more detail in this specific component of the CARB analysis and would be useful to address at a later point.

[3] as noted in *Updated...* p. 20.