# WHITE PAPER on CAP AND TRADE VS CARBON TAX

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This White Paper presents the Key Elements of The California Cap and Trade Program (a hybrid emissions trading program) and its Compliance Instruments; the mechanisms to mitigate adverse effects on Disadvantaged Communities (DACs); and what co-benefits, if any, have been derived to date. It also provides a comparison to Carbon Tax Programs. This Paper is an overview of many of the credible analyses published on these topics. It is not meant to be an exhaustive discussion; nor does it get into the minute details and nuances of the programs which are better left to the experts. References used in researching this Paper are included.

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The California Cap and Trade Program ("The Program" ) is the world's first economy-wide cap on GreenHouseGases (GHGs). The Program covers ~ 85% of CA GHG emissions and most economic sectors. It is the key element of the CA emission reduction strategy. The Program is administered by the CA Air Resources Board (CARB).

**KEY ELEMENTS OF THE CA CAP AND TRADE PROGRAM**
**and The Program's Compliance Instruments**
**(Allowances and Offset Credits)**

1. **The Program creates a statewide limit for major sources of CA GHG emissions**.

a. This limit is called a "Cap". There are two main Compliance Instruments in The Program: Allowances and Offset Credits.

b. The Program issues tradable permits called "Allowances" that equal the Cap. One Allowance is equal to emitting one Metric Ton of Carbon Dioxide (MTCO2). Each year the Cap, and in turn the Allowances, decrease to achieve the intended target of emission reductions. Currently the cap decreases 3% annually through 2020.

This puts pressure on covered facilities to reduce their GHG emissions over time. However, The Compliance Instrument also provides long-term visibility to encourage investment in strategies, such as green infrastructure and technology, that will lower their emissions over the long term.

CARB allocates free Allowances annually to covered facilities. This creates several benefits: It provides transition assistance for newly covered facilities in order to keep businesses from leaving the state; and provides some protection to the end-users (rate-payers) from steep price increases. This is of particular benefit to DACs where utility costs are a higher percentage of DAC incomes than in affluent communities.

c. In addition, there are other tradable instruments called Offset Credits. An Offset Credit is equal to one MTCO2 that has been reduced from a verifiable emission reduction project in a sector outside the cap and trade program. Offset Credits are limited to 8% of a facility's compliance obligation. Therefore only a small portion of the allowances can be mitigated by offsets.

Note: Offsets may be from out-of-state projects. These offsets may not directly benefit the state of CA; or they may indirectly benefit the State if there are downwind benefits to be had; but in any case the planet is benefitted.

d. A portion of the allowances are auctioned quarterly and funds deposited in the Greenhouse Gas Reduction Fund (GGRF). These funds are available for appropriation by the legislature to further the goals of AB 32. If businesses aggressively decrease their emissions, they can sell excess allowances or offset credits to high polluters.

e. Every year each covered facility must turn in Allowances and Offset Credits for at least 30% of the previous year's emissions. At the end of the 3-year Compliance Period, covered facilities must surrender all instruments to cover their remaining emissions (100% of the final year and 70% of earlier years). One Allowance or one Offset Credit must be turned in by facilities covered by Cap and Trade regulation for every MTCO2 within the prescribed aforementioned cap.

2. **The Program establishes a Price Signal.** This is part of the Compliance Cost of The Program. There is a bottom floor price limit called the Auction Reserve Price, and a soft price ceiling called the Allowance Price Containment Reserve (APCR). The floor price was set at $10 in 2012 and increases 5% plus inflation annually. The APCR is set at three fixed-price tiers: $40, $45, and $50 starting in 2013 and increases 5% plus inflation annually.

a. A Price Signal is needed to drive long-term investment in cleaner fuels and more energy-efficient use. The Price Signal also communicates to consumers the amount of GHG emissions associated with covered entities.

b. The Auction Reserve, or floor price, assures a stable and growing market for future years; prevents Allowance auction prices from going too low; and provides an incentive for covered facilities to invest in clean energies before Allowances increase.

c. The ACPR soft ceiling price avoids drastic spikes in Allowance prices and prevents market manipulation.

Note: None of the covered entities have participated in the APCR auction since the Allowance prices have been far below the APCR levels.

d. The price-collar mechanisms anticipate and minimize possible shocks to the market and help to prevent manipulations to the Allowance prices.

Note: Bornenstein, et al developed market simulations to test out the robustness of this mechanism and suggested recommendations to reduce the risk of spikes in Allowance prices or market manipulations. So far his predictions are being born out.

3. **The Program provides covered entities the flexibility to implement the lowest cost options to decrease their emissions.**

4. **The Program complements CA existing efforts to reduce criteria and toxic air pollutants.**

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## CAP AND TRADE AUCTION PROCEEDS INVESTMENT PLAN AND FUNDING GUIDELINES CONCENTRATING ON DISADVANTAGED COMMUNITIES (DACs)

We are into the second plan period for Investments and this covers 2016-2017 and 2018-2019. There is a diversified approach:

1. Facilitate ongoing emission reductions from transportation and sustainable communities; clean energy and energy efficiency; and natural resources and waste diversion.

2. Review how the plan intersects and interacts with current state legislature policies and programs, including how investment can be incorporated into existing programs; and devise metrics to measure the benefits of the investment.

Funding Guidelines for Agencies Receiving GGRF Appropriations (two key directives):

1. Maximize benefits to DACs

a. SB 535: 25% of the proceeds provide benefits to DACs of which 10% provide benefits directly in DACs. This bill has been in place since 2012.

b. AB 1550 which modified SB 535 to include higher percentage of proceeds directly in DACs and also to low-income individuals and households statewide (presumably not living in a defined DAC but low-income nevertheless). Implementation of this bill is in transition.

2. Develop guidance on reporting and quantification methods, especially for DACs.

## CUMULATIVE BENEFITS AND IMPACTS TO DISADVANTAGED COMMUNITIES (DACs) UNDER THE CURRENT CA CAP AND TRADE PROGRAM

1. **Of the $1.2 billion in cumulative implemented funds for projects to-date, 50% of funding for projects benefited DACs, of which 34% of funding for projects were directly located within DACs.** Cumulatively, this impacted 97% of the census tracts in the DACs where projects were implemented. This exceeded the requirements of SB 535 which has been in effect. We anticipate that the DAC and low-income requirements of AB 1550 will be met.

2. **Co-Benefits:** At this time there are qualitative reporting of benefits including job creation and training especially for those in DACs. Quantification and standardization of reporting of co-benefits are underway.

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## KEY ELEMENTS OF A CARBON TAX PROGRAM

1. **A tax is levied on carbon emissions:** There is no cap or limit to emissions unless it is built into the design of the program.

2. **A Carbon Tax Program may be combined with additional design features:** The tax can increase when emissions exceed a threshold; or the tax can decrease if emissions fall below the threshold; or the tax may be combined with a Cap And Trade Program.

3. **The tax must be voted into law (which is no small undertaking).**

4. **The tax is typically revenue-neutral, but it may become regressive.**

## ADVANTAGES AND DISADVANTAGES OF CAP AND TRADE EMISSIONS TRADING VS CARBON TAX

### MAJOR ADVANTAGES OF CAP AND TRADE EMISSIONS TRADING

#### 1. Greater Certainty in Achieving Emissions Reductions

Perhaps one of the most important advantages emission trading programs hold over carbon tax systems is the ability of these programs to more or less guarantee meeting set emission reduction goals (Goulder and Schein, 2013). This is because emissions caps can be made to reflect the emissions reduction targets deemed environmentally and economically acceptable by scientists, economists and government agencies. Only a set number of allowances - equal to this explicitly defined cap - are then made available for allocation or purchase, and because emitting entities obligated to comply with the trading scheme would face large financial penalties for polluting more than their share of permits or allowances would allow, they are incentivized not to exceed the cap. In short, in these systems, emission limits are set by the cap, whereas, in carbon tax systems, emission reductions are determined by the tax rate, which may have to be tailored (perhaps continually) to achieve desired GHG reductions (Goulder and Schein, 2013). A more detailed discussion of the carbon tax rate determination can be found below, in the disadvantages subsection of the carbon tax section.

#### 2. Revenue Generated May be Used for Public and Environmental Benefit

Another benefit of cap-and-trade centers around the use of auction revenues. If an emissions trading program requires that some or all program allowances be sold to complying entities, then part or all of the revenue generated from the sale of these allowances can be used to fund projects that provide public or environmental benefits. These can include projects that increase vehicle energy efficiency and further reduce GHG emissions, address unemployment and economic inequality, and improve public health. California's cap-and-trade program is designed with this revenue reinvestment feature. Under the program, the monies generated from quarterly auctions of allowances are directed towards a Greenhouse Gas Reduction Fund (GGRF), from which they flow through different state agencies to a variety of programs and projects. As of March 2017, nearly $3.4 billion of GGRF monies had be allocated to various state agencies, and $1.4 billion of these funds had been awarded to specific projects. Examples of some of these projects include a program to provide low-income, single-family households with photovoltaic systems ($49 million awarded; an estimated 60,000 MTCO2e avoided as of March 2017); a wetland restoration project to enhance the Sacramento-San Joaquin Delta ($13.4 million awarded; an estimated 519,000 MTCO2e avoided or sequestered as of March 2017); and a clean vehicle rebate program that incentivizes California residents to purchase various light-duty vehicles i.e.electric, plug-in hybrid, and fuel cell vehicles ($334.5 million awarded; an estimated 4.9 million MTCO2 avoided as of March 2017). Many of these programs are designed to benefit minority and low-income individuals, which is keeping with state legislation that mandates that at least 25% of all GGRF monies be used to benefit communities designated by SB 535 as disadvantaged.

**3. Economic Impacts (does not appear to have an adverse economic impact though more data are needed since the program is young)**

Though the California cap-and-trade program is still relatively young, it appears that the implementation as well as the reinvestment of auction revenues in specific projects have not had an adverse economic effect. Instead, according to the little data that are available, cap-and-trade has resulted in slight net economic growth. According to a 2017 Next10 study that relied on records documenting appropriated and implemented GGRF monies, and IMPLAN modeling software to quantify economic interactions and impacts from injecting funds into a local economic region, it was found that the expected and implemented cap-and-trade revenue monies generated during the 2012 to 2015 time period and directed into the economy of the San Joaquin Valley created more than 7840 jobs (more than 3700 of these being directly created jobs), likely had a total economic activity impact of approximately $1.75 billion and generated more than $50 million in state and local tax revenue. These benefits overshadowed the adverse regional economic impacts - a loss of 428 jobs and total impact on and loss of $9.6 million in local and state tax revenue - resulting from compliance cost pass-through in the region during that same time period.

**NOTE:** The California cap-and-trade program is not the only emissions trading program to yield such results. The Regional Greenhouse Gas Initiative (RGGI), which was initiated in 2008 and established to curb GHG emissions from new and existing power plants in the US Northeast, is another example (Hibbard et al., 2015). According to a 2015 Analysis Group study examining the economic impacts of the RGGI, the implementation of the emissions trading program between 2012 and 2014 and the subsequent reinvestment of auction revenue into various projects (including community-based renewable power projects, programs aimed at assisting low-income residents with their utility payments, jobs and training programs, and projects aimed at increasing plant energy efficiency) added approximately $1.3 billion dollars to the regional economy (reinvestments offset the negative economic impact of compliance cost pass-through) (Hibbard et. al., 2015).

**MAJOR DISADVANTAGES OR CONCERNS WITH CAP AND TRADE EMISSIONS TRADING**

1. **Price Volatility - a common criticism especially with Pure Cap and Trade Programs; yet the CA Cap and Trade Program, which is a hybrid system, has "hard floor" and "soft ceiling" controls to mitigate this volatility**

Emissions limits are generally defined by sector- or economy-wide emissions caps. However, the price of an allowance is not explicitly defined but instead indirectly determined by market forces. As demand for pollution permits fluctuates over a given period of time, so then will the prices for those permits. Goulder and Schein (2013) argue that such price volatility may be detrimental to the ability of businesses to adapt and respond to climate policy. With a stable allowance price, businesses are less likely to continue polluting at a given current rate, and may find it profitable to invest in new technology that would reduce its future emissions and lower production costs. At this given stable price, the business can predict the value of the return on investment and the time until the payoff is received. However, if the allowance price unexpectedly plummets immediately after installing the new technology, the business that took this risk may be at a competitive disadvantage compared to other businesses, which did not invest in costly emission reduction technology and, as such, do not have to pass on installation costs to their consumers or otherwise bear the negative financial impact for such a decision. As a result of this price uncertainty, entities obligated to to comply with the emissions trading program may be hesitant to take on risks that they would normally undertake in situations in which allowances prices were constant.

Price volatility has been evident in several local and international emission trading systems. During phase I of the European Union (EU) ETS (the trial run phase of the program), the price of an allowance climbed rapidly from approximately 5 Euros at the onset of the program to approximately 30 Euros within the span of six months (Ellerman and Joskow, 2008). During this three-year trial period, there were also several instances in which prices plummeted by as much as 10 Euros in a single week, and by the end of phase I in December 2007, permit prices had collapsed to nearly 0 Euros per metric ton (Ellerman and Joskow, 2008). The market prices for allowances used in California's emissions trading program also exhibited similar price variability (though these changes were not as drastic as in the European trading system). Between January 2012, the onset of the cap-and-trade program, and early 2013, the price of an allowance jumped from approximately \$13 to nearly \$20, fell to approximately \$12, and then increased again to about \$16 (However, from January 2014 to September 2016, the price had more or less become stable, hovering around a value about \$13.50 per tonne) (http://calcarbondash.org/).

Price uncertainty may always be somewhat of an issue when the market is chosen as the arbiter of carbon price determination. This is because external factors, like changes in economic activity, unexpected cold spells or heat waves, and fluctuations in fuel and energy prices will always exert some influence on the price of an allowance (Hintermann, Peterson, and Rickels, 2016; Ellerman and Joskow, 2008). These uncertainties may be further compounded when an emissions trading system is first being implemented, due to uncertainties among program participants regarding the level of abatement that can be achieved and the allowances that must be acquired to meet compliance requirements (Ellerman and Joskow, 2008). However, certain measures can be taken to mitigate volatile market prices.

Banking of allowances is one strategy. Allowing emitting entities to bank their permits gives program participants opportunities to buffer themselves against unexpected price spikes (http://www.energy.ca.gov/2007publications/ARB-1000-2007-007/ARB-1000-2007-007.PDF). Allowing emitting entities to bank current compliance period allowances for use in future compliance periods may also prevent artificial price collapse when a compliance period comes to a close and unused permits remain available for purchase. It is widely believed that the lack of this feature in the first phase of the EU ETS (coupled with a growing notion that permits would be essentially worthless at the end of the compliance period) contributed to the artificial price crash observed at the end of phase I in 2007 (Schmalensee and Stavins, 2015). Prices may also be controlled by setting limits on the maximum and minimum values allowances can assume.

In CA's Cap and Trade Program, allowance price containment is achieved through the Auction Reserve Price and the Allowance Price Containment Reserve. The Auction Reserve Price is the minimum price at which an allowance may be sold at auction; setting this limit ensures that if that allowance is sold on the secondary market, it will be sold at or above that minimum price. The Allowance Price Containment Reserve controls for higher-than-normal demand by making reserve allowances available for purchase at three set prices ($40, 45, $50) whenever allowance prices unexpectedly spike (A portion of the allowances sold in a particular year are always designated for the Allowance Price Containment Reserve so that no new allowances need be created and made available for purchase if prices become too high). This provides an element of stability to the pricing mechanism.

**2. Pollution Hotspots (the data on this issue are inconclusive)**

Another criticism of cap-and-trade systems stems from the fact that with an incrementally decreasing emissions cap, emissions trading programs can indeed ensure reductions in greenhouse gas emissions from an entire sector or group of covered entities as a whole, but these programs do not mandate reductions for each and every individual emitting entity participating in the program. Reductions in greenhouse gas emissions may not be guaranteed for a given facility that may find it less costly to purchase allowances rather than install low-carbon technology. This can be problematic as pollutants detrimental to human health (criteria pollutants like NOx, SO2, CO, O3, Pb and PM2.5) tend to be co-generated during activities or industrial processes that produce GHGs (OEHHA, 2017) (Footnote: Obviously, the linearity between GHG emissions and co-pollutant emissions varies with the industrial process in question { e.g. cement manufacture vs. oil refining}, but all correlations appear to be statistically significant and at least moderate (OEHHA, 2017)). Furthermore, many polluting facilities tend to be disproportionately located in areas occupied by disadvantaged, low-income and minority residents. While examining the changes in GHG emissions from facilities under California's Cap And Trade Program, Cushing et. al (2016) found that the likelihood of an emitting facility occurring in a particular community increased with the share of low-income residents and residents of color (Figure xx). Specifically it was found that communities with no emitting facilities within 2.5 miles had a 22 percent lower share of residents of color and 21 percent lower share of residents living below two times the federal poverty line than communities that had at least one facility within that same distance. Older and larger facilities that find it more expensive to install pollution mitigating technologies than modern firms tend to also be disproportionately located in former city centers where they co-occupy space with poor and minority residents (Chinn 1999; Ringquist 2011). Because of these circumstances, critics of cap-and-trade argue that despite the intent, covered entities regarding the many minority, poor and disenfranchised individuals will inevitably bear the brunt of the public health impacts that result from the non-homogeneous facility-level emission changes (as some facilities import more allowances than other program participants)
The data on this issue are inconclusive.

**3. Administrative Cost and Ease of Administration (may be slightly more burdensome)**

A Cap And Trade Program may be slightly more burdensome than a straight tax program for government agencies because, under the program, administrators would not only be required to establish means of collecting auction revenue, but establish allowance registries and track the trading and surrender of these allowances (Goulder and Schein, 2013).

## MAJOR ADVANTAGES OF A CARBON TAX PROGRAM

**1. Price Stability (fixed price is established; nevertheless this has disadvantages)**

The legislature sets the price of carbon. (Note: A fixed price reduces the program's flexibility to respond to new information over time).

**2. Administrative Cost and Ease of Implementation (taxation is not a new program; yet implementation and sustainability of the program are subject to the political climate)**

There is reason to believe that, with regard to administrative ease, carbon taxation may provide additional benefits (on top of what cap-and-trade may provide). This is because taxation is a well understood concept, and tax revenue collection is an already established process (Hardee, 2014).

## MAJOR DISADVANTAGES OR CONCERNS WITH A CARBON TAX PROGRAM

**1. Lower Certainty in Reaching Emission Reduction Goals (emissions reductions normally not designed into the program; A fixed tax may fail to constrain GHG emission reductions during an economic upturn)**

a. Emission reduction targets are more difficult to reach under a carbon tax program than under emission trading programs. This is because carbon tax programs are generally not designed with emission caps that set defined limits on the aggregate amount of emissions that can come from a particular sector or region (Goulder and Schein, 2013). Instead, they rely on a tax rate to lower emissions. While there is broad consensus among policy makers and economists that any sort of tax on carbon would cause some reduction in GHG emissions, there is uncertainty regarding how high the fixed rate would need to be to meet a given emission reduction goal (Goulder and Schein, 2013; Marron, Toder and Austin, 2015). Much of this uncertainty arises from the fact that different studies examining the effects of carbon taxation on emissions are different in scope (federal vs state taxes; economy-wide tax vs sector-specific tax) and make contrasting assumptions regarding the growth of a particular economy (Marron, Toder, and Austin, 2015). This makes it difficult for policy makers to determine the appropriate carbon tax rates for their specific jurisdictions.

b. The positive effects of economic booms on energy demand may blunt the mitigating effects of a carbon tax, causing emissions to rise above projections and emission reduction targets to be missed.

c. Assuming the revenue goes into general state fund, there are no assurances it will be used for programs to further reduce emissions.

**2. Burdens**

A fixed tax may be too burdensome to emitting entities during periods of low economic activity.

**2. Feasibility of Implementation**

It may take many years to enact a new tax law. What happens in-between?

**3. Limited Flexibility**

Having a fixed price set for carbon limits the flexibility to respond to new information about the impacts of the program.

**4. Political Susceptibility**

As with any tax, lobbying and pressure from non-governmental entities can carve out tax loopholes for some entities covered by the tax thereby lowering the effectiveness of the tax in meeting emission reduction targets.

**NOTE: A Carbon Tax is not as simple as it sounds.** Measures for flexibility can be built in to a carbon tax program. In order to correct for modeling errors, respond to new and relevant information regarding changes in economic activity and emission projections, and increase certainty in achieving emission reduction goals, it may be necessary to design the tax to be adjustable (Doda, 2016; Murray et al, 2016). Though this undercuts one of the greatest advantages of this carbon pricing tool (price stability), several suggestions have been put forward regarding how this can be achieved without causing severe rate volatility (Murray et al, 2016). However, price stability does not necessarily have to be sacrificed in order to ensure emission reductions. For example, the tax can be designed with backup regulatory mechanisms that kick in if the tax fails to meet certain performance goals (Murray et al, 2016). Alternatively, if the performance of a tax at a given rate is suboptimal, measures can be taken to invest revenue generated from the tax in projects that mitigate GHG emissions elsewhere (such as the forestry and agriculture sectors), much like offset programs do in many emission trading systems (Murray et al, 2016).

## COMPLIANCE COST PASS-THROUGH WITH CAP AND TRADE VS CARBON TAX

One major drawback associated with the implementation of ANY carbon pricing policy has to do with compliance cost pass-through. If, under a given policy, emitting entities involved in the production of certain goods become required to pay for each unit of greenhouse gas emitted during the production of those goods, either through the purchase of pollution allowances or through the payment of an emissions tax, then the cost of complying with that policy will generally be incorporated into the production cost and passed onto consumers as an increase in the final price of that given good. However, this compliance cost pass-through can be disproportionately burdensome to low-income individuals, who already spend a greater share of their incomes on energy-intensive goods like electricity and fuel than more wealthy residents

(Marron and Morris, 2016) (According to a recent ACEEE report, the energy burden of low-income US residents is nearly two and one half times that of high-income individuals, who spend only 2.3% of their total income on energy needs (Drehobl and Ross, 2016). The energy burden of the very poor is even higher, with up to 20% of total income devoted to utility payments (Hernandez and Bird, 2010).

Measures can be taken to mitigate these effects. Emissions trading systems, for example, can be designed so that a portion of the revenues generated from the sale of allowances at auction go back to low-income residents as a form of "climate credits" in order to assist them with their rising utility bills. CA Cap And Trade Program utilizes this concept to protect the ratepayers of investor-owned electric utility companies. As a result, the penalty for emitting carbon is maintained, but consumers are buffered against the resulting high prices of the carbon pricing policy. Evidence suggests that this policy feature not only protects low-income California residents from high electricity prices but there is a net economic benefit to them. According to a 2016 UCLA study, the net economic benefits to representative households in three communities identified by SB535 as disadvantaged (Oakland, San Bernardino, and Traver) during the 2016 to 2020 time period may be between $215 and $246 dollars (Gattaciecca, Callahan and DeShazo, 2016). Similarly, the revenue generated from a carbon tax can be used in part to relieve the financial burden placed disproportionately on the poorest in society, by funding, for example, home weatherization programs and programs that assist low-income residents with their electricity bills. Alternatively, the tax can be made to be revenue neutral, and all newly generated revenue can be recycled back to residents and businesses in the form of various tax cuts. Under this scenario, government expenditure does not increase (Murray and Rivers, 2015).

This is the path that British Columbia took in July 2008, when it implemented a carbon tax on 70-75% of all GHG emissions in the province (Murray and RIvers, 2015). This tax, which initially started at C$10/ton carbon and increased annually by C$5/ton until a rate peak of C$12/ton in 2012, was countered by tax cuts elsewhere, including business tax cuts, personal income tax cuts, and direct grants to rural, low-income residents (Murray and Rivers, 2015). Analyses of the effect of the tax shift indicate that in the first year of implementation, it was modestly progressive, and slightly financially beneficial to low-income individuals (Murray and Rivers, 2015). However, as the rate rose and plateaued over time, a greater share of the tax cuts went to reducing corporate income tax, and the tax became slightly regressive (Murray and Rivers, 2015).

## COMMAND AND CONTROL POLICIES
**(Technology Mandates and Performance Standards)**
**VS**
## EMISSIONS PRICING PROGRAMS
**(Cap and Trade Programs and Carbon Tax)**

Compared to Command And Control Policies, the Emissions Pricing Programs ( i.e. Carbon Tax and Cap And Trade Programs) tend to be be superior in terms of administrative ease, generally requiring fewer administrative funds and resources to implement than traditional regulatory measures for pollution control. This is largely due to the contrasting roles governmental agencies play in the different approaches (Napolitano et. al., 2007). Command And Control Policies may require certain state or federal agencies to thoroughly review, approve, and oversee the installation of specific pollution mitigating technologies and track emission changes over time. Under an emissions pricing policy, the roles of those same agencies center mainly around setting emission reduction goals and monitoring GHG emissions, which transfers the burden of developing and implementing pollution mitigating strategies onto the emitting entities (Napolitano et. al., 2007).

## TAKE-AWAYS FROM THIS REVIEW

The critical review of Goulder and Schein (2013) sums it up in that the attraction of exogenous emissions pricing (a "hybrid" cap and trade vs carbon tax), in theory, is the potential to lower emissions at a lower cost than command and control mechanisms. This pricing system encourages emitters to alter their processes to reduce emissions. Economists seem to agree on the advantages of emissions pricing; however, most of the debate is about which program (a "hybrid" cap and trade vs carbon tax) is best. Goulder and Schein's critical review determined that both emissions pricing programs discussed in this White Paper, if properly designed, can achieve a fair distribution of the policy burden between emitters and consumers, maintain competitiveness on the international level, and avoid the problems associated with verification of offsets. On the other hand, there may be advantages for one program over another along other dimensions such as administrative cost and ease of implementation, uncertainties about damages form emissions and costs of abatement, price volatility, and several other complex issues. The key is that the design of the emissions pricing program may be as important as the choice between the two programs! The key attractions are to prevent emissions price volatility; minimize expected policy errors in the face of uncertainties about benefits and costs; avoid problematic interactions with other climate policies; and avoid large wealth transfers to oil exporting countries.

It is important to realize that a "hybrid cap and trade" like the CA Cap and Trade Program, and a Carbon Tax Program are two ways to accomplish exogenous emissions pricing. Neither one is a panacea. By knowing how The CA Cap and Trade Program works, and reviewing the multiple studies, analyses, and modeling of the data to date even for a young program, the results are promising and there are positive impacts being made without compromising the economy. As with any type of program, there are improvements that can be made to further enhance the Program and make it more robust. It is important, however, to take a systems approach. Changing one variable may have unintended consequences, especially for DACs and low-income communities. A modeling approach would help assess the positive and negative consequences resulting from a change in one or more variables, and also what magnitude of change provides the best possible outcome. Let's be smart rather than aggressive with changes. Also, appropriate metrics to evaluate co-benefits such as the impact of our approach to emissions reductions on public health must be in place for analyses. We will be following new developments and analyses and adding to this Paper annually.

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