

2019 ANNUAL REPORT OF THE INDEPENDENT EMISSIONS MARKET ADVISORY COMMITTEE

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Chapter 1: Introduction

Dallas Burtraw and Ann Carlson

California's suite of climate policies have contributed to the state achieving its 2020 emissions goal four years ahead of schedule. About 76 percent of emissions in the state come from sources that are covered by the cap-and-trade program, making it one of only two jurisdictions in the world (along with the Canadian province of Quebec) that apply economy-wide carbon pricing. As California has begun to achieve important reductions in its emissions, it has begun a transformation of its energy sector that positions the state to continue to lead in the global economy while demonstrating that a transition to clean energy need not impede economic growth. Amidst the state's rich portfolio of climate and energy-related policies, cap-and-trade improves the cost-effectiveness of state policies and has been identified as a significant component of the state's post-2020 policy portfolio. To achieve increasingly ambitious emissions reductions goals going forward, the cap-and-trade program can be expected to take on an increasingly influential role post-2020. At the same time, it will become increasingly important to anticipate the interaction between carbon pricing and other regulatory initiatives that aim to achieve specific outcomes.

In 2017, the California Legislature and Governor Edmund G. Brown, Jr. directed the development of the Independent Emissions Market Advisory Committee (IEMAC or Committee) through the passage of Assembly Bill (AB) 398. The provisions specific to the Committee are set forth in the Health and Safety Code, Section 38591.2. The statute established the IEMAC within the California Environmental Protection Agency (CalEPA) through January 1, 2031. IEMAC members include at least five experts on emissions trading market and policy design appointed by the Governor (three members), the Senate Committee on Rules (one member), and the Speaker of the Assembly (one member). Membership also includes a representative from the Legislative Analyst's Office. One member of the committee, a gubernatorial appointee, resigned several months ago, leaving the committee with four appointed members and a representative from the Legislative Analyst's Office.

Committee members must all possess academic, nonprofit, or other relevant backgrounds and lack financial conflicts of interest with entities subject to the cap-and-trade regulations adopted by the California Air Resources Board (CARB). The statute requires at least one annual public meeting and a report to both CARB and the Joint Legislative Committee on Climate Change Policies on the environmental and economic performance of the cap-and-trade regulation and other relevant climate policies.¹

¹ The statute also requires CARB to consult with the IEMAC and report to the Legislature in the event of specified cap-and-trade auction outcomes.

Summary of the Committee Research and Recommendations

The role of the IEMAC as outlined by AB 398 is to report annually on the environmental and economic performance of the state's carbon pricing regulation and other relevant climate policies. Against the overall backdrop of the strong success of the cap-and-trade program, the committee has identified five discrete issue areas to draw to the attention of regulatory agencies and the Legislature. We accompany the identification of these issues with suggestions for possible direction in the further development of regulatory policy. The committee believes that addressing these issues presents opportunities to strengthen the carbon market and the way it interacts with the state's overall climate policy portfolio.

This report presents five topical reviews, conducted in subcommittees consisting of two Committee members and ratified by the whole committee, of issue areas that affect the performance of California's cap-and-trade program and other relevant climate policies. The reviews cover affordability, overlapping policies, banking metrics, potential approaches to adjusting the supply of compliance instruments, and the transportation sector. With the resignation of one committee member, the transportation subcommittee had only one member, though again all committee members read and ratified each review.

Program Design

We begin by reiterating three important principles that the committee identified in its first report in 2018. First, it is crucial that decarbonization of the state's economy not interfere with California's economic growth and that the state continue the trend of decoupling greenhouse gas (GHG) emissions from economic activity. Ensuring that our climate policies are as cost-effective as possible (consistent with other goals) is important to achieving this outcome. Second, the programs the state has adopted to reduce our GHG emissions – both legislatively and administratively – must be administered in ways that maximize benefits to all Californians, particularly those in disadvantaged and vulnerable communities. And third, the state's programs to reduce emissions must be designed to maximize environmental integrity – to produce real, verifiable emissions reductions that help reduce overall global emissions. As the state's emissions targets ratchet down and the state aims to achieve carbon neutrality by 2045,² achieving cost-effective reductions that have environmental integrity and produce benefits to all Californians will become tougher. Our aim in this report is to evaluate areas of carbon market design, and recommend potential improvements, with these background principles in mind.

² Executive Order B-55-18 on Carbon Neutrality

Our subcommittee reports are worth reading in their entirety but below we summarize key recommendations offered by the Committee. We appreciate that tradeoffs must be made in assigning scarce resources within California's regulatory agencies. In this light, in selecting the five topics for our focus we identify priorities that we believe are consistent with our three principles above.

IEMAC Summary Recommendations

Affordability

As the stringency of California's climate policies increase, concerns about the affordability of those policies are likely to be of even greater concern. The IEMAC has two recommendations about affordability:

- Policy makers should be wary of recovering escalating costs of climate change mitigation and adaptation in electricity rates. Moving costs that are unrelated to the going-forward expenses of supplying electricity to a broader base could offer the opportunity to better address affordability concerns and help support efficient transitions away from petroleum and natural gas.
- CARB and the Legislature should use special care in enacting and keeping in place complementary policies -- policies that target the same emissions from the same regulated parties -- by analyzing and demonstrating that there is real value added by the policy that (a) would not be achieved through sole reliance on the cap-and-trade market, and (b) could plausibly justify the additional cost.

Overlapping Policies

The cap-and-trade program affects emissions sources that are covered by other incentive-based policies such as the renewable portfolio standard, that are participating in regional electricity markets, and that are subject to other direct regulations. These overlapping markets and regulations can influence the effectiveness of these policies and the emissions outcome on a regional basis. The IEMAC recommends actions that can help inform tradeoffs and lead to resolution of potential conflicts.

- CARB should publicly report data on the total renewable electricity imports as collected under its Mandatory Reporting Regulation.
- CARB should report as many subcategories of renewable energy types (e.g. wind, hydro) and geographies of origins (e.g. states or northwest vs. southwest) as is practicable to do without compromising confidential company information. The data structure for reporting should be designed, if reasonably feasible, to facilitate comparison with the California Energy Commission's Total System Electric Generation reporting.
- CARB should share available data on the RECs that were retired or "bundled" with California imports.

- CARB should work to facilitate a regional dialog among states and stakeholders to make sure GHG accounting and associated policy incentives are efficiently coordinated across all overlapping electricity markets.

Banking Metrics

Banking metrics are important to allow analysis of the supply of compliance instruments in the market. The IEMAC recommends that:

- CARB should identify its preferred method for calculating the number of unused compliance instruments at the end of the Third Compliance Period (2018-20) well in advance of reporting results. We recommend that CARB retain the approach used in its April 22, 2019 letter reporting WCI-wide unused allowance and offset holdings at the end of Second Compliance Period (2015-17).
- Consistent with the IEMAC's 2018 recommendations, CARB should develop annual banking metrics to measure allowance and offset holdings in private, government holding, and government reserve accounts. CARB should adopt the metric described in this report or develop another one that satisfies the principles articulated in Table 1 of Chapter 4.

Potential Approaches to Adjusting Allowance Supply

It is possible that the supply of compliance instruments under the cap-and-trade program, including allowances and offsets, may make it difficult to achieve the state's 2030 emissions goals. In anticipation of that possibility:

- CARB should develop rule-based approaches for adjustments to supply on an automatic basis that can be anticipated by market participants.
- Any new rule-based mechanisms to adjust the supply of compliance instruments, changes to existing rule-based mechanisms, or administrative decisions to adjust supplies, should be announced in advance of implementation to the extent possible in order to enable regulated entities to adjust their compliance activities.
- CARB should consider a vintage differentiation of allowances to adjust their compliance value (tons/allowance) before and after program reform to avoid unintended changes in the value of banked allowances.

Transportation Sector

Unlike the electricity sector, transportation emissions are increasing. Moreover, the state's Clean Car Program and its policies to reduce Vehicle Miles Travelled (VMT) may not deliver the emissions reductions necessary to achieve the state's long-term climate

goals. IEMAC recommends additional research to evaluate policies to increase reductions in the transportation sector:

- CalEPA should prioritize projects focused on accelerating the turnover of the existing vehicle fleet.
- CalEPA should place a priority on identifying at what price the cap-and-trade program can produce additional large reductions in GHGs should transportation emissions fall less than anticipated in the Scoping Plan; alternatives to Clean Car Standards for increasing Zero Emission Vehicle (ZEV) penetration without running afoul of federal preemption policies; alternative methods for reducing VMT, including evaluating the feasibility and effectiveness of congestion and roadway pricing; incentives or mandates for ridesharing and autonomous vehicle companies to purchase electric or other ZEV vehicles; and additional investments in public transportation.
- CARB should evaluate and recommend backup policies in the transportation sector in case the state cannot achieve the emissions reductions specified in the Scoping Plan from the Clean Car rules and from VMT policies.
- CARB should take special care to ensure that any additional transportation policies add real value above what reliance on the cap-and-trade program might achieve and maximize the affordability of its policies, especially for low-income communities.

Process

For the first time, the IEMAC had a full year to deliberate and develop recommendations in an open process. The committee held two public in-person meetings, and two public virtual meetings via webinar, which provided a very low barrier to participation. We were able to engage with the public, stakeholders, regulators and the legislature, and take their feedback into consideration as we developed the committee's recommendations.

We appreciate the hard work and dedication of the CalEPA Secretary's office and CARB, under the leadership and direction of the Executive Officer, the CARB Board and its Chair. Their work, along with many other state agencies implementing climate policy, has produced emissions reductions that have met the 2020 GHG emissions cap four years early at the same time that California has led the country in economic growth. We intend our recommendations to assist the Board in the next phase of program development and implementation as we work collectively to ensure that California meets its ambitious climate goals with environmental integrity, with environmental justice, and in a way that continues to contribute to California's economic health.

Chapter 2: Affordability

Ann Carlson and Meredith Fowlie

Introduction

As California's climate ambition increases, the costs of achieving our GHG mitigation goals are expected to rise. This brings concerns about affordability to the fore. Affordability is a concern that spans a broad range of consumer expenditure categories in California – electricity, transportation, housing, and more. Given time constraints and the complexity of these issues, we have focused on two areas in our recommendations, high electricity prices and overlapping (sometimes called “complementary” or “companion”) climate policies.

Electricity Prices

High electricity prices pose two formidable challenges for the state's ambitious climate change policies:

- First, with increasing amounts of renewable electricity, the electrification of transportation and buildings could offer the most cost-effective path to deep decarbonization. However, high electricity prices could also slow transitions away from gasoline, diesel and natural gas if the cost to power electrical alternatives becomes prohibitive.
- Second, the palatability and durability of climate change policy depends in part on how the cost burdens of reducing greenhouse gases are shared among households and firms. If the costs result in higher electricity prices, this could impose a large economic burden on low-income households at a time of high and increasing levels of economic inequality, and undermine political support for California's climate program.

In light of these challenges, we recommend:

- **Policy makers should be wary of recovering escalating costs of climate change mitigation and adaptation in electricity rates. For example, if the cost of wildfire damages and mitigation is entirely borne by electricity ratepayers, electricity rates will rise at the same time that other policies – e.g., storage mandates, integrating higher and higher levels of renewable resources onto the grid -- may increase rates. Burdening electricity prices with costs that are not going-forward expenses of supplying electricity is a form of taxation. It is essentially a sales tax on electricity consumption that discourages efficient substitution from other energy sources to electricity and, if poorly designed, disproportionately affects low-income households. Moving costs that are unrelated to the going-forward expenses of supplying electricity**

to a broader base could offer the opportunity to better address affordability concerns and help support efficient transitions away from petroleum and natural gas.

Complementary Policies

California has several policies that overlap, or “complement,” one another in that these policies target the same emissions from the same regulated parties. The most obvious of these is a suite of policies that prescribe how particular emissions reductions must be made even when those emissions are also covered by the cap-and-trade program. For example, electricity sector emissions are subject to the state’s cap-and-trade program but utilities must also comply with the state’s Renewable Portfolio Standard (RPS), a program that requires the state’s utilities to procure an increasing percentage of their energy from renewable sources, 60 percent by 2030. As a result, many of the emissions reductions utilities must make under the cap-and-trade program will be accomplished through the RPS. Other complementary policies include the Clean Car standards and the Low Carbon Fuel Standard, among others.

There can be good reasons to enact complementary policies. For example, if more than one market failure is slowing the adoption of socially cost-effective investments in GHG mitigation, a combination of policy incentives could be required to achieve an efficient outcome. However, complementary policies can also interfere with the working of the cap-and-trade market, increasing the cost of delivering the level of abatement required by the cap. There can be tension, then, between using complementary policies that increase the cost per ton of carbon dioxide equivalent reduced and using cap-and-trade to seek out the cheapest reductions. In light of mounting concerns about affordability, these tensions should be carefully and explicitly addressed.

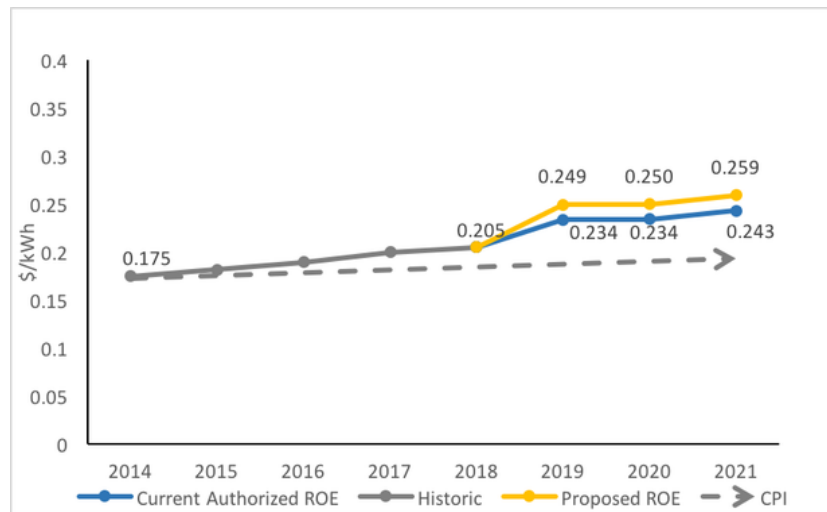
We recommend that:

- **CARB and the Legislature should use special care in enacting and keeping in place complementary policies by analyzing and demonstrating that there is real value added by the policy that (a) would not be achieved through reliance on the cap-and-trade market, and (b) could plausibly justify the additional cost.**

Background in Support of Recommendations Addressing Affordability

High Electricity Prices

Retail electricity prices in California have been rising faster than inflation since 2012. The graph below shows historical and projected average rates for California's largest utility (PG&E).



Residential Average Rate Forecast with Pending PG&E Requests
Credit: Public Advocates Office and Steven Weissman

California's exceptionally high electricity prices are not due to increasing renewable energy costs, but rather due to the state's use of retail electricity rates to pay for a wide variety of activities, ranging from energy efficiency programs to wildfire risk mitigation.

These retail electricity prices are too high by any measure. California has the highest retail electricity prices in the continental U.S. Borenstein and Bushnell (2019) compare California's retail electricity prices in 2014-2016 against the social marginal cost (i.e. fuel costs + pollution damages + climate impacts). California's average retail prices over this period were more than twice as high as the social cost per kWh. Retail electricity prices have increased by more than 25% since 2016.

These price increases have captured the attention of lawmakers. There is an ongoing affordability proceeding at the California Public Utilities Commission (CPUC). It aims to develop a framework and principles to identify and define affordability criteria for all utility services under CPUC jurisdiction; and develop the methodologies, data sources, and processes necessary to comprehensively assess the impacts on affordability of individual CPUC proceedings and utility rate requests.

Current proceedings seem to presume that compliance costs will be recovered in energy prices, so the question becomes how to use energy rate design in combination with redistributive policies to cover costs subject to affordability constraints however we choose to define them. Which customers bear these costs? And how do rate structures change to achieve this cost recovery? But taking a step back, one begins to question why cost recovery has to happen via higher energy prices. As climate change mitigation and adaptation costs escalate, it becomes more important to explore ways to break down the barriers between sectors and regulatory agencies in order to maintain affordability in the large.

Complementary policies

If the central premise behind cap-and-trade is to allow market mechanisms to work in as unfettered a manner as possible in order to find the most cost-effective emissions reductions, complementary policies that designate in advance which emissions should occur will interfere with that premise. Though complementary policies, if well structured, can and will lead to reductions in carbon emissions, the point of cap-and-trade is to rely on market forces to find the cheapest emissions reductions without undue governmental interference. If the government enacts a cap- and-trade scheme—but independently regulates through complementary policies a significant percentage of the emissions that would otherwise be subject to cap-and-trade—the opportunities for reductions of emissions covered by cap-and-trade will be reduced. Moreover, the emissions reductions occurring because of complementary policies may be more expensive than reductions a cap-and-trade scheme would produce independently. The point of cap-and-trade is to find the cheapest cost reductions, and those may be different reductions than the ones required by complementary policies.

There may be good reasons for complementary policies. There is evidence, for example, that market barriers may exist that prevent the cost-effective implementation of energy efficiency programs. One common example is a principal-agent problem in rental properties. If the landlord owns the building and rents out the property, the landlord may lack the incentive to invest in energy efficient appliances like air conditioners and heaters because, assuming the tenant pays for utilities, the cost savings will accrue to the tenant, not the landlord. A policy that mandates energy efficient appliances can overcome this market barrier even when a price on carbon may not. Complementary policies might also be warranted when they produce co-benefits, like air pollution reduction, that might not otherwise be captured in an allowance price under a cap-and-trade program designed to reduce carbon pollution. To put it in the words of California’s Legislative Analyst, complementary policies should be used when “they are achieving benefits that carbon pricing [cap-and-trade] is not.”

There is a large risk, however, that if complementary policies overlap with cap-and-trade and do not achieve sufficient additional benefits (over and above what the cap-and-trade program would deliver), then they add to the cost of reducing carbon without providing offsetting gain. Our recommendation to use due diligence in assessing the

efficacy of complementary policies is based on this concern. And more specifically, our recommendation is to require explicit consideration of how complementary policies might affect costs and benefits.

We recognize, however, that evaluating the relative costs of carbon reductions via a complementary policy as opposed to cap-and-trade can be difficult, in part because it is difficult to know what alternative compliance path an emitter might utilize in the absence of a complementary policy. Put a different way, allowance prices in the cap-and-trade market are currently lower than they would be in the absence of complementary policies. If complementary policies were repealed, allowance prices would rise, making the evaluation of the costs of a pure cap-and-trade program compared with the existing system of overlapping policies tricky. Nevertheless, we think it important that policymakers have good reasons to adopt or maintain complementary policies and understand that the policies may result in higher costs that could in the long run undermine political support for the state's climate policies.

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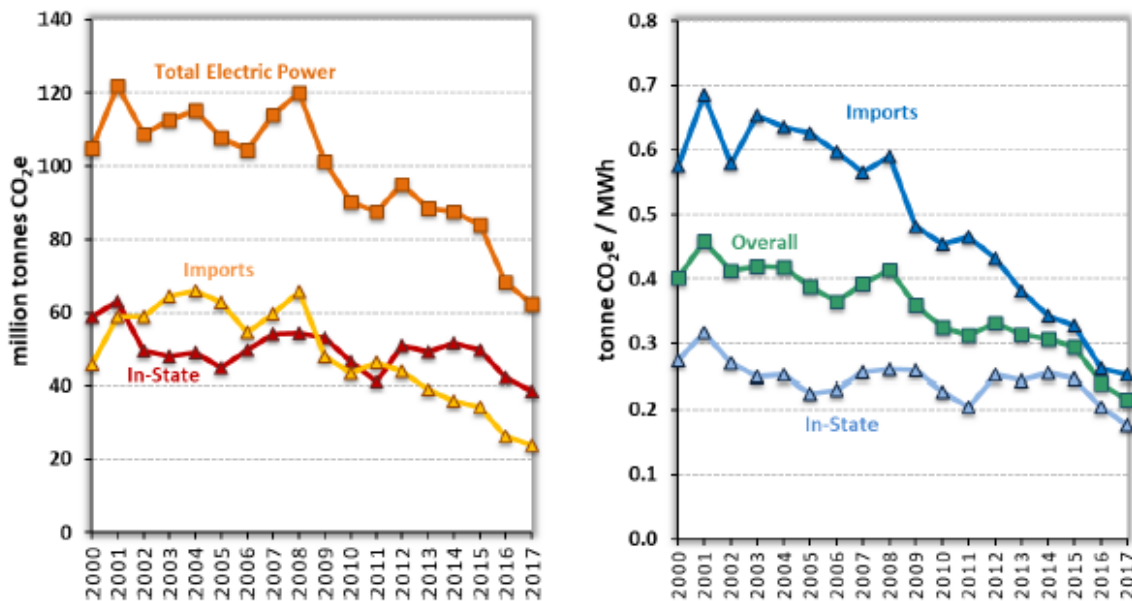
Chapter 3: Overlapping Markets and Policy Interactions

Meredith Fowlie and Danny Cullenward

Introduction

The electricity sector is responsible for a significant share of the net reductions in statewide GHG emissions achieved since the passage of the state's 2006 climate law, AB 32. In particular, a large share of these reductions has come from reductions in the reported carbon intensity of electricity imports (see Figure 1). As the role of clean electricity imports grows, so too does the importance of understanding how California's cap-and-trade program is impacting electricity markets and GHG emissions in neighboring states.

Figure 1: Electricity sector greenhouse gas emissions (source: CARB 2019)



NOTES: The figure on the left shows trends in the GHG emissions associated with electricity consumption in California (measured in MMTCO₂e) over the period 2000-2017. The figure shows how total GHG emissions have fallen significantly since 2008, with much of this decrease driven by a reduction in emissions associated with imports. The figure on the right tells a similar story, but in terms of carbon intensity (measured in tonnes of CO₂e per MWh). In 2017, carbon intensity of electricity consumption in California is approximately half of what it was in 2006-2007. Most of this reduction comes from a reduction in the emissions intensity of California's electricity imports.

Environmental policy efforts are not coordinated across western states. In an electricity context, many state-level GHG policies apply to only a subset of sources operating, serving increasingly integrated markets. To the extent that emissions reductions reported in California cause resource shuffling of low- and high-emitting resources within neighboring states, emissions may “leak” and reduce the environmental benefits of California policies. A related challenge is that rules and accounting protocols designed to mitigate emissions leakage in one part of the integrated western electricity market can affect outcomes—and potentially undermine efficiency—in other parts of the market.

This report highlights two closely related topics that fall under the broader theme of overlapping markets and climate change policy interactions. The first considers interactions between California’s GHG emissions trading program and other energy policies or GHG programs in neighboring states (such as RPS). The second concerns GHG accounting practices that can be misaligned when state-level GHG policies overlap in an electricity market context.

Policy Interactions

There are mounting concerns about how low- or zero-carbon renewable energy imports are tracked and managed in California’s cap-and-trade program. Currently, CARB does not require the Renewable Energy Certificates (RECs) associated with imported renewable electricity to be retired in order to claim that the imported electricity is a low- or zero-carbon import for the purposes of assigning emissions liabilities in the cap-and-trade program. Some stakeholders have argued that this policy decision creates the possibility for “double-counting” of emission reductions because the RECs associated with electricity delivered to California could be used for compliance with load-based policies in neighboring states (such as RPS or compliance with Washington’s Clean Energy Transition Act).

At the heart of this issue lie potential inconsistencies in how policymakers in California and across the west implement climate change policies designed to reduce the carbon intensity of electricity generation. California tracks tons of GHGs in order to assess compliance with its cap-and-trade program. Under RPS, renewable energy producers generate electrical energy (MWh) and RECs (one REC per MWh). In contrast with the cap-and-trade program, RPS compliance is measured in terms of RECs. If a neighboring state associates a REC with a low- or zero-carbon resource when California also counts the low- or zero-carbon resource with the associated energy delivery, there is the potential to “count” (albeit using different metrics) the same low- or zero-emissions attribute twice.

We recognize that this is a complicated issue that involves multiple states and even multiple agencies within California. The CEC, for example, tracks electricity imports in its Total System Electric Generation reports (CEC, 2019a). The CEC is also proposing to update its Power Source Disclosure program this year to address, among other matters, complexities related to using RECs to account for the GHG emissions associated with certain “firmed-and-shaped” renewable energy transactions (CEC, 2019b). These transactions illustrate the challenge of GHG emissions accounting across the western grid because they involve renewable energy that is contracted for sale to California, but which is consumed elsewhere instead. The associated RECs are packaged with substitute power deliveries to California from other power generators and are eligible for RPS compliance (CPUC, 2012: 44-52; see California Public Utilities Code § 399.16(b)(2)). For the purposes of the Power Source Disclosure Program, the CEC is now proposing that load-serving entities report the GHG emissions associated with substitute power for all new firmed-and-shaped contracts, rather than relying on the REC to establish the GHG emissions profile of the integrated transaction.

The potential emissions implications of double counting are very difficult to assess in the absence of good data on renewable energy imports. We requested data from CARB on the electricity imports it tracks for the purposes of its cap-and-trade program’s Mandatory Reporting Regulation, but CARB did not provide this information. We appreciate that there may be reasons why CARB and CEC programs identify different quantities of electricity imports, potentially owing to the differences in their policy purposes and regulatory authorities, but it would be helpful to be able to compare this information on an ongoing basis.

Recommendation 1:

- **CARB should publicly report data on the total renewable electricity imports as collected under its Mandatory Reporting Regulation. CARB should report as many subcategories of renewable energy types (e.g. wind, hydro) and geographies of origins (e.g. states or northwest vs. southwest) as is practicable to do without compromising confidential company information. The data structure for reporting should be designed, if reasonably feasible, to facilitate comparison with the CEC’s Total System Electric Generation reporting. We also request that CARB share available data on the RECs that were retired or “bundled” with California imports. REC reporting is required under the Mandatory Reporting Regulation, so presumably some information about the share of renewable energy imports that are/are not bundled with RECs should be available.**

Greenhouse Gas Emissions Accounting

GHG accounting practices in California Independent System Operator’s Western Energy Imbalance Market (CAISO EIM or EIM) have been designed to address

concerns about resource shuffling and GHG emissions leakage *in this EIM market*. These practices correct—to some extent, and with potential imperfections—any double counting that may be happening as a result of overlaps between California’s GHG market and RPS policies in neighboring states. In contrast, it is our understanding that GHG accounting practices in the current CAISO real-time and day-ahead markets or bilateral transactions market do not impose analogous requirements. This has the potential to discourage participation in the EIM vis-a-vis other market alternatives.

In the EIM, out-of-state power plants that wish to sell electricity to California must include in their bids a facility-specific GHG bid adder (\$/MWh) that reflects the anticipated costs of complying with the cap-and-trade program, based on facility-specific GHG emission factors. Because the market optimization algorithm will select the lowest-cost options, it may preferentially select low-emitting resources for dispatch to California including renewable energy imports. This has led to concerns about “secondary” dispatch of higher-emitting resources to serve load outside of California—a form of GHG emissions leakage.

CARB, CAISO, and stakeholders have debated this issue and ultimately reached a compromise position (as summarized in IEMAC, 2018: 33-35). The details of how these liabilities are assigned and managed are complicated, but in essence, the emissions associated with secondary dispatch in the EIM are estimated as the difference between the unspecified emissions rate (0.428 tCO₂e/MWh) applied to California imports and the out-of-state emissions associated with CAISO imports identified in the EIM market. EIM purchasers are ultimately responsible for surrendering compliance instruments to CARB to cover these secondary emissions.

The EIM is currently a small market, capturing only a small share (2-5%) of total western electricity transactions. Its primary function is to help balance supply and demand on the margin across western markets, a goal that helps facilitate increased renewable energy deployment. If remedies designed to reduce GHG emissions leakage also discourage participation in the EIM, this could undermine the efficiency with which the electricity market can respond to variable supply conditions and efficiently coordinate renewable energy integration across the west. Both aspects need to be carefully considered because they affect one another; focusing on one to the exclusion of the other may miss important opportunities to increase environmental and economic benefits in tandem.

Last year we recommended that CARB consider updating the default emissions factor for unspecified power, which has not yet happened. We also encouraged CARB to consider how leakage-mitigation approaches developed for the CAISO EIM might unintentionally encourage electricity market participants to avoid organized markets like the EIM in favor of bilateral transactions, which do not require any leakage-mitigation

measures. We believe that the potential for these unintended consequences remains relevant and needs to be considered by policymakers going forward.

Meanwhile, policymakers are exploring opportunities to increase efficiency and renewable integration in the western U.S. More specifically, there are efforts to build on the existing EIM real-time trading platform to include an Extended Day-Ahead Market (EDAM). If this expansion happens, the current approach to accounting for secondary GHG emissions in the EIM will need to be modified substantively. New accounting approaches will need to be devised. Affected jurisdictions may address these challenges on their own terms, and absent a regional effort, the solutions that emerge may contradict—instead of complement—each other.

Recommendation 2:

- **Given the role that the current real-time CAISO EIM is currently playing to support renewable energy integration—and the role that an EDAM could play—any environmental benefits of accounting requirements designed to mitigate GHG emissions leakage in these markets should be weighed against potential market efficiency costs. CARB should work to facilitate a regional dialog among states and stakeholders to make sure GHG accounting and associated policy incentives are efficiently coordinated across all overlapping electricity markets.**

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Chapter 4: Banking Metrics

Danny Cullenward and Dallas Burtraw

Introduction

The environmental effectiveness of a cap-and-trade program depends on the balance between the supply of compliance instruments made available to regulated emitters and the demand for those instruments, which is determined by emissions covered under the program. If there are too many compliance instruments relative to emissions—that is, too many allowances and offsets—the cap-and-trade program may fail to deliver the emission reductions policymakers expect from it. Conversely, if there are too few compliance instruments relative to emissions, the cap-and-trade program may become prohibitively costly. Tracking outcomes is important because many of the forces that determine the program’s supply-demand balance are uncertain and subject to change over time.

This chapter develops a set of recommendations for how California can track the Western Climate Initiative (WCI) cap-and-trade program’s supply-demand balance. Last year’s IEMAC report recommended that CARB develop banking metrics to track the number of unused allowances and offsets on both an annual basis and at the end of each three-year compliance period (IEMAC, 2018: 54). We provide specific recommendations here, including a complete set of methods for implementing annual banking metrics that was presented publicly over the course of our meetings in 2019. Similar metrics are used by other climate policy leaders to measure and manage the supply-demand balance in their cap-and-trade programs (RGGI, 2014; European Commission, 2019).

A related chapter discusses potential reforms policymakers may wish to consider if they determine the cap-and-trade program exhibits a supply-demand imbalance. This year’s IEMAC report does not evaluate whether program conditions warrant reform, but future IEMAC reports may consider that topic.

Compliance period metrics

The WCI cap-and-trade program features three-year compliance periods. In California, regulated emitters must surrender allowances and offsets to cover a portion of their emissions each year, with the bulk of triennial compliance obligations due at the end of the three-year compliance period. Québec has no partial annual obligations and instead has a compliance event only at the end of each three-year compliance period.

California's cap-and-trade program is currently in the middle of its Third Compliance Period, which runs from 2018 through 2020. In Board Resolution 18-51, CARB committed to reporting the number of unused allowances from program years 2013 through 2020 by the end of December 2021 (CARB, 2018a). However, CARB has not yet specified the method by which staff would measure and report this information.

Earlier this year, a group of legislators wrote CARB, CalEPA, and the IEMAC raising concerns about the "overallocation" of compliance instruments in the program (Senator Allen et al. 2019; see *also* California Health & Safety Code § 38562(c)(2)(D)). See Appendix A for the text of this letter. In response, CARB reported some of the data it already makes available for tracking program outcomes, based on the Compliance Instrument Report for the fourth quarter of 2018 (CalEPA & CARB, 2019; CARB, 2019a). See Appendix B for the text of CARB's reply. The committee observes that these data are useful for describing WCI-wide private holdings of unused allowances and offsets at the end of the Second Compliance Period, which ran from 2015 through 2017.³ The IEMAC discussed how these data could be used to report WCI-wide compliance instrument holdings as of the end of the Third Compliance Period, as well as how CARB could employ alternative methods to address Resolution 18-51 (see Appendix C).

Recommendation 1:

- **CARB should identify its preferred method for calculating the number of unused compliance instruments at the end of the Third Compliance Period (2018-20) well in advance of reporting results. We recommend that CARB retain the approach used in its April 22, 2019, letter reporting WCI-wide unused allowance and offset holdings at the end of Second Compliance Period (2015-17) (see CARB & CalEPA, 2019). This would require a slight delay of a week or two beyond the deadline committed to in Resolution 18-51, however, as the underlying data would be released in early January 2022, rather than December 2021. Accordingly, CARB may also wish to consider amending the deadline in Resolution 18-51.**

³ The Compliance Instrument Reports provide data on WCI-wide holdings of allowances and offsets. This accounting structure provides a clear basis for evaluating market-wide supply-demand balance issues; however, the existing data are insufficient to facilitate a direct comparison with CARB's prior statements regarding overallocation. In its 2018 rulemaking implementing AB 398, CARB described the potential number of unused California allowances at the end of 2020 (CARB, 2018b: 7-11). No public data provide a breakdown of the jurisdictional origin of allowances in circulation, and therefore one cannot compare public data on current market conditions with CARB's prior statements without additional data disclosures (see IEMAC 2018: 54, Recommendation 1(a)).

Annual metrics

Clean information about the number of unused compliance instruments at the end of every three-year compliance period would be helpful, but incomplete. Program conditions can change quickly, including within individual compliance periods. As a result, policymakers and market participants would benefit from metrics that can be updated on an annual basis, rather than only once every three years.

Annual banking metrics are widely used by other governments and private parties. For example, the European Union’s Emissions Trading System—the world’s largest cap-and-trade program—features annual compliance obligations, and commensurately reports annual banking metrics to help manage its program’s supply-demand balance (European Commission, 2019). The IEMAC also heard from a market consultant who presented annual banking metric calculations, which we understand to be a common element of how private parties analyze program conditions (ClearBlue Markets, 2019).

The purpose of annual banking metrics is to measure at the end of each year the number of allowances and offsets held in excess of what regulated emitters owe to program regulators. That is, annual banking metrics should account for previous compliance submissions, such that only those compliance obligations that have been incurred but are still outstanding at the end of a calendar year are compared against contemporaneous private entity holdings. To accomplish this purpose, any annual banking metrics should satisfy the principles in Table 1.

Table 1: Principles for annual banking metrics

#	Principle
1	Measure all fungible compliance instruments across the linked market, including all offsets and allowances issued from all jurisdictions whose instruments are eligible for compliance purposes (currently California, Québec, and Ontario).
2	Measure all covered emissions through the end of a calendar year, including emissions from all active Western Climate Initiative jurisdictions (currently California and Québec).
3	Focus on compliance instruments held in private entity accounts and report government-controlled jurisdictional holding and reserve accounts in parallel.

Tracking allowances temporarily held in government accounts and reserve allowances is important because if there is a collapse in demand at program auctions, as occurred

in 2016 and 2017, then significant numbers of allowances may be temporarily held in government accounts. Eventually, these allowances will either be re-introduced and sold to private parties or transferred to program reserve accounts. Thus, it is relevant to distinguish between allowances in private accounts, allowances temporarily held by the government, and allowances held in government reserve accounts.

The IEMAC discussed methods that could be used to calculate annual banking metrics based exclusively on existing public data and without using any projections or estimations, which are presented in Appendix C (see *also* Inman et al., 2018). The *proposed* metrics would include only “current” allowances in order to conservatively focus on only those allowances that are fully fungible for compliance purposes at the point of the metric’s measurement. For example, a vintage 2020 allowance that a private party acquired at an advance auction would not be counted in the 2018 metric but would be included in the 2020 metric and in subsequent years’ metrics.

All of the data required to measure allowance and offset holdings come from the existing Compliance Instrument Report (CARB, 2019a). Consistent with CARB’s data disclosures concerning unused compliance instruments at the end of the Second Compliance Period (2015-17) (CARB & CalEPA, 2019), the annual metric for private banking would measure all allowance and offset holdings across all private entity accounts (the “General”, “Compliance”, and “Limited Use Holding Account (CA)” categories in the Compliance Instrument Report). Similarly, the unsold allowances would be measured from the “Auction + Issuance + Allocation” category and the reserves would be measured from the “Reserve” category. The remaining parameters come from existing official verified emissions and compliance submission reports (see Appendix C).

Recommendation 2:

- **Consistent with the IEMAC’s 2018 recommendations, CARB should develop annual banking metrics to measure allowance and offset holdings in private, government holding, and government reserve accounts. It is feasible to calculate annual banking metrics using existing program data and without making assumptions or projections. Annual metrics can be reported as soon as official emissions data become available in November for the previous calendar year, such that annual banking metrics for 2018 could be calculated as early as November 2019. CARB should adopt the metric described here or develop another that satisfies the principles articulated in Table 1.**

References

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- California Air Resources Board & California Environmental Protection Agency (2019), Letter from CalEPA Secretary Jared Blumenfeld and CARB Chair Mary Nichols to Senator Ben Allen et al. (April 22, 2019) (included here as Appendix B).
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- Senator Ben Allen et al. (2019), Letter to CalEPA Secretary Jared Blumenfeld, CARB Chair Mary Nichols, and IEMAC Chair Dallas Burtraw (March 1, 2019) (included here as Appendix A).

Chapter 5: Potential Approaches to Adjusting Allowance Supply

Dallas Burtraw and Danny Cullenward

Introduction

The quantity of compliance instruments, including allowances and offsets, in circulation now and in the future in the Western Climate Initiative carbon market determine the emissions that will occur at sources covered by the cap-and-trade program. The emissions budget in the program was determined amidst considerable uncertainty about cost, technology, and climate science, and is an interim milestone on the path toward achieving the state's long-run climate policy goal of decarbonization of the state's economy. The market price and the quantity of compliance instruments held in private accounts and in government reserves for use in future years provide information about the progress towards the interim emissions budget milestone and long-run climate policy goal. Based on that information, policy makers might adjust the number of allowances in the market to affect the overall pace at which emissions reductions are achieved.

A separate section of this report addresses methods to assess the quantity of compliance instruments available in the market. The allowance price and the supply of compliance instruments, supplemented with other information, enables policymakers to ask if the supply is too large or too small, and if program adjustments are necessary. This section addresses methods for the potential adjustment to the supply of compliance instruments if adjustments are deemed necessary.

One approach to adjusting the supply of compliance instruments we describe as a **rule-based adjustment**, or automatic adjustment. This type of adjustment is already present in the current market design—for example, when the auction price is at the price floor, fewer allowances enter the market; and when the auction price is at a cost containment price point, additional compliance instruments enter the market. In contrast, we characterize an **administrative adjustment** as one that involves deliberation and decision by the California Air Resources Board before it is implemented—for example a change in offset protocols, adjustment for Ontario's withdrawal from WCI, or backloading of allowances in the program's Fourth Compliance Period. Both types of adjustment could be applied to the same component of a market design. For example, California allowances that were unsold at the price floor are eventually moved into the cost containment reserves, which is a rule-based adjustment, and that rule could be administratively altered to affect allowance supply further.

Both approaches have advantages. Rule-based adjustments may be easier to anticipate by compliance entities based on current market conditions. Administrative adjustments reflect consideration of multiple currently relevant factors and allow for

public input; however, questions about whether and when administrative adjustments might occur can increase regulatory uncertainty. The possibility of administrative adjustments is always available to regulators, but often the process of deciding whether to make an administrative adjustment is time-consuming and difficult.

Table 2 lists several potential adjustments to supply of compliance instruments that could be implemented based on rule-based or administrative approaches. These examples describe ways to reduce supply, but there are analogues for how to increase supply.

Table 2. A Selection of Potential Approaches to Adjust the Supply of Compliance Instruments

- Delaying sale of auctioned allowances (back-loading), or cancellation of auction sales, based on the number of allowances in circulation
 - Adjusting the flow of allowances unsold at the price floor that come back into the market and/or moving them into the allowance price containment reserve
 - Changing the compliance value of allowances, for example, by applying a discount rate on banked allowances that varies based on the allowance vintage year
 - Allowing use of allowances as an alternative compliance instrument (with appropriate currency adjustment) in the LCFS
 - Increasing the price floor
 - Introducing additional price-triggered supply adjustments like an emissions containment reserve(s)
-

Implementation of the examples in the table or other approaches could have unintended effects on the market. For example, changes in the supply will affect currently-linked jurisdictions and consequently a careful collaborative process should be pursued. In addition, an unexpected change to the program that leads to a reduction in supply could precipitate a rapid increase in the price of allowances. Any adjustments to reduce compliance instrument supplies will also increase the value of allowances and offsets held by private parties, which might be perceived as unjustified. One of the potential approaches to adjust supply, the differentiation of compliance value of allowances with different vintages, might ameliorate the change in the value of banked allowances.

If an adjustment is implemented suddenly, it may appear to surprise compliance entities, undermining the political sustainability of the program. Sudden changes to the program may trigger the anticipation of subsequent adjustments and may increase the perceived risk of various compliance strategies. Further, adjustments to supply may change the revenue that is available for the state's greenhouse gas investment fund.

Recommendations

With these considerations in mind, the committee offers the following recommendations regarding approaches to adjust allowance supply.

Recommendation 1:

- **Preferentially and where possible, CARB should develop rule-based approaches for adjustments to supply on an automatic basis that can be anticipated by market participants. The approach could be triggered by a price-based measure such as an emissions containment reserve(s) as observed in RGGI, or a quantity-based metric such as a market stability reserve as observed in the EU.**

Recommendation 2:

- **Any new rule-based mechanisms to adjust the supply of compliance instruments, changes to existing rule-based mechanisms, or administrative decisions to adjust supplies should be announced in advance of implementation to the extent possible in order to enable regulated entities to adjust their compliance activities.**

Recommendation 3:

- **CARB should consider a vintage differentiation of allowances to adjust their compliance value (tons/allowance) before and after program reform to avoid unintended changes in the value of banked allowances.**

Chapter 6: Transportation Sector

Ann Carlson

Introduction

Transportation emissions are California's largest source of greenhouse gases. Almost 40 percent of the state's total emissions come from vehicles; 28 percent of state's emissions come just from light duty vehicles. Light duty vehicles are a bigger source of emissions than the entire electricity sector.

CARB has included within its Scoping Plan a number of policies to reduce transportation sector emissions. Many of those policies are targeted at reducing or eliminating emissions from new vehicles. Others are aimed at reducing VMT. IEMAC is concerned that at least two of the state's major policies-- the state's Clean Car Rules, including its ZEV mandate, and its VMT policies -- may not deliver the estimated amounts included in the Scoping Plan for legal and implementation reasons. It is also worth stressing that policies to achieve the electrification of the vehicle fleet, while smart and necessary, will take many decades. For example, the state is aiming to have 5 million ZEVs on the road by 2030. 85 percent of cars and light trucks will still be powered by internal combustion engines. If VMT policies do not achieve significant reductions, it may be difficult for the state to meet its climate targets, particularly by midcentury.

CalEPA is currently in the process of evaluating how to prioritize research projects.

Recommendations

IEMAC has two recommendations that grow out of this background. See Appendix D for support of these recommendations.

- **CalEPA should place a priority on accelerating the turnover of the existing vehicle fleet. ARB's current suite of transportation policies does not demand many reductions out of existing vehicles. Yet scrappage or other policies could be cost-effective and provide significant co-benefits, especially when coupled with incentives to purchase new vehicles. IEMAC believes this is an under-researched topic. Additional questions that CalEPA should address in its research activities include: at what price the cap-and-trade program can produce additional large reductions in GHGs should transportation emissions fall less than anticipated in the Scoping Plan; alternatives to Clean Car Standards for increasing ZEV penetration without running afoul of federal preemption policies; alternative methods for reducing VMT, including evaluating the feasibility and effectiveness of congestion and roadway pricing; incentives or mandates for**

ridesharing and autonomous vehicle companies to purchase electric or other ZEV vehicles; and additional investments in public transportation.

- **Whether or not CalEPA can pursue all of the research questions specified above, IEMAC members believe that CARB should invest resources in evaluating and recommending backup policies in the transportation sector in case the state cannot achieve the emissions reductions specified in the Scoping Plan from the Clean Car rules and from VMT policies. The list contained in the previous recommendation provides guidance about possible alternative ways to reduce transportation sector GHGs. We make this recommendation in conjunction with recommendations about affordability and about complementary policies, so that CARB should take special care to ensure that any additional transportation policies add real value above what reliance on the cap-and-trade program might achieve and maximize the affordability of its policies, especially for low-income communities.**

Background on California Transportation Sector

The transportation sector is the largest source of greenhouse gas emissions in California, making up almost 40 percent of total emissions. Of total GHG transportation emissions, almost 70 percent are from light duty vehicles – 28 percent of total state GHGs. Emissions from light duty vehicles alone significantly exceed total emissions from the electricity sector. And unlike emissions in the electricity sector, even with aggressive policies in place, total emissions from the transportation sector have risen in recent years, especially in the light duty category – 6 percent between 2013 and 2017 (See California Greenhouse Gas Emissions Trends, 2000-2017). The rise has occurred largely because gasoline prices have remained at relatively low levels, leading consumers to drive more and to purchase larger vehicles. As of the fourth quarter of 2018, 57 percent of new vehicle registrations in California were for SUVs, a huge increase from 2013 (Next 10, California Green Innovation Index, 2019 at 30). VMT has also increased after a marked decline during the Great Recession.

The Scoping Plan that the California Air Resources Board has developed, setting forth how the state will achieve its 2030 GHG emissions target, seeks much larger direct reductions from the transportation sector than from the electricity sector. This makes sense given the sector's relative contributions to total GHGs but is nevertheless worth emphasizing. The Scoping Plan seeks 64 million metric tons of CO₂-equivalent (MMTCO_{2e}) by 2030 from the transportation sector, not including reductions from the Low Carbon Fuel Standard. By contrast, achieving a 50 percent RPS in the electricity sector will reduce emissions by 16 MMTCO_{2e}, only 25 percent of the transportation total. (The sector is now required to achieve a 60 percent RPS, with a corresponding larger reduction in GHGs.) This reverses the relative magnitude of the achievements of this decade, where the vast majority of GHG reductions have come from the electricity sector.

California has a number of policies in place to regulate transportation emissions. CARB's Scoping Plan identifies the following in the light duty category as most significant:

- Having 1.5 million Zero Emission Vehicles on the road by 2025 and 4.2 million ZEVs by 2030; these are achieved in part through mandates under the Clean Air Act that manufacturers sell a certain percentage of ZEVs as part of their California fleets, in part through direct consumer subsidies for the purchase of ZEVs, and in part through programs to increase electric vehicle infrastructure in the state in order to make EV purchasing more attractive to consumers.
- Increasing GHG stringency for Model Year vehicles 2026 and later, through tighter emissions standards under the Clean Air Act.
- Reducing Vehicle Miles Travelled, principally through the encouragement of higher density development under SB 375 and SB 743.
- Reducing carbon intensity of fuels by 18 percent through the Low Carbon Fuel Standard.

The Scoping Plan also relies heavily on the cap-and-trade program for a large amount of emissions reductions, some of which would come from the transportation sector because fuel distributors are covered entities under the program.

The majority of state policies to reduce emissions from light duty vehicles are targeted at new vehicles, particularly the ZEV mandate, the ZEV subsidies, and the reductions in GHGs from new cars. Over the long run, these policies will be effective in transitioning the vehicle fleet to low and eventually zero emissions. However, CARB has made clear that the state cannot meet its 2030 transportation GHG reduction goals without a reduction in VMT. That is because, even if we achieve the 2030 goal to have almost 5 million ZEVs on the road, 85 percent of cars would continue to be powered by internal combustion engines. The percentage of ZEVs would presumably increase each decade, but a large percentage of internal combustion engines will remain on the road. This is true not only because consumers will continue to purchase traditional cars but also because used cars remain in circulation for, on average, close to 12 years. A car bought in 2030 will very likely still be running in 2040.

It is also worth emphasizing that at least two of California's policies aimed at passenger vehicles may be at risk of falling short of their ambition. The first is the state's Clean Car Emission Standards. The second is the policies in place to reduce VMT. If either falls short, the cap-and-trade program will presumably have to cover even more emissions than the 236 MMTCO_{2e} CARB currently estimates unless the state enacts additional policies.

The state's Clean Car Standards are, of course, under attack by the Trump Administration. The Trump Administration has proposed two actions that would harm the state's climate policies. The first is to roll back the standards currently in place for

model years 2020-2025, a proposal that is still not yet final. The second action is to revoke the California waiver not only for the GHG standards, but also for the state's ZEV program. On September 19, 2019, the Administration issued its final rule revoking the state's waiver. California sued the Trump Administration for its argument that the state's Clean Car Program is preempted by federal law on September 20 and in an additional suit filed on November 15 sued EPA for the revocation of the state's waiver. The state's legal position appears to be strong. It is not, of course, infallible, particularly with a conservative U.S. Supreme Court in a position to make a final decision on both actions. The state has also entered into a settlement with four automakers that would mitigate the effects of the roll back of the GHG standards, though several major car companies are not party to the agreement and thus the GHG reductions would be significantly lower than the Scoping Plan contemplates. Furthermore, the settlement agreement does not cover the ZEV mandate.

CARB estimates that GHGs would increase by 12 MMTCO_{2e} by 2030 if the rollback succeeds (though this estimate does not account for the settlement) (California Air Resources Board, Analysis in Support of Comments of the California Air Resources Board on the Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks (October 26, 2018) at 303).

The state faces three risks with the Clean Car standards: first, it could lose the legal cases; second, the standards could be delayed while litigation ensues; third, if Trump is reelected in 2020, the state is almost certainly unlikely to get a waiver for model year cars 2026 and beyond.

VMT policies are not, by contrast, threatened by outside legal risk. Instead, to date they have failed to deliver measurable reductions in driving behavior. To the contrary, VMT has increased, not decreased, despite ten years of experience with SB 375, the principal mechanism to reduce driving and consequent GHG emissions. SB 375, also known as the Sustainable Communities and Climate Protection Act of 2008, requires the state's 18 Metropolitan Planning Organizations to include in their long-range regional transportation plans strategies for reducing GHGs. CARB issued its first required report assessing the effects of SB 375 on climate change goals in November, 2018. The board concluded that "California is not on track to meet the greenhouse gas reductions expected under SB 375 for 2020." The board acknowledged that "vehicle travel per capita [is] increasing and going in the wrong direction." The report also set forth a number of obstacles to reducing VMT, many of them outside the control of the MPO/SB 375 process. New CEQA guidelines developed pursuant to SB 743 (Steinberg 2013) require that new transportation developments be measured by their impact on VMT. These guidelines, finalized in 2018, are another state strategy to reduce VMT. Both SB 375 and the new CEQA guidelines are aimed at new development, not existing development, and are thus likely to be at best very slow means to reduce driving.

It is beyond the scope of our report to evaluate whether and by how much the state is likely to miss the GHG transportation targets set forth in the Scoping Plan. We believe,

however, that the likelihood is sufficiently high that research should be conducted to determine whether alternative ways to reduce emissions from the sector are necessary.

CalEPA is currently in the process of selecting research projects. One area the IEMAC considers especially important is research about ways to speed up the turnover of the vehicle fleet through policies targeted at existing vehicles. The state might be able to increase emissions cuts from the transportation sector if existing vehicles are retired earlier and replaced with either zero emissions vehicles or new ones that emit lower amounts of GHGs. These programs might include, for example, scrappage policies to retire old and high emitting vehicles or registration fees that increase for high emitting and older vehicles. When combined with new vehicle incentives these may be effective programs to reduce emissions.

It may be necessary for CARB to ensure that its policy scenario models include the data necessary to include the existing vehicle fleet and the effect of policies to increase its turnover in order to evaluate scrappage policies. Most of our current policies focus on changing the composition of the new vehicle market even though consumer decisions lock in investments in vehicles for, on average, more than a decade.

Speeding up the transition to zero emission vehicles may also offer significant benefits in reducing conventional air pollution. Existing vehicles are, on average, larger sources of conventional pollutants, with the oldest vehicles on the road typically the heaviest polluters. The co-benefits from doing so are also likely to benefit residents who live near highly trafficked roadways, who are often low income and of color. In pursuing such research, IEMAC members believe that policies that penalize drivers of older and higher emitting cars rather than subsidizing them are much less desirable, particularly given the distributional consequences of penalty policies. As a result, IEMAC urges that research focused on retiring existing cars in order to accelerate the turnover of the fleet should address the distributional consequences of such policies on low-income drivers. Other areas of import include at what price the cap-and-trade program can produce additional large reductions in GHGs should transportation emissions fall less than anticipated in the Scoping Plan; alternatives to Clean Car Standards for increasing ZEV penetration without running afoul of federal preemption policies; alternative methods for reducing VMT, including evaluating the feasibility and effectiveness of congestion and roadway pricing; and incentives for ridesharing and autonomous vehicle companies to purchase electric or other ZEV vehicles.

Whether or not CalEPA can pursue all of the research questions specified above, IEMAC members believe that CARB should invest resources in evaluating and recommending backup policies in the transportation sector in case the state cannot achieve the emissions reductions specified in the Scoping Plan from the Clean Car rules and from VMT policies. The above research areas are promising avenues for CARB to consider, taking into account our recommendations in Chapter 2 about affordability and complementary policies.

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Chapter 7. Appendices

Appendix A: Letter from Legislators to CARB, CalEPA, and the IEMAC

March 1, 2019

The Honorable Jared Blumenfeld, Secretary
California Environmental Protection Agency
1001 I Street P.O.
Box 2815 Sacramento, CA 95812

The Honorable Mary Nichols, Chair
California Air Resources Board
1001 I Street P.O. Box 2815
Sacramento, CA 95812

Dr. Dallas Burtraw, Chair
Independent Emissions Market Advisory Committee
Resources for the Future
1616 P Street NW
Washington, DC 20036

Re: The role of California's cap-and-trade program in achieving the SB 32 target

Dear Secretary Blumenfeld, Chair Nichols, and Dr. Burtraw:

We write regarding California's cap-and-trade program and its role in achieving the 2030 statewide greenhouse gas emissions limit established by SB 32 (Pavley, Chapter 249, Statutes of 2016). According to the Air Resources Board (ARB) 2017 Scoping Plan, which lays out the state's official strategy for achieving the 2030 emissions limit, the cap-and-trade program is expected to play the single largest role in California's post-2020 climate strategy. Specifically, the 2017 Scoping Plan calls on cap-and-trade to deliver 38% of the cumulative emission reductions needed from 2021 through 2030 and 47% of the annual reductions needed in 2030.

As you know, AB 398 (E. Garcia, Chapter 135, Statutes of 2017) extended the cap-and-trade program through 2030 and required a number of program design changes. AB 398 also created the Independent Emissions Market Advisory Committee (IEMAC), which is established within the California Environmental Protection Agency (CalEPA) and charged with providing analysis and advice to both ARB and the Legislature about the cap-and-trade program's design and performance.

Given its prominence in the 2017 Scoping Plan, an especially important and critical issue facing the cap-and-trade program is the overallocation of compliance instruments. According to the IEMAC, overallocation "refers to a market condition where the supply of compliance instruments persistently exceeds emissions." If the cap-and-trade

program is overallocated, market participants may acquire excess allowances and hold (or "bank") them to allow for higher emissions in the future. Should this outcome manifest, the Legislative Analyst's Office has expressed concern that statewide emissions could exceed the SB 32 target.

AB 398 instructed ARB to "evaluate and address concerns related to overallocation" in its implementing regulations (see Health and Safety Code §38562(c)(2)(D)). ARB's response to this statutory direction has been criticized by independent experts, however, including a member of the IEMAC. Although the IEMAC did not evaluate ARB's analysis in its 2018 annual report, the IEMAC reviewed the underlying controversy and made several specific recommendations to improve data reporting in order to create a shared factual basis for evaluating programmatic outcomes. Our understanding is that ARB has not yet adopted these recommendations.

One of the IEMAC's recommendations was for ARB to adopt an annual banking metric that reports the number of excess allowances and offsets held in private accounts each year, calculated as holdings in excess of the compliance obligations regulated emitters accrued over the same period. The IEMAC also recommended ARB provide detailed data about the extent and type of allowance banking at the end of every multi-year compliance period.

These metrics are important because they allow policymakers to evaluate whether or not concerns about overallocation are manifesting in practice. As the IEMAC observed, a number of independent studies have concluded that private parties may acquire several hundred million excess allowances by the end of 2020. In contrast, ARB assumed that no more than 150 million allowances would be banked in private accounts at the end of 2020. The Senate's appointee to the IEMAC testified to the Senate Environmental Quality Committee that ARB's data now shows that more than 150 million excess allowances were already in private accounts by the end of 2018. This suggests the overallocation problem may be more significant than what ARB has so far acknowledged and indicates the need for further analysis.

Finally, we note that in adopting its cap-and-trade regulations last December, ARB agreed in Board Resolution 18-51 to take additional steps to address concerns related to overallocation:

- BE IT FURTHER RESOLVED that the Board directs the Executive Officer to quantify and report to the Board, by no later than December 31, 2021, the volume of unused allowances from 2013 through 2020, including volumes held in private accounts, and the potential for unused allowances to hinder the ability of the program to help achieve the SB 32 target. The Executive Officer shall hold a public workshop in 2019 to discuss potential methodologies to evaluate this topic.

These developments are welcome, but it is unnecessary and potentially counterproductive to wait until 2021 to improve program reporting about conditions that could manifest in the interim. In light of the concerns discussed above and the opportunity to create a common factual understanding of program performance in 2019, we ask that:

- 1) ARB provide additional information about the timing and agenda for the 2019 workshop identified in Board Resolution 18-51 as soon as is practicable.
- 2) ARB adopt the reporting requirements recommended by the IEMAC's 2018 Annual Report, in consultation with the IEMAC (as appropriate), including:
 - a. An annual banking metric that calculates the number of allowances and offsets held in private accounts above and beyond the unsatisfied compliance obligations regulated parties have incurred; and
 - b. A detailed report of the number, vintage, and jurisdictional origin of all allowances and offsets banked from the second compliance period (2015-2017) to the third compliance period (2018-2020), in both private and government accounts. This report should separately address each of the different accounts tracked in ARB's quarterly Compliance Instrument Reports, calculated across holdings in the entire Western Climate Initiative program, *with data sufficient to complete the table provided in Attachment A to this letter.*
- 3) ARB consult with the IEMAC at the 2019 workshop identified in Board Resolution 18- 51 and in any follow-up engagement the Board deems relevant.
- 4) The IEMAC include in its 2019 Annual Report:
 - a. An assessment of ARB's response to AB 398's instruction to "evaluate and address concerns related to overallocation";
 - b. An independent calculation of the annual and multi-year compliance period banking metrics described above; and
 - c. A discussion and associated analysis of key issues raised in ARB's 2019 workshop, including those that relate to overallocation, potential policy reforms to address overallocation, and the impacts of any such reforms.

Developing a shared factual basis for program design and evaluation will offer policymakers in both the administration and the Legislature the opportunity to make careful program design choices should the need for reforms become apparent. Finally, we note that these actions would not prejudice any particular policy outcome and therefore can be pursued no matter one's views about the adequacy of current policy.

Thank you for your continued leadership on climate policy and your diligence to ensure that California achieves the 2030 SB 32 target for greenhouse gas emission reductions. We look forward to working together in the coming months and years. Please contact

David Ernest Garcia, consultant to the Senate Environmental Quality Committee, at (916) 651-4108 should you have any questions or need any clarification about the information we have requested.

Sincerely,

Ben Allen, Chair
Senate Environmental Quality Committee

Laura Friedman, Chair
Assembly Natural Resources Committee

William W. Monning, Senator
ARB Ex Officio Member

Eduardo Garcia, Assemblymember
ARB Ex Officio Member

Bob Wieckowski, Chair
Senate Budget and Fiscal Review Subcommittee #2

Cristina Garcia, Chair
Joint Legislative Committee on Climate Change Policies

Attachment A

Template for ARB to use when providing WCI-wide reporting metrics at the end of California's second multi-year compliance period (2015-2017). This table should be completed for each of the nine categories of accounts tracked in ARB's quarterly Compliance Instrument Report:

Private entity accounts

1. General
2. Compliance
3. Limited Holding Use Account (CA)

Jurisdictional Accounts

4. Voluntary Renewable Electricity (CA)
5. Auction+ Issuance+ Allocation
6. Retirement
7. Invalidation
8. Reserve
9. Environmental Integrity (QC)

This information could be disclosed in the form of a new Compliance Instrument Report that distinguishes between the jurisdictional origin of all compliance instruments and measures allowance and offset holdings in the Compliance Instrument Tracking System Service (CITSS) immediately following each multi-year compliance event. For example, such a report issued immediately after the November 2018 California compliance event would provide sufficient information to determine the bank of allowances and offsets carried from the second compliance period (2015-17) into the third compliance period (2018-2020).

Template for compliance instrument reporting table

WCI-wide holdings as of the end of Compliance Period 2 (2015-17)

Type	Issuing Jurisdiction			Total
	California	Quebec	Ontario	
Allowances, Vintage 2013				
Allowances, Vintage 2014				
Allowances, Vintage 2015				
Allowances, Vintage 2016				
Allowances, Vintage 2017				
Non-Vintage Quebec Early Action Allowances				
Non-Vintage Price Containment Reserve Allowances				
Subtotal, Allowances				
Offset credits				
Total Compliance Instruments				

Appendix B: Letter from CARB and CalEPA to Legislators

April 22, 2019

The Honorable Ben Allen
Chair, Senate Environmental Quality Committee
State Capitol, Room 2205
Sacramento, CA 95814

Dear Senator Allen:

Thank you for your letter of March 1, 2019. We continue to appreciate the shared efforts of the Legislature and the Administration in developing and implementing programs - including the Cap-and-Trade Program - to achieve California's greenhouse gas (GHG) emission reduction targets and ambitious climate goals.

Your letter raises the important topic of allowance supply in the Cap-and-Trade Program. We take this issue seriously.

GHG emissions in California have declined faster than anticipated. This decline will yield unused allowances at the end of 2020. Using best available data, we compared an estimate of unused allowances with a forecasted demand for allowances post-2020 when the annual caps decline about four percent each year, double the current rate. Our analyses, and those of several independent market analysts, forecast continued and steady increases in allowance prices over time, sending the critical price signal for companies to act to reduce their GHG emissions. As a result of these analyses, California Air Resources Board (CARB) determined that no changes to allowance supply or banking rules are required at this time. Though forecasted demand may be uncertain, removing allowance supply today will certainly increase compliance costs and costs to consumers, negatively impacting affordability for Californians.

We agree with you that we must continue to monitor our programs and make program adjustments as needed to ensure the program continues to deliver GHG reductions in a cost-effective manner. CARB held two public workshops and released two public documents regarding the issue of over-allocation.

CARB will hold a public workshop this summer to discuss potential methodologies to evaluate cost-effective reductions. We have invited the chairman of the Independent Emissions Market Advisory Committee (IEMAC), Dallas Burtraw, to participate in that workshop.

Per your request, we provided data related to current allowance supply. See Appendix A attached. As a jointly operated, Western Climate Initiative (WCI)-wide market, California and Quebec publishes data included in Appendix A to enable market participants and the public to understand the program. We will continue to engage with the Legislature, Quebec, the IEMAC, and other market experts on recommendations related to additional data disclosures.

In taking action to reduce GHG emissions, we are acutely aware of the need to simultaneously address issues of affordability while avoiding over allocations of allowances. Analysis shows that California's portfolio approach to addressing climate change produces the highest likelihood of meeting California's GHG targets. The portfolio approach is also four times less costly than alternatives without Cap-and-Trade, and results in minimal impacts to the economy, jobs, and household income. In short, we are seeking to implement the most effective and affordable approach to reducing California's GHG emissions.

Thank you again for your continued leadership and interest in the success of our programs. We appreciate David Garda's participation in the first IEMAC meeting of 2019 and look forward to legislative engagement with the IEMAC. Should you have further questions, please contact Virgil Welch, Special Counsel to the Chair, CARB, or CalEPA's Deputy Secretary for Legislation, Anna Ferrera.

Sincerely,

Mary D. Nichols Chair- California Air Resources Board

Jared Blumenfeld Secretary for Environmental Protection

WCI-wide holdings in Private Entity Accounts (General, Compliance, LUHA) as of the end of Compliance Period 2 (2015-2017)

Type	Issuing Jurisdiction			Total
	California	Quebec	Ontario	
Allowances Vintage 2013				1,408,541
Allowances Vintage 2014				4,901,858
Allowances Vintage 2015				10,592,014
Allowances Vintage 2016				53,291,321
Allowances Vintage 2017				107,635,826
Non-Vintage Quebec Early Action Allowances		19,221		19,221
Non-Vintage Price Containment Reserve Allowances				38,317
Subtotal, Allowances				177,887,098
Offset Credits	40,538,499	77,534		40,616,033
Total Compliance Instruments				218,503,131

Note: CARB cannot publish the jurisdiction of origin of allowances (outside of non-vintage Quebec Early Action allowances) for legal jurisdictional reasons. The jurisdiction of origin is not necessary to assess the current supply of compliance instruments or to

understand the number of vintage 2017 and earlier vintage allowances banked at the end of the second compliance period. This table provides all instruments in private entity accounts as of January 4, 2019. Source: Worksheet (2018 Q4) Columns B-D of the Workbook "Linked California and Quebec Cap-and-Trade Programs Carbon Market Compliance Instrument Report - Aggregated by Type and Account" (released Jan 4, 2019) available at <https://arb.ca.gov/cc/capandtrade/complianceinstrumentreport.xlsx>

Appendix C. Options for Third Compliance Period Metrics

The committee discussed options CARB could use for developing banking metrics for the Third Compliance Period, which runs from 2018 through 2020. CARB’s existing quarterly Compliance Instrument Report (CIR) reports WCI-wide holdings of allowances and offsets on a regularly scheduled basis (CARB, 2019a). Several of these quarterly reports could conceivably be used for future banking metrics (see Table 3).

Table 3: Data options for Third Compliance Period metrics

	Compliance Instrument Report (CIR)			
	2021 Q3	Special CIR	2021 Q4	2022 Q1
Date of measurement	Early Oct. 2021	Nov. / Dec. 2021	Early Jan. 2022	Early Apr. 2022
Before or after November compliance event?	Before	After	After	After
Adjustment needed?	Yes, for compliance event	No	No	No
Can metrics be reported by the end of December 2021?	Yes	Yes	No	No

The first two options would allow CARB to report metrics by the deadline contemplated in CARB Board Resolution 18-51, but each would require additional implementation steps beyond CARB’s existing program reporting. The first option would be based on the 2021 Q3 CIR, but would require a manual adjustment to account for the November 2021 compliance event that occurs after the CIR measurement takes place. The second option would be to issue a special CIR that measures WCI-wide holdings just after the November auction and compliance events occurs. This option would require no additional adjustments but would constitute novel public reporting.

The remaining two options require no additional implementation steps but would create delays relative to the Resolution 18-51 reporting deadline. Using the 2021 Q4 CIR would allow CARB to report a metric consistent with the data disclosure it made to legislators in a letter dated April 22, 2019 (CARB & CalEPA, 2019), but would require a delay of a week or two relative to the deadline CARB set for this reporting in Resolution

18-51. Alternatively, CARB could wait another three months to issue its report using the 2022 Q1 CIR. We cannot identify any benefits to waiting an additional three months or longer to use the 2022 Q1 or subsequent CIRs.

Proposed Method for Annual Metrics

One approach to calculating an annual metric for the number of unused private allowance and offset holdings would be:

$$Annual\ Bank_t = A_{P,t} + O_{P,t} - \left(\sum_{i=2013}^t C_i - \sum_{i=2013}^t S_i \right)$$

Where:

- $A_{P,t}$ = Allowances in private accounts P at the end of year t
(Only counting allowances with vintage $\leq t$ and non-vintage allowances)
- $O_{P,t}$ = Offsets in private accounts P at the end of year t
- C_i = Compliance obligations (verified emissions) in year i
- S_i = Compliance instrument surrenders for emissions in year i

These metrics would be reported in units of MMTCO_{2e}.

In addition to measuring the annual bank of privately-held compliance instruments, it is feasible to measure government holdings of allowances that were offered for sale at current auctions but not purchased by private parties:

$$Unsold\ allowances_t = A_{H,t}$$

Where:

- $A_{H,t}$ = Allowances in government holding accounts H at the end of year t
(Only counting allowances with vintage $\leq t$ and non-vintage allowances)

One can also measure government allowance reserves:

$$Government\ Reserve\ Accounts_t = A_{R,t}$$

Where:

- $A_{R,t}$ = Allowances in government reserve accounts R at the end of year t
(Only counting allowances with vintage $\leq t$ and non-vintage allowances)

The proposed annual banking metrics can be calculated without the use of any projections or assumptions. Because the demand for allowances and offsets depends on verified emissions, the metric can only be calculated when verified emissions data

are reported. Verified emissions data are available for the previous year in the following November, such that data on 2018 emissions will be available in November 2019. Thus, 2018 banking metrics can be calculated as soon as November 2019 (see Table 4).

Table 4: Data sources for annual metrics

Topic	Data source	Parameter	Updates
Supply	Compliance Instrument Reports (Q4 Reports) (CARB, 2019a)	$A_{P,t}$ and $O_{P,t}$ $A_{H,t}$ $A_{R,t}$	January
Demand	Verified emissions (CARB, 2018a; MELCC, 2018)	C_i	November
	Compliance submissions (CARB, 2019b; MELCC, 2019)	S_i	December (previous year)

Over the course of its 2019 activities, the subcommittee requested CARB’s feedback on the proposed methods here and anticipates that CARB may provide feedback at the IEMAC’s meeting on September 20th, 2019.

Comparison with the European Union’s TNAC metric

The European Union Emissions Trading System (EU ETS) employs an annual metric called the Total Number of Allowances in Circulation (TNAC) (European Commission, 2019). The TNAC metric counts all allowances and offsets in circulation at the end of a calendar year (supply), subtracting out the total verified emissions up through the same point in time (demand). It also reports the number of allowances held in the Market Stability Reserve, a government-controlled reserve account. The TNAC measures the surplus of allowances and offsets in circulation relative to verified emissions through the end of a given calendar year.

As shown in Table 5, each of the elements of the TNAC has a corresponding component in the annual metrics described in the main committee report.

Table 5: Methodological comparison

Concept	TNAC component	WCI metric equivalent
Supply	(a) Banked allowances from previous phase	$A_{P,t}$ <i>Note: TNAC includes future-year vintage allowances, not just “current” vintages</i>
	(b) Total free allocations, current phase	
	(c) Total allowance auctions, current phase	
	(d) Special allowances, current phase	
	(e) Total offsets, current phase	$O_{P,t}$
Demand	(a) Verified emissions	$\sum_{i=2013}^t C_i - \sum_{i=2013}^t S_i$
	(b) Cancelled allowances	
Reserve	EU ETS Market Stability Reserve	$A_{H,t}$ and $A_{R,t}$

There are two significant differences between the EU ETS TNAC method and the proposed annual metrics discussed in the main chapter text.

First, the EU ETS TNAC metric counts future-year vintage allowances, whereas the proposed annual metric does not. There is no objectively preferable approach; each has advantages and disadvantages. California and Québec both limit the use (or “borrowing”) of future-year vintage allowances for compliance purposes, which means that allowances from future program years are often not valid for compliance obligations that have been incurred but not yet satisfied. Limiting a metric to current-year vintages results in a lower and more conservative metric of private banking outcomes, but one that is arguably more closely tied to the fungibility of those instruments for compliance purposes at the point of measurement.

Second, the two metrics differ in how they calculate supply and demand, even though they are essentially similar in how they compare the difference between supply and demand. In other words, each metric calculates its constituent components in different ways, but the differences cancel one another out such that both metrics measure the same concept.

The EU ETS TNAC observes market supplies by looking at the annual introductions of allowances and offsets on a calendar year basis, building on established banking metrics that report the number of unused allowances from previous compliance periods. (California and Québec currently lack such metrics.) The EU ETS observes demand for

market supplies by counting the total verified emissions, adjusted by any allowances that regulators cancel.

In contrast to the EU ETS TNAC, the proposed annual metric for the WCI cap-and-trade program takes an instantaneous measure of how many allowances ($A_{P,t}$) and offsets ($O_{P,t}$) private market participants hold from the fourth quarter Compliance Instrument Reports (CARB, 2019a). Because private parties will have surrendered some allowances and offsets in annual compliance events (S_i), the number of allowances and offsets private entities hold as measured in the Compliance Instrument Report will be lower than the sum of allowances and offsets they banked from previous compliance periods, received in the form of free allocations, and purchased at auction. That is, what the Compliance Instrument Report measures for supply will be lower than what the EU ETS TNAC would measure. To account for this difference, the proposed metric subtracts the number of allowances and offsets surrendered at past compliance events (S_i) from the total compliance obligations (C_i)—that is, verified emissions—regulated parties have incurred to date. That is, what the proposed annual metric for the WCI program measures for demand will also be lower than what the TNAC would measure.

As a result, the two metrics each calculate supply and demand in different ways, owing to the different kinds of data reporting available in each program. Critically, the differences cancel each other out such that each metric reports the same concept.

References

- California Air Resources Board (2018a), Mandatory Reporting Regulation program data, <https://ww2.arb.ca.gov/mrr-data>.
- California Air Resources Board (2018b), Resolution 18-51, <https://www.arb.ca.gov/regact/2018/capandtrade18/reso1851.pdf>.
- California Air Resources Board (2019a), Compliance Instrument Report, <https://www.arb.ca.gov/cc/capandtrade/complianceinstrumentreport.xlsx>.
- California Air Resources Board (2019b), Compliance Reports 2013–2017, <https://ww2.arb.ca.gov/cap-and-trade-program-data>.
- California Air Resources Board & California Environmental Protection Agency (2019), Letter from CalEPA Secretary Jared Blumenfeld and CARB Chair Mary Nichols to Senator Ben Allen et al. (April 22, 2019) (included here as Appendix B).
- European Commission (2019), Publication of the number of allowances in circulation in 2018, https://ec.europa.eu/clima/policies/ets/reform_en#tab-0-1.
- Ministère de l'Environnement et du Lutte contre les changements climatiques (MELCC) (2018), Verified and declared Emissions, <http://www.environnement.gouv.qc.ca/changements/carbone/ventes-encheres/liste-etablissements-visesRSPED-EN.xlsx>.
- Ministère de l'Environnement et du Lutte contre les changements climatiques (MELCC) (2019), Compliance Period Reports, <http://www.environnement.gouv.qc.ca/changements/carbone/documentation-en.htm>.

Statement from IEMAC Member Dr. Danny Cullenward

I respectfully abstain from the recommendations in Chapter 6. While I commend my colleague for the chapter's thoughtful discussion of transportation sector issues and have no reservations about its substantive analysis, I do not believe that the IEMAC should make recommendations on research funding priorities in the absence of a formal conflict-of-interest policy. Because the Committee lacks such a policy, I respectfully abstain from these recommendations.

In addition, I write separately to emphasize that the IEMAC has not yet reviewed or evaluated the validity of CARB's 2018 response to AB 398's statutory instruction to "evaluate and address concerns related to overallocation" in the cap-and-trade program. An independent review of CARB's analysis is important in light of open questions about the program's ability to deliver the emission reductions called for in CARB's 2017 Scoping Plan; Legislators' request to our Committee to independently evaluate CARB's overallocation analysis (as contained in the April 1, 2019 letter reproduced in Appendix A of this year's IEMAC Report); and the significant criticisms I and others have raised with respect to CARB's analysis (as detailed in Appendix B to the 2018 IEMAC Report).

Similarly, I am concerned that questions about the scientific integrity of the U.S. Forest Offset protocol have only become more prominent since the IEMAC recommended last year that CARB provide more information about the technical basis for key protocol parameters (see Chapter 5 of the 2018 IEMAC Report), which CARB has not yet done. It is my hope that the IEMAC will take up these important issues in next year's report.

Statement from IEMAC Chair Dallas Burtraw

My colleague Danny Cullenward writes in an independent statement that he abstains from the recommendations in Chapter 6, which pertains to the transportation sector, because he does not believe IEMAC should make recommendations on research funding priorities.

I write to observe that Chapter 6 identifies important research topics for the California Environmental Protection Agency pertaining to challenges in the transportation sector. The chapter does not make recommendations about funding.