



Carbon Market California

A COMPREHENSIVE ANALYSIS OF
THE GOLDEN STATE'S CAP-AND-TRADE PROGRAM

YEAR TWO: 2014

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Acknowledgments

This report would not have been possible without the help and hard work of many individuals. The authors would like to thank their colleagues at the Environmental Defense Fund, including Derek Walker for guidance and editorial oversight, Minna Jung for media strategy and executive summary contributions, Timothy O'Connor for advice and review, Lauren Faber, Chloe Looker, Robert Parkhurst, Sara Snider, Josh Margolis, Christina McCain, Nathaniel Keohane, Annie Petsonk, Megan Ceronsky, Tomás Carbonell, Gernot Wagner, and Matthew Zaragoza-Watkins. The authors are especially grateful to their external partners who contributed editorial expertise and content to this report, including John T. Bloom Jr., Lenny Hochschild, Soffia Alarcón-Díaz, Professor Christopher Knittel, Stephen McComb, Katie Sullivan, Katie Kouchakji, Peter Shattuck, Kristin Eberhard, Sarah Henry, Renae Steichen, and Ann Gravatt. A very special thanks also to Senate President Pro Tempore Kevin de León, Anthony Reyes, and Nidia Bautista for their featured piece as well. Finally, thank you to Jose Fernandez for designing the infographics, Christina Baute and Bonnie Greenfield for the report design, and Anna Brinsmade for the copy editing.

Environmental Defense Fund

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The complete report is available online at edf.org/california-cap-and-trade-updates.

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Executive summary

In 2006, the state of California made a bold commitment to tackle climate change with the signing of the Global Warming Solutions Act, commonly referred to as AB 32. AB 32's main purpose is to decrease the emission of dangerous, heat-trapping greenhouse gases which contribute to climate change. The law centers on an overarching, ambitious mandate: reducing the state's greenhouse gas pollution back to 1990 levels by the year 2020.

To achieve this goal, lawmakers and regulators have pursued a comprehensive suite of policies, implemented as part of AB 32 and subsequent measures. A cap-and-trade program, which now applies to almost 85% of California's greenhouse gas emissions, was launched in 2013 and is widely considered the centerpiece of the program. While cap and trade as a concept predates the signing of AB 32, California's version of it is without precedent, as it covers the vast majority of the state's economic sectors. The other major cap-and-trade system in North America, the Regional Greenhouse Gas Initiative (RGGI), comprises nine Northeastern states, but only applies to the electricity sector.

Because of its sweeping scope, many observers called California's carbon market a "grand experiment." Almost two years into the experiment, all signs are pointing to the overarching conclusion that the experiment—an economy-wide cap-and-trade program in the world's eighth largest economy—is in fact working. California is proving that it is possible to limit, price, and reduce the state's greenhouse gas pollution while spurring continued growth of the state's economy. Even more encouragingly, some of the fastest economic growth is taking place within the "green" portion of the economy—defined by jobs and revenues generated from the accelerated adoption of cleaner energy solutions.

California's experiences must be well-documented, and will be increasingly scrutinized, as more and more cities, states, and countries consider the potential of cap and trade to address carbon pollution. The passage of future climate change and clean energy policies in other places will rely on lessons learned from California and other jurisdictions that have already taken action. It will be essential to analyze emissions reductions side-by-side with a robust economic analysis, given that much of the opposition to laws that curb emissions comes from companies

Photo below: United Nations Secretary General Ban Ki Moon (center) with Sam Kahamba Kutesa, President of the sixty-ninth session of the General Assembly (left), and Robert Orr, Assistant Secretary-General for Strategic Planning.



UN Photo/Cia Pak

claiming that fossil fuels are vital to economic health and growth. Indeed, a staggering portion of the world's economy *does* still depend on the use of fossil fuels, and breaking this dependence will require a clear understanding of benefits beyond emissions reductions, such as the health and economic prosperity of individuals and states.

This report contains a thorough analysis of several key indicators of whether California's cap-and-trade program is working, including the health of California's economy, the state's emissions level, how the carbon market is functioning under the regulatory framework, and the level of political support the program enjoys. It is the second in a series; the first report, released in January 2013, analyzed the first year of the cap-and-trade program, and provided an early overview of how implementation was going.

This report has the advantage of a second year's worth of data and analysis on the carbon market's operations and on the current state of California's economy. In addition, the end of 2014 officially marked the conclusion of "Compliance Period One," the first phase of the market program established by the California Air Resources Board (CARB). While important milestones still lie ahead for California's cap-and-trade program—most notably, the inclusion of transportation fuels under the cap starting in January 2015—this executive summary highlights several key conclusions that will be discussed in more depth in the full report.

1. The latest data shows that California's economy is thriving and emissions regulated by cap and trade have decreased since the program launched (see "Economic and emissions analyses," page 4).

California's gross domestic product (GDP) increased by over 2% in 2013. Overall job growth outpaced the national average, and this trend is expected to continue despite persistent claims that climate policies and carbon prices would interfere. Meanwhile, according to emissions data released by CARB in November 2014, "capped emissions" decreased by almost 4% during the first year of the program. "Capped emissions" are those produced by facilities covered under the cap since the program's launch.

2. California's carbon market has remained stable and strong since its inception, as demonstrated by the level of activity and participation in the quarterly auctions and secondary market (see "Market updates," page 10).

Cap and trade places a total cap on emissions and then issues a limited number of allowances, or permits, for those emissions. The total number of permits in the market corresponds to the overall statewide cap, which declines every year to help California reach 1990 emissions levels by 2020. In California's program, a percentage of allowances are auctioned off through quarterly auctions. While the idea of issuing permits for continued pollution seems counterintuitive at first glance, carbon allowances under a cap-and-trade program actually provide a mechanism to set a carbon limit for an entire economic system and create incentives for companies to decrease emissions over time. In order for the mechanism to work, however, regulations for the market need to be strict and enforced, and entities need to participate. The results of the nine quarterly auctions through November 2014 demonstrate that companies are taking this program seriously and factoring a carbon price into their business strategies. Between the state-run auctions, daily trade activity on the secondary market has been characterized by stable allowance prices and increased trading volumes. These metrics point to a healthy, well-regulated, and active carbon market, which is a positive sign that California's cap-and-trade program is going well, and that the state is on track to meet the 2020 emissions target set by AB 32.

3. Regulated companies are actively engaging in the program and complying with the rules that require them to limit and decrease their emissions (see "Allowance surrender," page 17).

Companies regulated by the cap-and-trade program are required to purchase enough allowances to cover their greenhouse gas emissions, and must relinquish these allowances at a required

time or face severe penalties. All of the entities regulated under California's cap-and-trade program during the first compliance period (2013–2014) retired the correct number of allowances by the first deadline in November 2014, which demonstrates that companies can comply with the program while incorporating cap-and-trade mechanisms into regular business practices.

4. California's government leaders in the executive and legislative branches have maintained a steadfast commitment to the cap-and-trade program (see "Regulatory and agency updates," page 23).

Despite well-financed efforts from some industry groups, which have ramped-up in opposition to transportation fuels coming under the cap in January 2015, California's government leaders have remained strong supporters of the economy-wide cap-and-trade program. The 2014 California legislative session closed without the passage of any bills to significantly weaken the program, and both Governor Brown and state legislative leaders continued to show strong leadership on climate and clean energy policies, including AB 32. Against the backdrop of strong political support, state regulators took steps to strengthen the program, including adopting additional offsets protocols to expand the pool of available emissions reduction opportunities.

5. California's cap-and-trade program will result in investments in innovative projects that benefit communities throughout the state (see "Cap-and-trade auction proceed investments," page 18).

While the primary purpose of AB 32 is to achieve the 2020 target for emissions reductions, the state's cap-and-trade program is designed to yield other benefits, too. Beginning in 2015, proceeds from the quarterly auctions of carbon allowances will be available for re-investment. This money, a total of \$902 million budgeted through mid-2015, has gone into California's Greenhouse Gas Reduction Fund (GGRF). Under a set of rules and criteria, the GGRF will invest in projects that achieve even greater emissions reductions, while creating jobs, improving communities, and slashing other harmful pollutants. The Fund will also direct a minimum of 25% of proceeds to benefit disadvantaged communities disproportionately affected by climate change and pollution.

6. Global momentum for climate action is growing and California continues to be both a model and willing partner for other states and nations eager to move on climate policies (see "California: A proving ground for global climate action," page 30).

California has formed working, two-way partnerships with ten other jurisdictions around the globe, including high-profile agreements with Mexico and China, in which the signing parties commit to share information and lessons learned about climate policies, with a special focus on emissions trading programs. These partnerships are a vehicle for California to share its climate policy knowledge while forming vital intellectual and commercial links with leaders around the world.

In addition to expanding on these conclusions with relevant data and analysis, this report illustrates past milestones, charts the year ahead, and contains interviews with market experts who possess unique vantage points and perspectives on how California's "grand experiment" is working.

While the implementation of California's cap-and-trade program is far from finished, this report shows that all indicators for success are pointing in the right direction. Steady progress towards ambitious climate goals is exactly what's needed, as the United States and other countries begin to take long-overdue steps to combat the worst effects of global warming and stimulate low-carbon economic growth around the world.

To read the full report online, to read the first report of the series, or for more background information on California's cap-and-trade program, please visit EDF's website at edf.org.

A close-up photograph of a person's hand plugging a white charging cable into the charging port of a white electric vehicle. The background is a blurred green landscape, suggesting an outdoor setting. The image is partially covered by a dark blue banner at the top, which contains the chapter title.

CHAPTER 1

Economic and emissions analyses

The hyphenated term **cap-and-trade** is used throughout as an adjective modifier, while the unhyphenated term **cap and trade** is used as a noun. For all intents and purposes, the hyphenation differences do not change the meaning of the term.

During the first year and a half of the state's cap-and-trade program, California added 491,000 jobs, a growth of almost 3.3%, outpacing the national growth rate of 2.5% during the same time period.

On January 1, 2013, California inaugurated a **cap-and-trade** program—overseen by the California Air Resources Board (CARB)—that made the Golden State the first in the U.S. with a stringent, economy-wide cap on carbon pollution and a price on carbon.

Under **cap and trade**, polluters must obtain one allowance for each ton of greenhouse gas pollution they emit, a system that allows the state to put a limit on the total amount of statewide pollution while holding each polluter accountable. The system rewards businesses who can find low-cost opportunities to reduce pollution by allowing them to sell excess allowances to other entities in the program. The cap-and-trade system is a key element of the Global Warming Solutions Act of 2006 (AB 32), a law requiring California to cut statewide greenhouse gas emissions (GHGs) to 1990 levels by 2020.

During the past two years, California's economy flourished, giving California one of the fastest recovery rates among all states following the recent recession. California is proving strong economic growth can occur with, and even be facilitated by, aggressive action on climate change. While many sectors across the conventional economy have posted large job gains over the past two years, the state's green economy (solar installation and clean technology manufacturing, for example) has helped spur statewide economic recovery, growing at a faster rate than traditional economic sectors such as manufacturing, which itself has posted large job increases over the past two years. Economic growth is outpacing emissions growth by a factor of almost five, breaking the link between economic output and carbon pollution, an essential characteristic of any future path to state, national, or global low-carbon economic development. At the same time, the state is reinvesting hundreds of millions of dollars generated by the cap-and-trade program to further reduce carbon pollution and deliver health, economic, and environmental benefits to California's communities.

Economic analysis

As California implemented one of the most ambitious cap-and-trade programs in the world, the state's economy grew faster than the national average, and the state's green economy grew even faster.

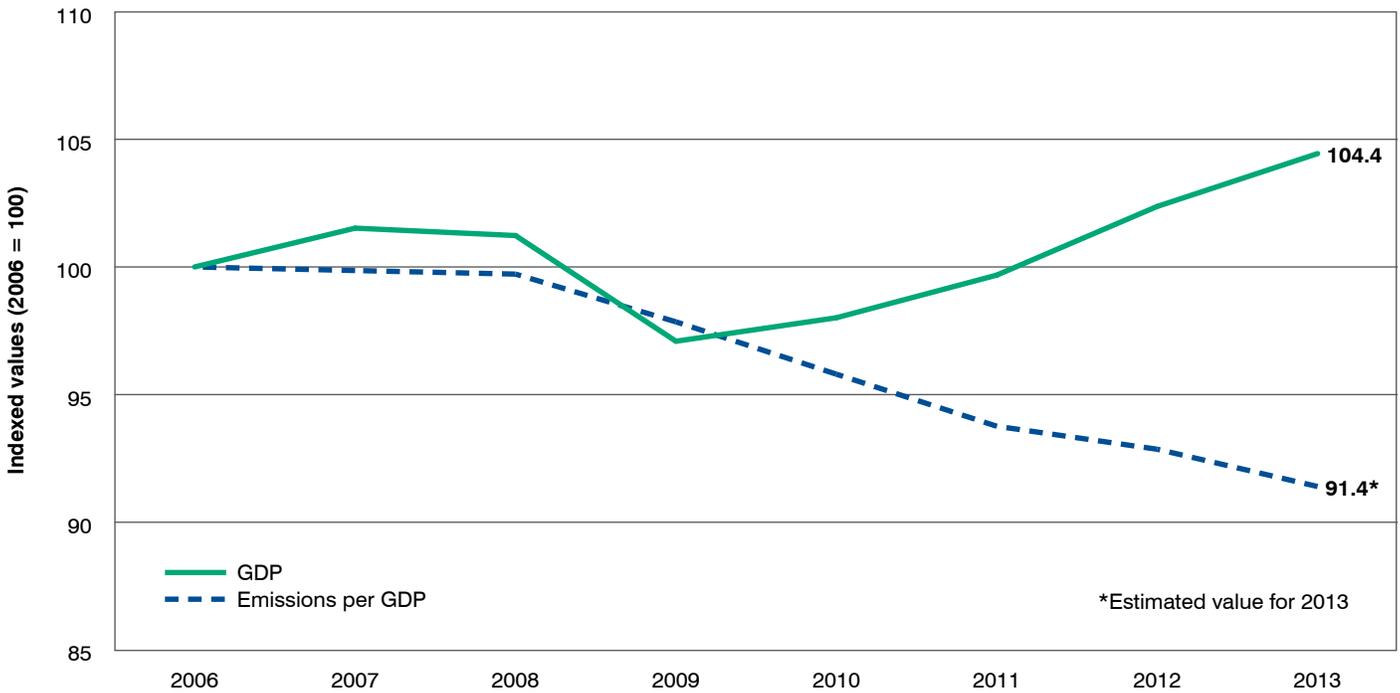
Overall economic growth

Job loss was one of the most crippling aspects of the recent recession, and unemployment rates are only now returning to pre-recession levels. During the first year and a half of the state's cap-and-trade program, California added 491,000 jobs, a growth of almost 3.3%, outpacing the national growth rate of 2.5% during the same time period (see Figure 1-1, page 6).¹ These gains were built on several years of strong economic growth: California has posted robust job gains in each of the past four years, adding more jobs than any other state from 2010 to 2013 and ranking sixth in job growth per capita among all states including the District of Columbia, according to Economic Modeling Specialists International research.² Studies predict an increasingly bright employment future for the state, with unemployment projected to decline over the next two years from 7.7% in 2014 to 5.9% in 2016.³ Among the fastest growing industries in the state are construction and the service and trade industry.⁴

As job growth continues to rise, Californians are enjoying growth in per capita personal income that is outpacing the rest of the nation. Between 2009 and 2013, California per capita personal income increased by 8.5%, while income across the entire nation only increased by 5.9%.⁵ These gains are not confined to higher-income earners: Governor Brown signed a bill in 2013 to raise the minimum hourly wage for the state's workers from \$8 to \$10 by 2016.⁶ The average California worker gets paid 12% more than the national average and produces 13% more output.⁷ Higher-paying, green jobs are contributing to this trend: workers building solar arrays earn an average of \$78,000 per year plus health and other benefits.⁸

FIGURE 1-1

California economy continues to grow while becoming more efficient



California	3.3%	California	\$21,000,000,000
Rest of nation	2.5%	Rest of nation (total)	\$19,000,000,000
<p>From January 2013 until June 2014, California added 491,400 jobs, which represents a 3.3% growth, outpacing the job growth in the rest of the nation of 2.5% during the same time period.</p>		<p>Between 2006 and 2013, when AB 32 was signed into law, California has received more clean technology venture capital investment than all other states combined (\$21 billion in California vs \$19 billion total for the rest of the U.S.)</p>	

Source: California Air Resources Board,⁹ California’s Department of Finance,¹⁰ the Bureau of Labor Statistics,¹¹ and Next 10¹²

Green economic growth

California’s ambitious climate change and clean energy policies have created a thriving clean economy that is growing faster than the overall economy and attracting considerable amounts of investment. In December 2014, the Advanced Energy Economy Institute pronounced California home to the largest advanced energy industry in the country. Advanced energy jobs grew 5% in the past year, which is more than double the overall state job growth rate.¹³ Green economic momentum has been building for some time: in the decade between 2002 and 2012, jobs in California’s “core clean economy” (including businesses that provide innovative products and services that allow the economy to transition away from fossil fuels) grew ten times faster than employment in the overall state economy.¹⁴ Since 2006, when AB 32 was signed into law, California has received \$21 billion in clean technology venture capital investment, more than all the other states combined (see Figure 1-1). The suite of California’s groundbreaking policies—including mandates on cleaner energy, fuels, cars, and buildings—has helped venture capital investment become more diverse and more evenly spread across multiple segments in 2013 compared to previous years, according to Next 10, a non-partisan, non-profit organization.¹⁵ California continues to grow as a hub of innovation,

ranking first in the nation in clean tech patent registrations (1,434 in 2012-2013 period), more than twice as many as the next leading state, Michigan.¹⁶

Gross Domestic Product is commonly used as a measure of an economy's health, and represents the total dollar value of all goods and services produced by that economy.

Breaking the link between emissions and economic growth

California's **Gross Domestic Product (GDP)** increased by over 2% in 2013, and the state surpassed Russia and Italy to become the world's eighth largest economy, as measured in total GDP.¹⁷ Between 2010 and 2013, California's GDP increased by almost 6.6%, passing the \$2.0 trillion mark,¹⁸ and the state outpaced national GDP growth in 2011, 2012, and 2013.¹⁹

Historically, it's been assumed unquestioningly that economic growth is accompanied by proportionate growth in GHGs (for example, burning more fossil fuels to create more goods).²⁰ As the pace of economic growth accelerates, particularly in the developing world, the future must look substantially different if the world is to succeed in averting the most dangerous impacts of climate change. California is demonstrating a different, more efficient path that breaks the link between economic and emissions growth by creating a more efficient, lower-carbon economy that produces more while burning fewer fossil fuels, a trend that will be essential to scale up globally.

California's GDP has increased steadily since 2009, but emissions have not increased proportionally (see Figure 1-1, page 6). Overall, California's economy produced approximately 6.6% less greenhouse gas pollution for every dollar of GDP in 2013 as compared to 2009.²¹ In 2011, California ranked fifth in the nation for lowest carbon intensity, or emissions per dollar of GDP, trailing only Connecticut, Massachusetts, New York, and Oregon.²²

Companies covered under California's cap-and-trade program reduced their 2013 emissions by 3.8%, or about 5.53 million metric tons of carbon dioxide equivalent (MMTCO₂e), a level that is 11% below the 2013 cap.

Emissions analysis

California companies covered by cap and trade reduced their emissions nearly 4% in the first year of the program, successfully becoming more energy efficient.

2013 GHG emissions data: On November 4, 2014, CARB released data submitted under the state's Mandatory Greenhouse Gas Reporting Rule (MRR) showing that companies covered under California's cap-and-trade program reduced their 2013 emissions by 3.8%, or about 5.53 million metric tons of carbon dioxide equivalent (MMTCO₂e), a level that is 11% below the 2013 cap. The data, which includes a minute increase in emissions not covered by cap and trade, suggests companies are responding to the price on carbon by taking steps to utilize clean energy and energy efficiency.²³

The reduction observed in 2013 of emissions capped in the first compliance period was driven largely by the decline of emissions from imported electricity. CARB has not completed a full analysis of the emissions yet, but it's likely that utility companies have begun to locate and import electricity from cleaner, renewable sources and that more importers are specifying where their power comes from in order to take credit for this cleaner generation. The data also shows small reductions in capped emissions from in-state electricity generators, while the biggest percent increases occurred from oil and gas producers and hydrogen plants. Emissions from transportation fuel and natural gas suppliers, which will be regulated during the second compliance period, stayed virtually constant.

Overall emissions reported under the MRR (including sources that are too small to be included in cap and trade) did not change significantly from 2012 to 2013, despite the noted reduction in capped emissions. This was due to an uptick in emissions not covered by the program. The largest absolute increases were observed in non-covered emissions from oil and gas producers, electricity importers, and transportation fuels. The decrease in covered emissions combined with the increase in uncovered emissions provides a strong argument for implementing the broadest possible GHG emissions cap.



Scienergy

Energy efficiency opportunities and challenges

Under a regulation approved in 2010, CARB has been investigating energy efficiency opportunities and corresponding co-benefits available in four of the large industrial sectors covered by cap and trade in California: refineries, cement, hydrogen, and oil and gas production/mineral production.²⁴ The facilities in these sectors were required to conduct one-time assessments to determine potential emissions reduction opportunities, including those for criteria pollutants and toxic air contaminants. The first report, covering 12 refineries, identified 401 energy efficiency improvement projects that were completed, ongoing, scheduled or under consideration. In total, these projects would reduce GHG emissions from these 12 facilities by about 9% annually, or 2.78 MMTCO₂e.²⁵ Similar analysis for the other three sectors also revealed substantial current and future energy efficiency initiatives.

The Climate Policy Initiative (CPI) completed a similar study last year focused on the barriers and opportunities for emissions reductions in the cement sector. The report identifies three barriers that prevent cement companies from implementing cost-effective efficiency improvements, including the need for more predictability on the availability of alternative fuels, the short payback period criteria used by cement firms, and lack of influence over purchasing practices of customers (see interview with John T. Bloom, Jr. in Chapter 4 for more information on the cement industry). Despite these barriers, the report concludes that “the carbon price signal is making a difference in how firms approach abatement decisions,” and companies participating in the study confirmed that they are currently factoring in an expected carbon price into their investment decisions and emissions reduction strategies.²⁶



CHAPTER 2

Program progress

The last day of market data collection for this report was November 30, 2014.

Market updates

After two years, California's carbon market is now fully linked with Quebec's, and is growing increasingly strong, based in large part on the successful quarterly auctions, stable prices, robust activity on the secondary market, and 100% compliance in the first phase of the cap-and-trade program.

Quarterly auctions

An **allowance** is a limited tradable authorization, like a permit, to emit up to one metric ton of carbon dioxide equivalent.

In each auction, two types of allowances are sold: **current vintage and future vintage**.

Current vintage allowances can be used for compliance starting the year they are sold and thereafter. In 2014, the current vintage allowances auctioned had a vintage year of 2014 and could be used for compliance in 2014 or beyond. Future vintage allowances can only be used three years after they are sold. The future vintage allowances sold in 2014 had a vintage year of 2017 and could only be used for compliance starting in 2017. Market participants submit bids for both types of allowances at the same time, in what is called the current and advanced auctions.

The **floor price** is the minimum bid a company can place for allowances in the auctions. In 2014, the floor price was \$11.34 and this will increase every year by 5% plus the rate of inflation.

CARB held four successful quarterly auctions in 2014 during which **allowances** were offered for sale to the market. The first three were California-only auctions, while the fourth was the first joint auction with Quebec, the Canadian province to which California has linked its cap-and-trade system. The results of all four auctions reveal a healthy market with strong participation by regulated companies and stable allowance prices. Just over 82 million **2014 vintage allowances** and 27.8 million **2017 vintage allowances** were sold, a small portion of each type coming from the Quebec program in the last auction of the year.

Settlement price: The price for 2014 vintage allowances stayed extremely steady throughout the three California-only auctions, only fluctuating by two cents (\$11.48 to \$11.50) and staying 15 cents above the **floor price** on average (see Table 2-1). This lack of any significant price change throughout the year suggests that California companies have a good understanding of their market position and their cost of compliance, and are comfortable with the use of auctions to purchase allowances.

The price of 2017 vintage allowances has remained at, or very near, the floor price through the three auctions, with a portion of these allowances going unsold in the last two California-only auctions in May and August (see Table 2-2, page 11). This is not surprising given that 2017 allowances can only be used three years in the future and many companies incur some small cost to hold these allowances in their accounts over that period of time. Future vintage allowances are inherently less valuable than current vintage allowances because they can be used for compliance for a shorter period of time. These results underscore the current expectation that prices will remain close to the floor into the next compliance period, another disincentive to buy 2017 allowances early.

All price projections are based on variable market data and are updated frequently. Before the program began, some analysts predicted allowance prices would soar to \$70 or more.

TABLE 2-1
Current auction results
California-only and first joint auction with Quebec

	2012/2013 SUMMARY	FEB 2014	MAY 2014	AUG 2014	NOV 2014 (JOINT)
Floor/reserve price	\$10.00 (2012) \$10.71 (2013)	\$11.34	\$11.34	\$11.34	\$11.34
Settlement price	\$12.00*	\$11.48	\$11.50	\$11.50	\$12.10
# allowances offered	81,052,928	19,538,695	16,947,080	22,473,043	23,070,987
% purchased	100%	100%	100%	100%	100%
# bids: # offered	1.67	1.27	1.46	1.14	1.73

*Volume-weighted average

Source: California Air Resources Board²⁷

TABLE 2-2

Advance auction results

California-only and first joint auction with Quebec

	2012/2013 SUMMARY	FEB 2014	MAY 2014	Aug 2014	NOV 2014 (JOINT)
Floor/reserve price	\$10.00 (2012) \$10.71 (2013)	\$11.34	\$11.34	\$11.34	\$11.34
Settlement price	\$10.81*	\$11.38	\$11.34	\$11.34	\$11.86
# allowances offered	77,690,000	9,260,000	9,260,000	9,260,000	10,787,000
% purchased	47.2%	100%	44%	70%	100%
# bids: # offered	0.64	1.11	0.44	0.70	1.92

*Volume-weighted average

Source: California Air Resources Board²⁸

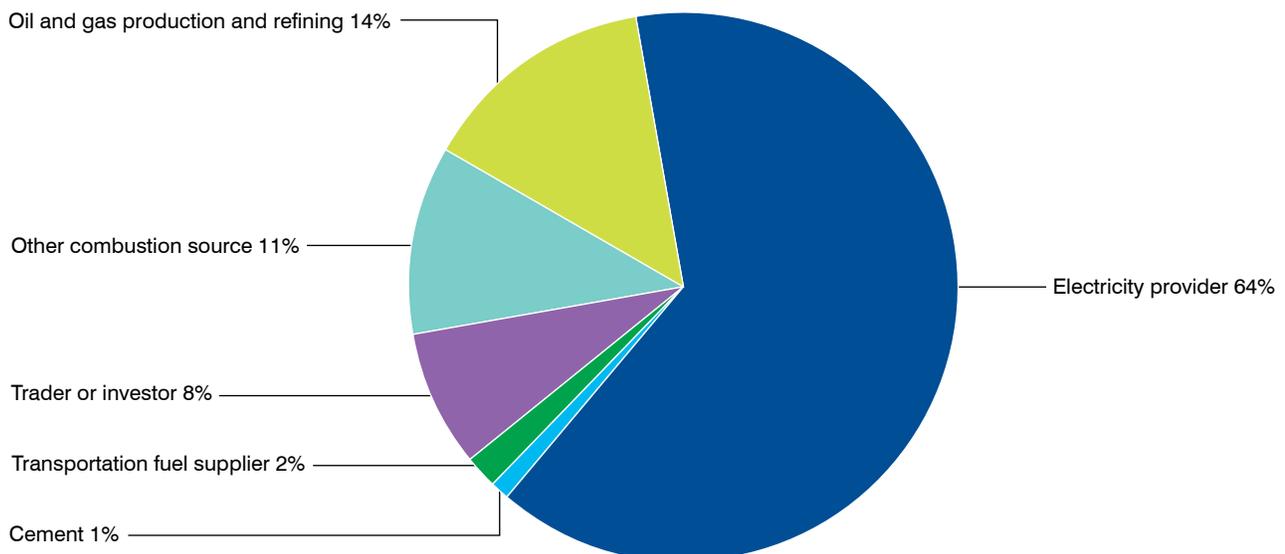
The fact that prices in both the current and advanced auctions have been at or slightly above the floor price suggests that regulated entities will be able to reduce their emissions at lower costs than previously expected. Though modest, the current \$11.34 floor price will continue to rise gradually every year, creating an incentive for companies to make early GHG reductions to lower their overall compliance costs.

Volumes purchased: All 59 million current vintage allowances that were offered for sale in the three prior California-only auctions of 2014 were purchased by auction participants, and 100% of current vintage allowances were sold in the five prior California-only auctions. These results indicate California companies are confident in the integrity and strength of the current program and are using the auctions to buy the allowances they need to comply with the regulation. Over these three 2014 auctions, there were approximately 27.5% more bids on 2014

FIGURE 2-1

Qualified bidders in quarterly auctions

California-only by sector, average



Source: California Air Resources Board²⁹

TABLE 2-3
Qualified bidders in quarterly auctions
 California-only

	2012/2013 AVERAGE	FEB 2014	MAY 2014	AUG 2014
Number of qualified bidders	80	71	74	71
% of qualified bidders that are regulated	80.9%	78.9%	79.7%	83.1%
% of current allowances that went to regulated companies	94.0%	84.5%	89.5%	87.7%

Source: California Air Resources Board³⁰

vintage allowances than actual allowances, reflecting a healthy level of interest and competition for allowances. Of the 27.8 million 2017 vintage allowances offered for sale in these auctions, 71% were purchased. Although a portion went unsold, this level of demand for allowances that can only be used three years from now shows market participants are preparing for the future.

Qualified bidders are entities that have been approved to participate in the quarterly auctions. Whether or not the approved participants actually submit bids in the auction is confidential information.

Participation: An average of 72 “qualified bidders” registered for each of the three California-only auctions in 2014, a slight decrease from the first five auctions, which had 80 registered bidders on average. Across all eight California-only auctions, 157 unique companies have registered to participate in at least one, showing that a large group of companies are becoming familiar with the auction process and are planning to use the auctions to help fulfill their compliance obligations.

The majority (64%) of qualified bidders in the eight California auctions were electricity providers, (see Figure 2-1, page 11) which includes companies responsible for in-state electricity generation, imported electricity, and cogeneration. The heavy participation of the electricity sector is unsurprising since electricity providers constituted the largest share of emissions during the first compliance period and will be second only to the transportation sector when the new compliance period begins. Between 75% and 89% of the qualified bidders in each auction were covered entities that must surrender allowances to CARB to comply with the program. Between 84.5% and 97% of the allowances offered for sale at each auction actually went to covered entities (see Table 2-3).

First joint auction with Quebec: In the last auction of 2014, entities from the California and Quebec cap-and-trade programs bid on the same pool of allowances, and results showed the auction was overwhelmingly successful. Credits from the two programs have been fungible since the beginning of 2014, meaning a California company could use an allowance that originated from Quebec’s program to meet their obligation under the program, and vice versa. The joint auction was the final step in complete harmonization, or linkage, of the two programs. In preparation for the first joint auction, CARB and its counterpart agency in Quebec, the Ministry of Sustainable Development, Environment and the Fight against Climate Change (MDDLECC), held a practice auction. This dry run enabled interested parties to become familiar with the processes and materials required to participate, and test out and provide feedback on the updated features of the auction platform, which was refined to support bidding from both jurisdictions.

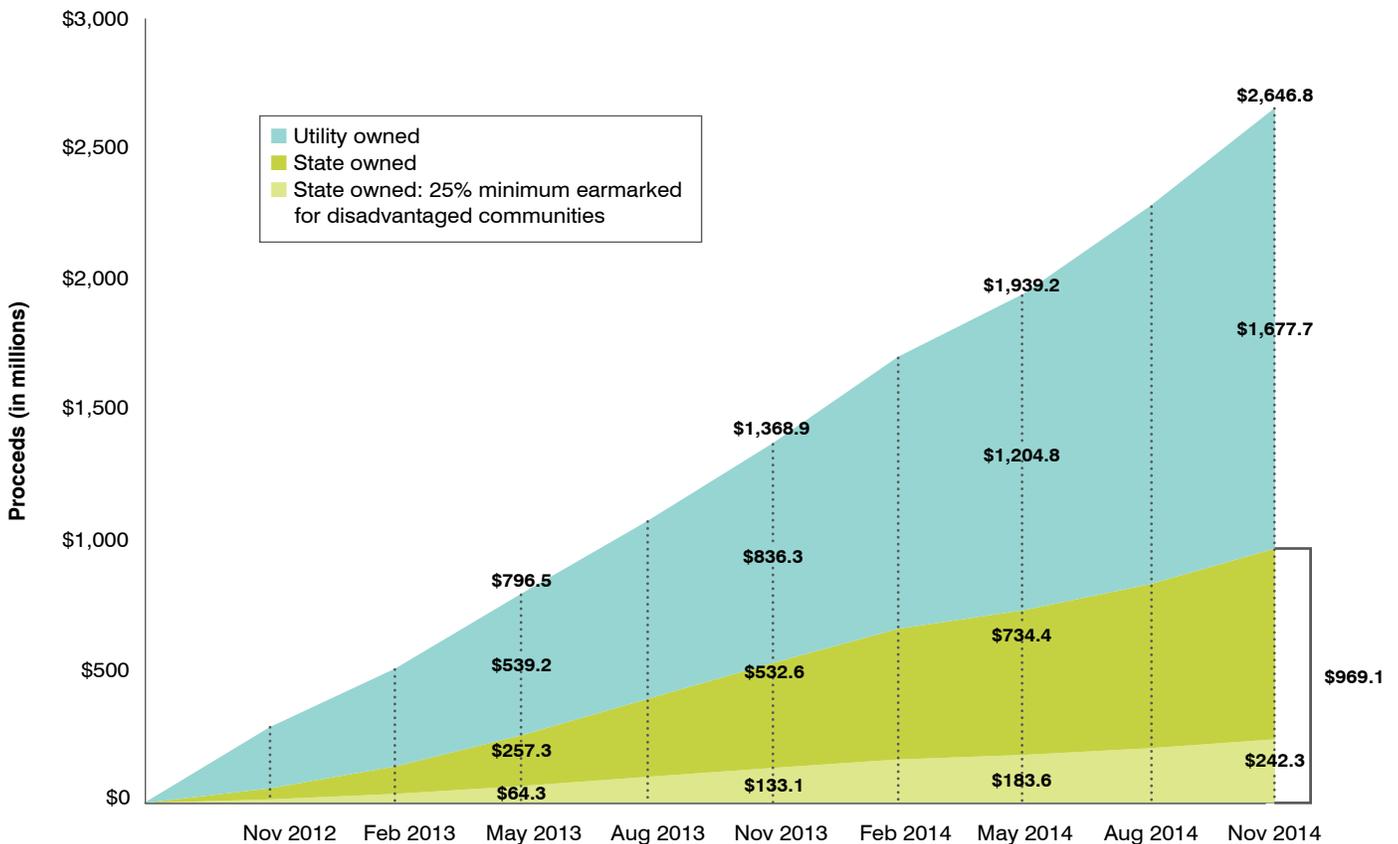
The practice auction ran smoothly, but the system experienced a technical glitch when it came time for the real auction. On November 19, the day the first joint auction was to take

place, some participants were unable to log into the system, prompting CARB and MDDLECC to postpone the auction to ensure everyone had an equal opportunity to bid. The auction was held five days later and results suggested no adverse impacts from the delay. All of the 23.1 million 2014 vintage allowances offered for sale were purchased at \$12.10 per allowance, 76 cents above the minimum allowable bid price of \$11.34 (see Table 2-1, page 10). In addition, all of the approximately 10.8 million 2017 vintage allowances offered were purchased at \$11.86 (see Table 2-2, page 11), demonstrating confidence among market participants that the linked cap-and-trade program has a long, healthy future.

The high level of demand for allowances in the inaugural joint auction was driven by several factors, all of which show that participants are preparing for the future. The first driver of demand was companies preparing for the start of the second compliance period on January 1, 2015, at which point transportation fuel suppliers will be regulated under the program. This expands the size of the market by more than a factor of two. In addition, the minimum allowable bid price was set to increase on January 1, 2015 to \$12.10, driving demand for allowances in this auction while the lower minimum bid price was still in place. Strong demand for 2017 vintage allowances is a promising indicator of confidence in the future of the program, which was buttressed by increasing discussion in California about the establishment of a long-term, post-2020 GHG reduction target in the near future.

Auction proceeds: Over the history of the program, a total of \$2.65 billion has been collected through the sale of allowances in the quarterly auctions (see Figure 2-2). \$969.1 million of

FIGURE 2-2
Cumulative proceeds from quarterly auctions



Source: California Air Resources Board³¹

this total, from the sale of state-owned allowances, has been placed in the Greenhouse Gas Reduction Fund for investment in projects that further reduce GHGs in California. At least 25% of this (\$242 million), must be allocated to projects that benefit disadvantaged communities (see “Cap-and-trade auction proceed investments,” page 18). The remaining portion (\$1.68 billion) represents allowances sold by utilities who will use the proceeds for the benefit of their ratepayers.

Secondary market

The strength and stability of the state-run auction system has been complemented by a healthy and maturing **secondary market** for allowances, characterized by stable prices and robust trading (see “Offset market,” page 15 for discussion about offset trade on the secondary market). In 2014, the clearing prices for **futures contracts** were much more stable than in previous years (see Figure 2-3, page 15). The price of the most heavily traded contract varied by just \$0.89 during the entire year, a sharp contrast to the fluctuations of \$4.82 in 2013 and \$8.55 in 2012 (see Table 2-4). The trend towards more stable, predictable prices is good for businesses, which are more able to develop a plan for compliance and make decisions about long-term investments.

TABLE 2-4

Measures of secondary market strength

MEASURE	2012	2013	FIRST HALF OF 2014	SECOND HALF OF 2014
Price fluctuation, year*	\$8.55	\$4.82	\$0.89 [†]	\$0.89 [†]
Average weekly volumes	226,058	1,348,604	2,838,154	3,757,476

*Price fluctuation over the year is measured as the difference between the highest and lowest settlement price over the year for the contract type that had the highest volume of trading over ICE.

[†]This value is for all of 2014, not just the first or second half of the year, to make the number comparable to the previous years' values.

Source: Intercontinental Exchange, Inc.

The secondary market also experienced a dramatic increase in the volume of trades during the course of 2014, an indicator of market **liquidity**, which is another good sign of market health. Average weekly trading more than doubled from 2013 to the first half of 2014, then increased again by almost 33% in the second half of 2014 (see Figure 2-3, page 15, and Table 2-4). The increase in trading is likely due to market participants becoming more familiar and comfortable with the program while preparing for the start of the second compliance period, when the market doubles in size. Regulated companies were also required to surrender allowances for the first time at the beginning of November 2014, which may have driven market activity.

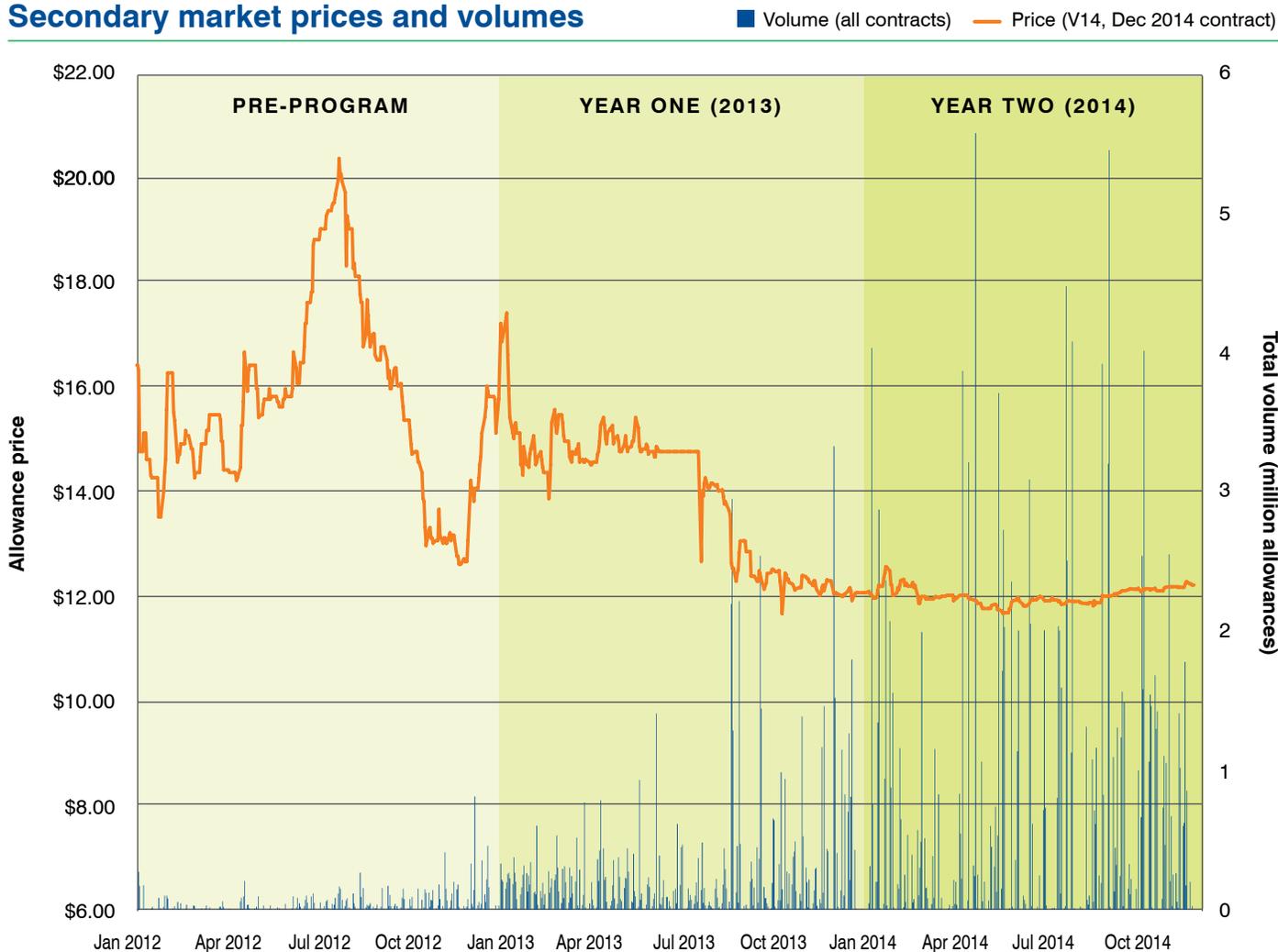
In 2013, contracts for about 25 million future allowances with vintage years 2015 and 2016 (two and three years in the future) were traded on the secondary market. By comparison, in 2014, contracts for more than 77 million 2016 and 2017 vintage allowances (again, two and three years in the future) were traded. Therefore, trading for future vintage allowances more than tripled from 2013 to 2014, demonstrating that more and more participants are making preparations for later years instead of simply purchasing allowances for immediate compliance. This is an indication that companies are gaining confidence in the long-term strength of the program. Figure 2-3 (page 15) depicts the increase in trade volumes (blue bars) coupled with more stable prices (orange line). The data demonstrates that the secondary market has continually matured and strengthened since the cap-and-trade program began in January 2013.

If entities would like to either trade allowances outside of the auctions or buy offset credits, they can do so on the **secondary market**. Trades on the secondary market involve the exchange of 1) current and future vintage allowances, 2) offset credits, or 3) contracts to deliver allowances and offsets in the future (termed “futures contracts”). These trades are cleared across the largest trading exchange in the world, the Intercontinental Exchange (ICE).

A **futures contract** is a formal, contractual agreement for one entity to deliver valid allowances or offsets to another entity in the future at a predetermined price.

Liquidity is a measure of how easy it is to convert an asset to cash or how rapidly the asset can be sold. In this market, greater liquidity signifies a healthier market because it means that companies are able to buy and sell emissions allowances in a timely manner to fulfill compliance obligations.

FIGURE 2-3
Secondary market prices and volumes



Source: Intercontinental Exchange, Inc.

Offset market

The offsets market has expanded over the past year, with CARB growing the potential offsets pool by fully approving one new protocol and taking the first of two steps to approve a second. Most existing protocols have seen a steady increase in the overall number of offsets credits issued as well.

At the beginning of 2014, only offsets within four approved project types could be generated and sold into California's program: U.S. forestry projects, urban forestry projects, destruction of ozone depleting substances (ODS), and livestock projects. CARB added a mine methane capture protocol and is expected to fully approve a rice cultivation offset protocol in early 2015. Since the first CARB-certified offsets were issued and became available for sale into the market in September 2013, the total pool of offsets has grown steadily, with approximately 904,500 offsets being issued per month on average. Approximately 13.6 million offsets have been issued to date, just under half (6.66 million) being ODS offsets, and the rest being U.S. forestry (6.23 million) and livestock offsets (0.68 million) (see Table 2-5 and Figure 2-4, page 16). No certified offsets under the urban forestry protocol have been issued, likely because these projects remain too costly. Due to its recent regulatory approval, no mine methane capture offsets have yet been issued.

TABLE 2-5
Offset credits issued by CARB

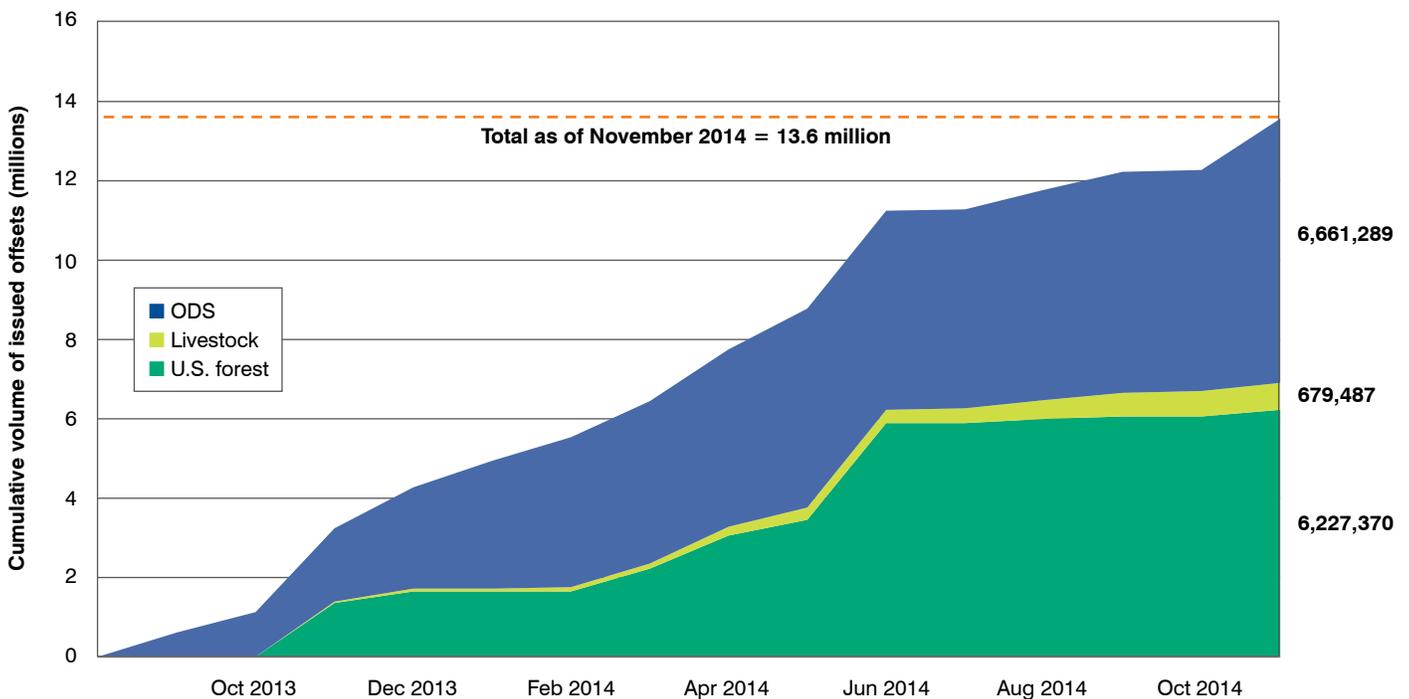
PROJECT TYPE	ODS	LIVESTOCK	U.S. FOREST	URBAN FOREST	MINE METHANE CAPTURE
Compliance	1,645,536	72,831	3,378,928	–	–
Early action	5,015,753	606,656	2,848,422	–	–
Total	6,661,289	679,487	6,227,370	0	0

Source: California Air Resources Board³²

There is a period of up to eight years following offset issuance during which CARB can decide, upon investigation and findings of fact, to invalidate an offset due to calculation issues, double selling, or environmental non-compliance. This invalidation window can be shortened to three years if the offset is verified twice by two different CARB-accredited verification bodies, a process that should give the credits higher market value due to the lower invalidation risk. This double verification occurred for the first time in April 2014, for an ODS project developed by Diversified Pure Chem, an important milestone marking the maturation of the offset market.

In May 2014, CARB initiated an investigation of ODS offset credits generated by the company Clean Harbors on the grounds of potential non-compliance with environmental laws. During the investigation, over four million credits were taken out of the market to prevent them from being traded. After a thorough review, CARB invalidated about 2% of the offsets that were called into question, representing less than 1% of the total offsets market at the time (see “ODS Offset invalidation,” page 25). The investigation and subsequent invalidation process took about five months from start to finish, during which time activity on the offset market decreased

FIGURE 2-4
Cumulative offset credits issued by CARB by month



Source: California Air Resources Board³³

substantially as participants waited to find out the outcome of the investigation and reassess their invalidation exposure. The final determination was made in time for companies to retire offsets for the first compliance period and move into the second compliance period with updated knowledge about the invalidation process and risk. During the course of the investigation, CARB issued almost 3.8 million credits (see Figure 2-4, page 16), increasing the pool of available offsets credits by more than 40%.

Allowance surrender

On November 3, 2014, covered companies were required for the first time to surrender allowances—enough to cover 30% of their 2013 emissions—to demonstrate compliance with the cap-and-trade program. By this day, each covered entity had to transfer the appropriate number of allowances from their holding account to their compliance account. CARB reports that 100% of regulated companies met their requirement, a significant milestone demonstrating that entities are committed to complying with the program and are aware of what is expected of them moving forward.

Quebec auction results

Prior to the successful joint California-Quebec auction in November 2014, Quebec held four of its own quarterly auctions which were considerably smaller than the California-only auctions due to the size of Quebec's program, roughly one-sixth of California's. There was greatest interest in the first Quebec auction, with the highest number of bidders registered and the most total bids made across both the current and advanced auctions (see Table 2-6). Although the percentage of allowances purchased in the first auction was smaller than in subsequent auctions, a greater number of allowances were offered for sale. The number of bids and qualified bidders dropped slightly in the next auction, although the relative number of allowances being auctioned was smaller. The third auction had very similar results, followed by another drop in number of bids in the final auction. This muted interest is attributable to the fact that Quebec entities do not have to surrender any allowances until November 2015, unlike California, where entities had to surrender allowances for the first time in November 2014. This delayed surrender requirement means that Quebec entities could be waiting to engage in the market and may still be evaluating how they will comply.

The results of the last Quebec-only auction in August 2014 show that Quebec entities were poised to benefit from having a larger, better functioning market. In this auction, 66% of the 2014 vintage allowances were purchased, while 95% of the 2017 vintage allowances were

CARB reports that 100% of regulated companies met their [allowance surrender] requirement, a significant milestone demonstrating that entities are committed to complying with the program.

TABLE 2-6
Current auction results
Quebec-only auctions

	DEC 2013	MAR 2014	MAY 2014	AUG 2014
Floor/reserve Price (in Canadian dollars, or CAD)	\$10.75	\$11.39	\$11.39	\$11.39
Settlement price (in CAD)	\$10.75	\$11.39	\$11.39	\$11.39
# allowances offered	2,971,676	1,049,111	1,049,111	1,049,111
% purchased	34%	99%	100%	66%
# of qualified bidders	19	16	15	14

Source: The Ministry of Sustainable Development, Environment and the Fight against Climate Change³⁴

TABLE 2-7
Advance auction results
 Quebec-only auctions

	DEC 2013	MAR 2014	MAY 2014	AUG 2014
Floor/reserve price in Canadian dollars, or CAD)	\$10.75	\$11.39	\$11.39	\$11.39
Settlement price (in CAD)	\$10.75	\$11.39	\$11.39	\$11.39
# allowances offered	6,319,000	1,527,000	1,527,000	1,527,000
% purchased	27%	84%	85%	95%

Source: The Ministry of Sustainable Development, Environment and the Fight against Climate Change³⁵

purchased (see Table 2-7), a seemingly counterintuitive result considering 2014 vintage allowances should be more valuable than 2017 allowances as the latter can be used for an additional three years of compliance. It is possible that entities were not aware of this distinction when bidding, or there may have been so few bidders that one entity's bidding strategy impacted the whole auction. Similarly, the floor price at the August auction was lower than in the first joint California-Quebec auction because of the conversion rate between Canadian and U.S. dollars, indicating there should have been greater demand for the cheaper allowances in the August pool. Overall, the relatively low volume of bidding suggests that Quebec entities were still gaining experience with the market prior to the first joint auction.

Cap-and-trade auction proceed investments

Investments of the revenue generated by the cap-and-trade auctions will help California move towards an energy efficient, low-carbon economy.

As described in the "Auction proceeds" section (page 13) California's cap-and-trade auctions have already raised hundreds of millions of dollars in proceeds. California has held nine quarterly allowance auctions to date, raising a total of \$969.1 million for the Greenhouse Gas Reduction Fund (GGRF). At the direction of California decision makers, proceeds will be reinvested to reduce climate pollution and benefit the economies, health, and environment of California's communities. These investments play an important role in fulfilling the goals and objectives of AB 32, but it is also important to note that because the cost of carbon, and thus the cost for an allowance, is set by the cap, allowances have inherent value whether they are auctioned or not. Decisions about how this value is distributed throughout the economy are essential aspects of the design of any cap-and-trade program.

Allowance value

In a cap-and-trade program, the overall number of allowances is set by the cap and demand is determined by the quantity of emissions generated by companies regulated under the system, since all polluters must turn in an allowance for every ton they produce. As with most products in a market-based system, allowance value reflects the balance between supply and demand. Allowance auctions are one way that CARB distributes this limited supply of allowances. Revenue collected from the auctions is either returned to electricity customers as a climate credit or reinvested in the economy through the GGRE.

California has held nine quarterly allowance auctions to date, raising a total of \$969.1 million for the Greenhouse Gas Reduction Fund.

Cap-and-trade benefits communities and serves as a model for the world

By Senate President Pro Tempore Kevin de León

California is a thriving state and a leading global powerhouse—the eighth largest economy in the world—bigger than the economies of nations like Russia and Italy. We are a state known for our innovation and pioneering efforts in technology, business, entertainment, and sports, as well as in how we address environmental challenges.



When California officially launched the price on carbon pollution two years ago, I knew we were on the brink of something big. Carbon pricing is an important tool to level the playing field between high polluting fossil fuels and clean renewable energy. To ensure success, I have spent much of my time in the legislature ensuring the rules of the road are the tightest in the world.

California has not waited for Washington D.C. to act—the effects of climate change are real and happening now. Fire, drought, flooding, and unhealthy air are realities that impact Californians. Inaction is not an option when the costs of waiting are so high and when action can benefit communities across the state.

By pricing carbon pollution, we are laying the foundation for a green economy with good jobs and cleaner air that is

an example for the world. A key element to the cap-and-trade program is the accompanying investments made possible by no longer allowing carbon polluters to pollute for free. In 2014 alone, we directed over \$850 million towards projects that move us towards a clean, low-carbon economy. As a product of a landmark bill I championed, neighborhoods that are low-income and highly polluted will be directly benefitting from these investments. Thanks to SB 535, a law I authored in 2012, we are showing the world that fighting climate change also means more green-collar jobs such as driving the most cutting-edge clean cars, trucks and buses to make our cities less polluted or providing energy retrofits in low-income apartments to lower household energy bills. In turn, parents won't have to worry as much about children suffering asthma attacks and missing school and work as a result. These benefits from the cap-and-trade program and other clean transportation policies add up to major savings, an estimated \$8.3 billion in pollution-related health costs alone by 2025.

California is seeing big pay-off on our resolve to safeguard California's communities, environment, and economy. Our two year old cap-and-trade program is ratcheting down dangerous carbon pollution while strengthening our economy through deployment of energy efficiency and clean technology. With the world watching California, and coming to our doorstep to partner with us, we as lawmakers have a duty to protect and strengthen the program to guarantee progress well into the future.



Senate President Pro Tempore Kevin de León speaks during Governor Jerry Brown's January 2015 inauguration.

California decided to provide industrial polluters with some free allowances to help them transition into the program and to help them remain economically competitive with similar out-of-state businesses not subject to climate regulation. This free allowance allocation system is a method by which California provides value directly to regulated businesses to protect the economy and foster clean economic growth.

Investments can deliver myriad benefits

All state proceeds collected through the cap-and-trade auctions are placed into the GGRF and must be used to reduce GHGs. However, both AB 32 and legislation passed in 2012 outline other important policy priorities that must be considered when investing GGRF funds, including ensuring benefits to disadvantaged communities, cutting emissions cost-effectively, and maximizing societal benefits to the environment, economy, and public health.³⁶ Pursuing these policy priorities is often referred to as “furthering the purposes of AB 32.” By investing auction proceeds in programs that cut greenhouse gas emissions in the state, California can accelerate pollution reductions while delivering on these larger policy objectives.

California’s decisions about investing proceeds have immense impact on the legal durability of the cap-and-trade program. In the fall of 2012, the California Chamber of Commerce (joined by the Pacific Legal Foundation in early 2013) sued California, arguing that the auctions constitute an illegal tax. The state’s decision to use the proceeds to reduce GHGs and further the regulatory purposes of AB 32 was the foundation of the District Court judge’s ruling that the auctions do not constitute an illegal tax under California law. Alternative uses of the auction proceeds, including dividends for California residents or reductions in distortionary taxes, may not have been viewed as favorably by the Court.

By investing auction proceeds in programs that cut greenhouse gas emissions in the state, California can accelerate pollution reductions while delivering on these larger policy objectives.

Legislative investment decisions in 2014

The budget for fiscal year 2014-2015 passed on June 15, 2014 and appropriated the first \$832 million of cap-and-trade revenue. Accompanying bills (enacted as part of the state budget) provided further direction for future fiscal years. Senate Bills (SBs) 852 and 862 establish long-term funding streams for transit, sustainable communities, affordable housing, and high-speed rail (see Figure 2-5, page 21). Both bills require 25% of this funding to be invested in programs that benefit disadvantaged communities in California, in accordance with the mandate established by SB 535 (de León) in 2012. SB 1204 (Lara) directs CARB to fund development, demonstration, and deployment of zero and near-zero emission trucks, buses, and off-road vehicle and equipment technologies, with a focus on disadvantaged communities. SB 1275 (de León) requires CARB to develop a long-term funding plan to meet the goal of putting one million electric cars, trucks, and buses on California’s streets while ensuring that low-income and disadvantaged communities benefit from this transition. Earlier in 2014, the Legislature amended the 2013–2014 budget to include \$30 million for electric vehicle rebates and \$40 million for water efficiency projects, bringing the total amount of appropriated cap-and-trade funds to \$902 million.

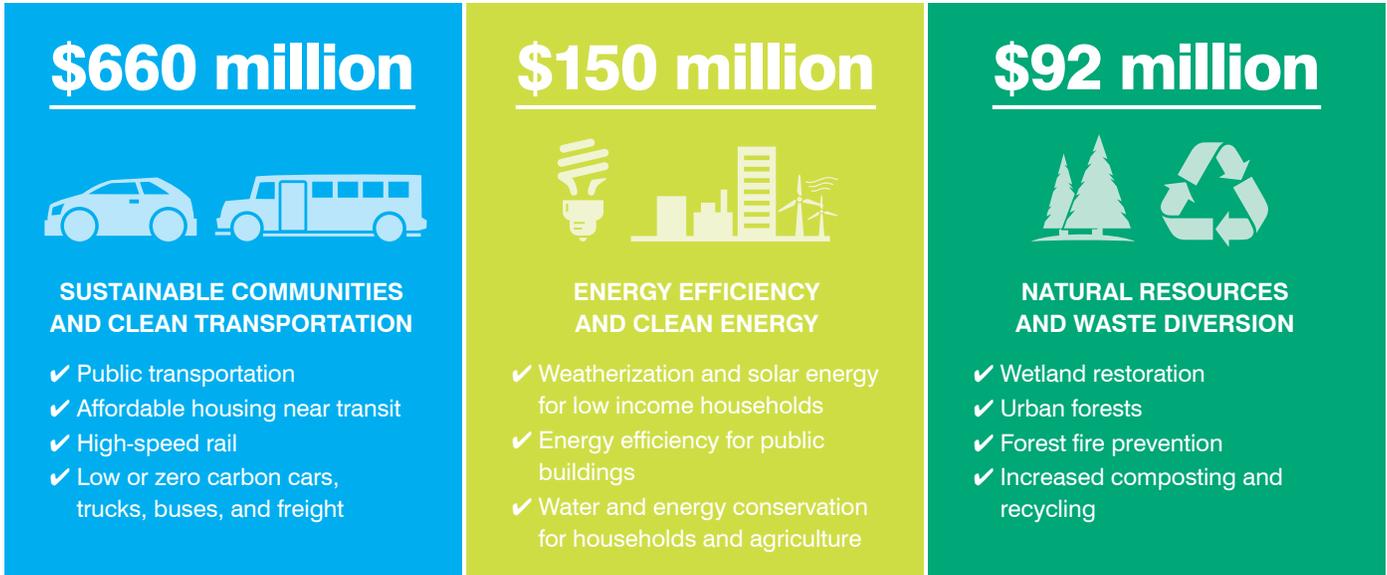
Public process to implement GGRF investments

Legislative action is critical, but not the only component of the cap-and-trade proceeds investment process. The diversity of investments outlined by the Legislature means 12 different California agencies will be responsible for directly making investments in communities with CARB providing guidance and oversight throughout the process. There are many other important steps California is taking to get investment dollars into communities:

FIGURE 2-5
Greenhouse gas reduction fund, 2013–2015

How will the \$902 million be used?

This year, more than 30% of cap-and-trade proceeds will benefit California’s most impacted communities



Source: California Air Resources Board³⁷

- **CalEnviroScreen Tool:** SB 535 (de León, 2012) requires that at least 25% of investments benefit California’s most disadvantaged communities. The Office of Environmental Health Hazard Assessment (OEHHA) developed a first-of-its-kind mapping tool to pinpoint the location of these communities, using 12 environmental factors and seven demographic and socio-economic factors. The tool, called the CalEnviroScreen, creates scores for each of the state’s 8,000 census tracts, which are widely used to analyze demographic data.
- **CARB SB 535 Guidance:** In September 2014, the CARB board adopted guidance for agencies administering SB 535 funds.³⁸ The guidance defined what it means to “benefit” a disadvantaged community, directed agencies to conduct public outreach and gather input in target communities, and provided examples of the types of benefits that agencies should maximize while simultaneously reducing GHGs. CARB estimated that 32% of the investments made in 2014–2015 would benefit disadvantaged communities, well above the 25% minimum requirement.
- **Expenditure Record:** Before disbursing funds, each agency must submit their expenditure record to CARB for approval. The expenditure record documents how each agency plans to invest cap-and-trade funds and how that investment will lower greenhouse gases and further the purposes of AB 32. CARB staff and attorneys review the record to ensure compliance with all legislative requirements. All approved expenditure records are then made publicly available.
- **Quantifying Reductions and Benefits:** CARB is also responsible for developing guidelines for agencies to quantify and track the GHG reductions and associated benefits of all investments. Draft guidelines should be released in early 2015, and final guidance will be approved in 2015 after public comment.

- **Three-Year Investment Plans:** CARB is required to develop a cap-and-trade investment plan every three years to help guide the Legislature as it appropriates proceeds annually through the budget. The first investment plan was completed in 2013, with the next due in 2016. The public outreach process for the second investment plan is likely to start in 2015.

Experts identify likely benefits from cap-and-trade investments

Several steps remain before the cap-and-trade investments translate into real, tangible projects in communities. Although it is too early to measure outcomes, a wealth of research exists that provides a window into the likely environmental and economic benefits of these investments:

- **Next 10 and UC Berkeley:** A report released in 2012 looked at California’s options for investing cap-and-trade proceeds and analyzed economic impacts of 18 different expenditure scenarios, many of which are similar to the actual 2014–2015 investments.³⁹ Researchers modeled the impact of a \$100 million investment on gross state product (GSP), state tax revenue, and jobs. Although there was significant variability, all scenarios delivered monetary benefits that far exceeded the investment. For example, investing \$100 million in residential building energy efficiency would increase GSP by \$875 million, generate \$56 million in new state tax revenue, and create 8,751 new job-years.
- **ICF, Inc.:** A report released in 2013⁴⁰ explored the benefits of using allowance value in five different ways: 1) a lump sum dividend to all California residents; 2) investments in energy efficiency; 3) investments in clean transportation; 4) a blended strategy of options one through three; and 5) free allocation of allowance to the fuels sector, which is covered under the program as of January 1, 2015. The results found that all scenarios created benefits greater than would occur if proceeds were diverted into the **General Fund**, an option that had been proposed by state budget officials. The results showed that energy efficiency and clean transportation investments resulted in the most job growth, and that a dividend maximized equity and income growth. Investing in clean transportation would create about 75% more jobs than providing free allowances and providing a

The GGRF is a special fund with a specific purpose whereas the **General Fund** is where tax dollars are collected and then spent via the state budget.

TABLE 2-8
Benefits of cap-and-trade investments

EXPENDITURE	ENVIRONMENTAL/HEALTH FACT	ECONOMIC FACT
Sustainable communities Transit-oriented development that puts low-income people closer to public transportation and other conveniences	“Smart growth” policies mean that we will need 75% less land to accommodate California’s growing population, preserving it for agriculture, watersheds, and forests. ⁴¹	The average Los Angeles resident could save \$11,000 per year by switching from driving to using public transportation. ⁴²
Clean transportation/zero emission cars Californians receive tax credits for purchasing an electric vehicle	An electric car reduces dangerous air pollution by over 90% compared to a conventional car. ⁴³	Electric vehicle drivers save between \$2-3 per gallon compared to gasoline. ⁴⁴ Every \$1 saved on gasoline creates \$16 of economic benefit for the state economy, and lower income Californians benefit most. ⁴⁵
Clean energy Solar photovoltaic (PV) systems on universities or multi-family, low-income housing	Unlike coal and natural gas, solar power produces no GHGs or other harmful pollutants, and uses almost no water to operate.	Almost 50,000 jobs could be created if 10% of solar capacity in Los Angeles County was realized. ⁴⁶
Waste diversion Increasing composting and non-traditional recycling (e.g., fibers)	Diverting 75% of solid waste away from landfills (as required by 2011 legislation) would reduce GHG emissions by an additional 1.7 million tons beyond earlier targets set in 2005. ⁴⁷	Meeting the goal of increasing waste diversion to 75% by 2020 is expected to result in 110,000 new jobs by 2020. ⁴⁸

dividend would increase incomes by 20% more than free allocation. California's current investment strategy that combines GGRF investments and a "climate credit" to electricity consumers is most similar to the blended strategy that can provide both jobs and income benefits to Californians.

- **Analysis Group and RGGI, Inc.:** Nine northeastern states currently participate in the Regional Greenhouse Gas Initiative (RGGI), a cap-and-trade program for the electricity sector. RGGI launched in 2009 and auctions 100% of its allowances, raising a total of \$1.9 billion through December 2014.⁴⁹ The RGGI states primarily invest auction proceeds in categories also identified as priorities for California: energy efficiency, clean and renewable energy, research and development for GHG abatement technologies, and direct bill assistance.⁵⁰ A 2011 Analysis Group report showed that RGGI states turned \$912 million in proceeds from the first three years of cap and trade into \$1.6 billion in economic value for state economies and created 16,000 new job-years.⁵¹

Table 2-8 (page 22) shows potential investments from each expenditure category, and identifies key environmental, health, and economic facts associated with each.

California climate credit

In March 2014, the California Public Utilities Commission (CPUC) and CARB announced that each household purchasing electricity from an investor-owned utility (IOU), electric service provider, or community choice aggregation provider in California would receive a credit on their April and October electricity bills as a result of the cap-and-trade program. The so-called California Climate Credit is designed to protect ratepayers from increases in electricity prices due to the cap-and-trade program. The credit amounts to 85% of the revenue collected from CARB's sale of the allowances allocated to the California IOUs—the rest of the funds are used for the benefit of small businesses and manufacturers. The average credit in 2014 was \$70 per household. The credit may increase in the future if electricity consumers significantly decrease their aggregate energy use and/or electricity providers invest substantially in GHG reductions.⁵²

The average credit in 2014 was \$70 per household.

Regulatory and agency updates

CARB strengthened the cap-and-trade program in 2014 through amendments to the regulation and enforcement actions taken against companies that had violated program requirements. California is on track to meet its 2020 GHG emissions cap and to comply with the Environmental Protection Agency's (EPA's) recently-announced Clean Power Plan.

Amendments

CARB maintains an on-going dialogue with regulated entities, academics, market experts, and other stakeholders to assess how the cap-and-trade program is working and what if any changes are needed. Technical amendments to the cap-and-trade regulation often emerge from this process, including a series of changes that were approved by CARB's board in April 2014 and took effect on July 1. The new amendments included, but were not limited to:⁵³

- additional cost containment mechanisms (i.e. limited borrowing from future years to replenish the allowance price containment reserve as needed)
- adoption of a Mine Methane Capture (MMC) offset protocol

Resource shuffling is defined by CARB as “any plan, scheme, or artifice to receive credit based on emissions reductions that have not occurred, involving the delivery of electricity to the California grid.”⁵⁴

- updates on allocation to the natural gas sector specifying that utilities will receive free allowances but must auction a minimum of 25% in 2015 and 50% in 2020. Further compliance rules will be decided by the CPUC
- modifications to existing benchmarks for allowance allocation to certain sectors
- increased transition assistance into the second compliance period for the industrial sector
- specification of retirement order for compliance surrender (i.e. offsets and reserve allowances are retired from compliance accounts first)
- definition of activities that do not constitute **resource shuffling** in the electricity sector
- additional provisions to improve CARB’s ability to monitor the market, including a disclosure requirement for entities voluntarily in the program that may have a relationship with covered or “opt-in” entities

On July 29, 2014, CARB proposed another round of technical amendments, which were approved by CARB’s board at their September 18, 2014 public meeting, during which staff were asked to make additional changes. The new amendments included, but were not limited to:⁵⁵

- clarification of how tomato producers quantify their product data
- adjustment of allowance allocation for two covered entities based on new information
- removal of the exemption for imported carbon dioxide
- updates to the Ozone Depleting Substances, Livestock, and U.S. Forestry offset protocols
- modification of requirements related to corporate association disclosures and offset transfer price reporting

On December 18, the CARB board directed staff to move forward with the work necessary to potentially adopt a sixth offset protocol at a future board meeting in 2015. The protocol involves U.S.-based projects that reduce methane emissions associated with rice cultivation.

California’s new offset protocol for rice cultivation

By Robert Parkhurst, Agriculture Greenhouse Gas Markets Director at Environmental Defense Fund

Rice is one of California’s largest crops and contributes more than \$5 billion a year and 25,000 jobs to the state’s economy. Throughout the growing season, rice farms serve as important wetland habitat, but they can also release large amounts of methane, a potent greenhouse gas. Research has shown that growers can implement practices that cut methane while protecting wildlife habitat and maintaining rice quality and yield. Practices such as dry seeding, early drainage, and alternate wetting and drying all fit this category, but have not been widely used.

The new rice offsets protocol would give rice farmers, many of whom are found in California’s Central Valley, the opportunity to generate offsets if they reduce methane emissions and meet stringent quality requirements. For example, rice producers must provide both historical and current information to certified third party verifiers to ensure the emissions reductions are real and accounted for accurately.

This new financial incentive can help rice growers earn more money while protecting the environment. Since the protocol rewards methane reductions that are avoided, the reductions are permanent and the methane will never be released into the atmosphere.

Throughout 2014, CARB took several enforcement actions against parties in violation of the regulation, demonstrating the high level of vigilance with which they are monitoring the program.

First update to the Climate Change Scoping Plan

Under AB 32, CARB was required to develop a Scoping Plan laying out recommended measures that would reduce California's emissions to 1990 levels by 2020. The Scoping Plan, completed in 2008, contained a suite of regulations, including a cap-and-trade program, that are being implemented and that have put California on track to meet the 2020 mandate.

AB 32 also required CARB to update the Scoping Plan at least every five years. CARB released a draft First Update to the Scoping Plan in the fall of 2013, and the final was adopted by the CARB board in May 2014. This update is a comprehensive planning document that takes a sector-by-sector (transportation, energy, natural and working lands, agriculture, waste management, water, short-lived climate pollutants, and green buildings) approach to evaluating California's progress to date and recommending future actions to reduce GHG emissions. The overarching conclusions include:

- California is on track to meet its 2020 target.
- The state's economy is growing and thriving even as emissions decline.
- California should begin planning for reductions after 2020 and should set a mid-term (2030) target for GHG reductions.
- California needs to be even more comprehensive in its approach to tackling climate change, including incorporating short-lived climate pollutants, natural resources, waste, water, and agriculture even more directly into climate action strategies.

Enforcement actions

CARB is responsible for monitoring the cap-and-trade program and enforcing compliance with the regulation when necessary. Throughout 2014, CARB took several enforcement actions against parties in violation of the regulation, demonstrating the high level of vigilance with which they are monitoring the program.

GHG emissions reporting violations:⁵⁶ Accurate GHG emissions reporting is vital to the health and integrity of the cap-and-trade program. On January 27, 2014, CARB issued close to \$1 million in fines against three companies for late or inaccurate reporting of their 2011 GHG emissions. Chevron U.S.A. Inc. was penalized for reporting incorrect emissions information for one of its refineries, and failing to correct the data for 243 days. Chevron North America Exploration and Production Company was also fined for not reporting emissions from one of its oil fields, an error the company neglected to correct for 219 days. Finally, Southwest Gas Corporation was fined for being 320 days late in submitting the necessary report regarding natural gas supplied to California.

Bidding violations:⁵⁷ On February 20, 2014, CARB fined four companies between \$25,000 and \$75,000 for violations committed during auction bidding. Southern California Edison, Luminus Energy Partners QP, L.P., and CP Energy Marketing (US), Inc. were fined for confidentiality breaches that involved disclosing information to third parties regarding auction participation and bidding, actions strictly prohibited by the regulation to prevent collusion among market participants. The City of Riverside was also fined for submitting a bid at auction that exceeded its financial bid guarantee, an amount stipulated by CARB that ensures each entity can, and will, pay for the allowances it bids on.

ODS offset invalidation:⁵⁸ On May 29, 2014, CARB began an investigation of ODS offset credits issued to a project at a Clean Harbors Incineration Facility. Evidence showed that the facility

may not have been in compliance with its operating permit issued under the federal Resource Conservation and Recovery Act (RCRA) at the time some of these offsets were generated. All of the approximately 4.3 million ODS offsets from this facility were called into question. After an in-depth investigation, CARB determined that the Clean Harbors Incineration Facility was not operating in accordance with its RCRA permit on February 2–3, 2012. CARB released a preliminary determination invalidating the 231,154 offset credits generated on those two days; however, on November 14, 2014, after a 10-day comment period during which a more detailed timeline of events was uncovered, CARB moved to invalidate only 88,955 credits, which were generated before 4 p.m. on February 3. At the time of the invalidation, these credits represented less than 1% of the market, which totaled 12.6 million credits (see “Offset market,” page 15).

United States EPA’s Clean Power Plan

On June 2, 2014, EPA proposed the Clean Power Plan (CPP)—a rule that would use existing legal authority under section 111(d) of the Clean Air Act to establish the first nationwide limits on carbon dioxide (CO₂) pollution from existing power plants. The CPP contains state-specific emission intensity targets based on each state’s unique generating portfolio and potential to deploy four key emission reduction measures—known as “building blocks”—that many states and utilities are already putting in place to reduce carbon pollution from the power sector. Each state has a 2030 emissions intensity target, and average emissions intensity targets for the period from 2020 to 2029. States have tremendous flexibility to adopt a range of policies that are cost-effective and tailored to local conditions and circumstances. Under the President’s Climate Action Plan, EPA has committed to finalizing the CPP by June 2015, and state plans establishing standards consistent with the CPP must be submitted by June 2016. The CO₂ emissions limit on the power sector begins in 2020.

EPA anticipates that the flexible framework proposed in the CPP will reduce CO₂ emissions from the power sector to 30% below 2005 levels by the year 2030—yielding not only vital climate benefits, but also urgently needed reductions in other harmful pollutants from the power sector such as sulfur dioxide, nitrogen oxides, and particulate matter. These emission reductions will yield significant near-term public health benefits: according to EPA, in 2030 the CPP will lead to 6,600 fewer premature deaths, 150,000 fewer asthma attacks in children, and 490,000 fewer missed work and school days. The total benefits of the rule will reach approximately \$55 billion to \$93 billion per year by 2030, or approximately six to eleven dollars in benefits for every dollar spent on compliance.⁵⁹

The four building blocks used to develop the CPP targets include:

1. improving efficiency of existing fossil fuel power plants
2. shifting generation from high-emitting power plants to lower-emitting units
3. expanding use of zero-emitting generating resources, such as renewables and nuclear
4. increased end-use electricity efficiency

In evaluating the building blocks, EPA considered potential emission reductions, cost-effectiveness, energy requirements, and other health and environmental impacts.⁶⁰ States have wide latitude to choose from a broad range of policy measures to achieve their state-wide emissions target, and are not confined to the building block measures. California and other states that have adopted cap-and-trade programs have the flexibility to translate their emissions intensity targets into an equivalent annual limit on total CO₂ emissions from the power sector (what EPA calls a “mass-based” target). This flexibility is a core component of the CPP and allows each state to tailor its plan in a way that is most cost-effective and consistent with its own energy landscape and policy objectives.⁶¹

These emission reductions will yield significant near-term public health benefits: according to EPA, in 2030 the CPP will lead to 6,600 fewer premature deaths, 150,000 fewer asthma attacks in children, and 490,000 fewer missed work and school days.

California is well-positioned to comply with the CPP, thanks to its successful implementation of AB 32 and long history of clean energy policies. California's interim carbon intensity goal (the average for years 2020–2029) under the proposed CPP is 556 lbs CO₂/MWh and its final 2030 goal is 537 lbs CO₂/MWh. In meeting these goals, California will be able to draw on a number of existing policies that will reduce emissions from its generating fleet over the coming years—including not just the cap-and-trade program, but also California's nation-leading energy efficiency programs and strong renewable portfolio standard. Recently, the California Energy Commission, with help from CARB and the CPUC, conducted a preliminary projection of the state's CO₂ emissions rates in 2020, 2024, and 2030. This analysis found that with current environmental programs in place and a relatively clean mix of energy, California is already on track to meet the EPA's proposed targets.⁶² California has not publicly announced what existing policies will be submitted to EPA as part of the state's plan for CPP compliance (due in 2016), but it is clear that the state is already making progress towards the necessary reductions within the power sector.

Legislative update

2014 was a banner year for AB 32 in the California Legislature. Several bills designed to strengthen AB 32 were passed while measures that would have harmed or derailed the program failed to move forward.

The 2014 legislative session delivered a number of significant environmental successes, including a package of bills tackling short-lived climate pollutants, methane emissions, and clean cars, trucks, and buses that Governor Brown presented at the United Nations (UN) Climate Summit in New York City in September. A number of bills related to cap and trade were considered, though only measures related to the distribution of auction proceeds were approved:

- **Auction proceed bills:** The Legislature made several key decisions about cap-and-trade auction proceeds, mostly through the annual budget process (see “Cap-and-trade auction proceed investment,” page 18).
- **Tax-and-dividend proposal:** On February 20, 2014, then-President pro Tempore of the California Senate, Darrell Steinberg, introduced legislation (SB 1156) that would have created a carbon tax for the transportation fuel sector with a dividend to low- and medium-income Californians. The bill would have exempted transportation fuels from complying with California's cap-and-trade program. The stated intent of the legislation was “addressing the inseparable connection between climate change and social inequality.”⁶³ While agreeing with many of the bill's objectives, AB 32 advocates raised serious concerns about weakening the successful cap-and-trade program and allowing fuels producers to avoid the mandatory GHG emissions limit. Two months after introducing SB 1156, Senator Steinberg changed his focus, leading an ultimately successful campaign to create a permanent source of funding for “sustainable and affordable housing and mass transit” from cap-and-trade auction proceeds.⁶⁴
- **Planning for reductions beyond 2020:** Several bills were introduced that supported the idea of setting ambitious GHG reduction targets beyond 2020. SB 1156, the Steinberg tax-and-dividend bill, included a finding about the need for longer-term reduction targets. SB 1125 (Pavley and Lara) would have directed CARB to set a 2030 reduction target for GHGs and short-lived climate pollutants by January 1, 2016. AB 2050 (Quirk) would have directed CARB to conduct specific economic analysis for existing AB 32 programs and set a 2050 target, as well as interim GHG reduction targets. While the authors ultimately did not take these bills up for final votes, interest from the Legislature in post-2020 GHG reduction targets will likely re-emerge in future Legislative sessions.

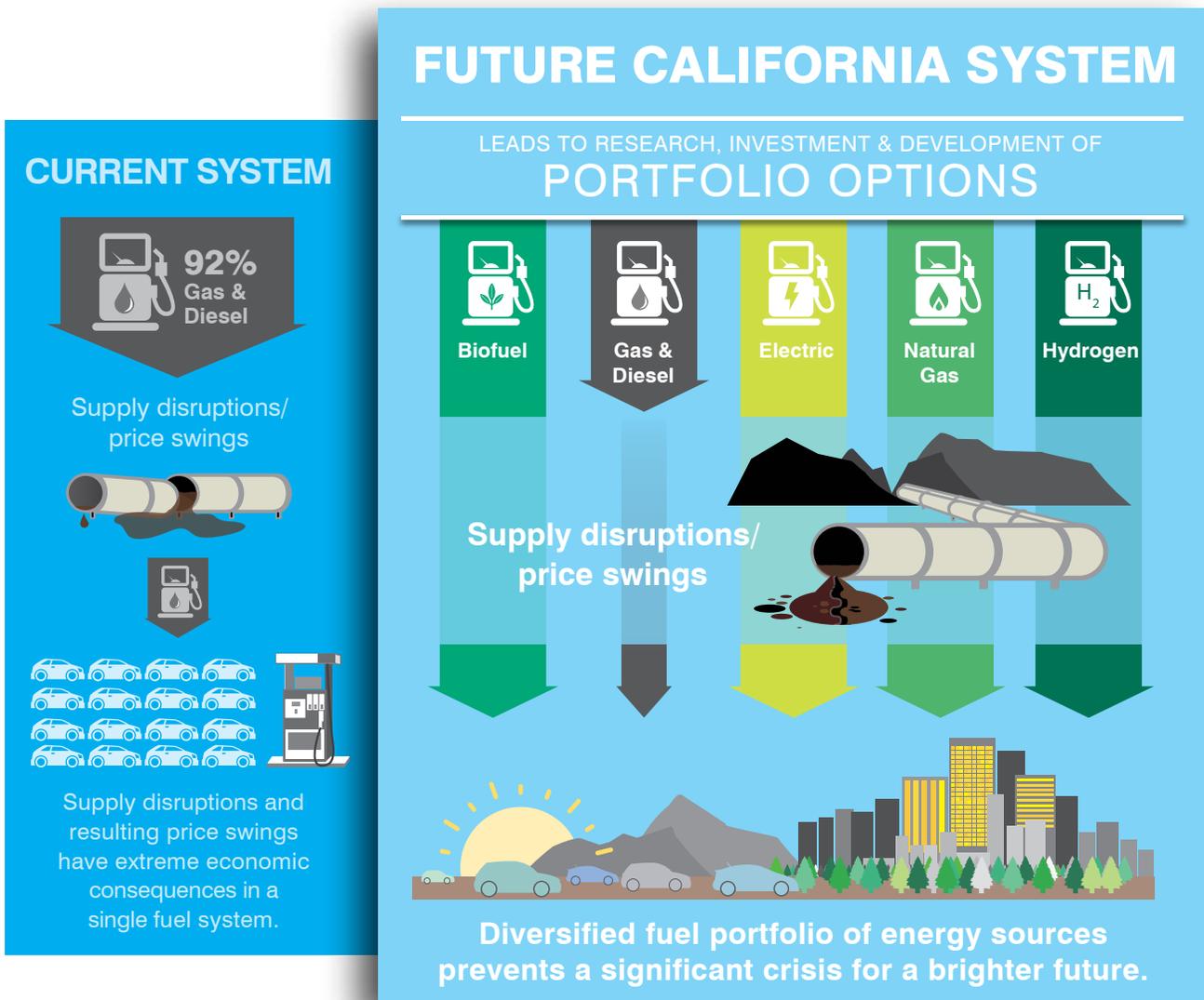
FIGURE 2-6

What is the “portfolio effect”?

The portfolio effect is an investment term that refers to a strategy of investing in many different types of instruments instead of just one (“diversifying an investment portfolio”) to reduce the risk associated with any one investment going bad. Risks that might otherwise greatly affect a portfolio with only one or two investments have much less effect when a portfolio contains several investments. The same concept can be applied to the fuel mix in California. The more alternative fuels (biofuels,

electricity, hydrogen, etc.) available for customers to use across the board, the less California will be dependent on one fuel type and the less the state’s economy will be affected by price swings or shortages of any one fuel. Portfolios reduce volatility overall, meaning better ability to manage pricing changes across the economy. California is moving towards a more diversified portfolio through its suite of climate policies, like cap and trade and the Low Carbon Fuel Standard.

THE PORTFOLIO EFFECT: A tale of two fuel systems



Source: California Energy Commission⁶⁵

“Gut-and-amend” is the practice of amending a bill to remove the current contents in their entirety and replace them with different provisions.⁶⁶

Holding limits are the provisions that limit the number of allowances any one entity can own in order to foreclose opportunities to manipulate the market by hoarding allowances.

- **Removing GHG emissions limits on transportation fuels:** In June and July, two bills unrelated to climate underwent a **“gut-and-amend”** process. AB 69 (Perea) would have delayed inclusion of transportation fuels in the cap-and-trade program for three years, and SB 1079 (Vidak) would have stopped the expansion of cap and trade to fuels altogether. Despite a highly-visible and well-resourced campaign attacking the “fuels in the cap” regulation, the legislative session ended without either bill’s passage. Mr. Perea has since announced that next year he plans to focus on directing more cap-and-trade proceeds towards electric vehicle rebates and charging infrastructure in the Central Valley.⁶⁷

In response to this campaign, 74 economists sent a letter to CARB Chair Mary Nichols outlining the benefits of regulating fuels under the cap. The letter stated that “by establishing a price for carbon reductions within the transportation sector, California will shift toward diversification of its transportation fuel mix through the creation of powerful economic signals to investors.”⁶⁸ Fuel diversification protects the economy from price volatility and reduces California’s vulnerability to supply disruptions in the crude oil market, termed the “portfolio effect” (see Figure 2-6, page 28). The letter also explains that, over time, fuel diversification will decrease demand for, and lower the price of, gasoline and diesel.

- **Other technical adjustments:** AB 985 (Cooley) sought to make significant technical adjustments to cap and trade. First, the bill attempted to ease the allowance **holding limits** that the cap-and-trade regulation places on large polluters. The bill also sought to modify corporate disclosure requirements which are now being addressed through a regulatory amendment process at CARB. AB 985 did not pass.

Legal update

California continues to successfully defend AB 32 against legal challenges, and no major new legal actions were brought against the cap-and-trade program in 2014.

CARB has prevailed in each of the most recent judicial decisions involving AB 32 and the cap-and-trade program. In each case, opponents have appealed these decisions, and most legal activity in 2014 was associated with the appeal processes. The one new lawsuit brought in 2014 relates to the use of cap-and-trade proceeds to partially fund the construction of a California high-speed rail system.

Low Carbon Fuel Standard Constitutional Challenge: In 2010, corn ethanol and oil interests sued CARB over the Low Carbon Fuel Standard (LCFS), arguing that it violated Federal Constitution provisions related to disrupting interstate commerce, preemption, and regulating beyond state borders. The LCFS is a policy designed to reduce the carbon intensity of fuels sold in California 10% by 2020. Though the LCFS is not part of the cap-and-trade program, many experts have expected that similar challenges could have also been brought against the cap-and-trade program. The 9th Circuit Court of Appeals issued a favorable decision for CARB in October 2013, and plaintiffs appealed the ruling. On June 30, 2014, the U.S. Supreme Court declined to hear the case, leaving the 9th Circuit’s favorable decision in place and sending the case back to the trial court, where parties await decision on issues not reached in the first round of litigation.

Auction Challenge: In November 2012, the California Chamber of Commerce sued CARB arguing that the agency did not have authority to hold auctions and that auctioning allowances resulted in an illegal tax. Morning Star Packing Co., a regulated entity, along with other small businesses represented by the Pacific Legal Foundation, filed a similar suit in February 2013 that was considered with the Chamber case. In November 2013, the Sacramento Superior Court

UN Secretary-General Ban Ki-moon described carbon pricing as “one of the most powerful tools available for reducing emissions and generating sustainable development and growth.”

found that CARB does have authority to hold auctions and that tax law does not impose a restriction on auctioning carbon allowances if proceeds are used to reduce GHGs. Both plaintiffs appealed the case and the appellate briefing started in October 2014. Ultimately, the result of this case will provide more clarity on what legal restrictions exist for spending auction proceeds.

Offsets Challenge: In 2012, the Citizens Climate Lobby and Our Children's Earth challenged the use of offsets under California's cap-and-trade program, claiming that CARB had not demonstrated that California offsets protocols represent GHG emissions reductions that would not have occurred in the absence of the offsets credit. In 2013, the state trial court ruled in favor of California, offering unequivocal support for the legality of the offsets program. Our Children's Earth appealed the decision and the case was heard before the California Court of Appeal in December 2014.

High-Speed Rail Challenge: The Transportation Solutions Defense and Education Fund has challenged the inclusion of a high-speed rail (HSR) project in CARB's Scoping Plan and the use of auction proceeds to partially fund it. The challenge points to requirements under AB 32 and the California Environmental Quality Act (CEQA), arguing that HSR will not effectively reduce GHG emissions. Although auction proceeds must be used to reduce GHG emissions, the parameters of what this means are not yet clear. The outcome of cases such as this could affect the record that a state agency must develop in order to fund projects with cap-and-trade auction proceeds.

California: A proving ground for climate action

As other jurisdictions establish carbon pricing regimes, including cap-and-trade programs, they are increasingly looking to learn from California's success and experience. According to the World Bank, nations and regions representing 52% of global GDP have stated their support for putting a price on carbon as a necessary tool to fight climate change and transition to a low-carbon economy.⁶⁹

California is implementing the largest economy-wide cap-and-trade program in the world, building off lessons from previously established programs such as the **European Union Emissions Trading System (EU ETS)** and the **Regional Greenhouse Gas Initiative (RGGI)**. Two years into implementation, experience and expertise from California's program is in high demand by other governments considering how and whether to design their own market-based policies.

Global interest in carbon pricing was on full display at the UN Climate Summit held in New York at the end of September 2014. Governments, businesses, and investors announced their support for carbon pricing as a critical tool for cutting GHG emissions and averting the most dangerous impacts of climate change (see Figure 2-7, page 31). These governments represent 54% of global greenhouse gas emissions, 52% of global GDP, and nearly half of the global population. UN Secretary-General Ban Ki-moon described carbon pricing as “one of the most powerful tools available for reducing emissions and generating sustainable development and growth.”⁷⁰

In his speech at the UN Climate Summit, California Governor Jerry Brown stated, “I believe that from the bottom up we can make real impact, and we need to join together.”⁷¹ Throughout 2014, California has demonstrated its commitment to working with other jurisdictions, creating new alliances and building on previously established partnerships.

Linkage with Quebec: California officially linked its cap-and-trade program with Quebec's as of January 1, 2014, making allowances from both jurisdictions entirely interchangeable

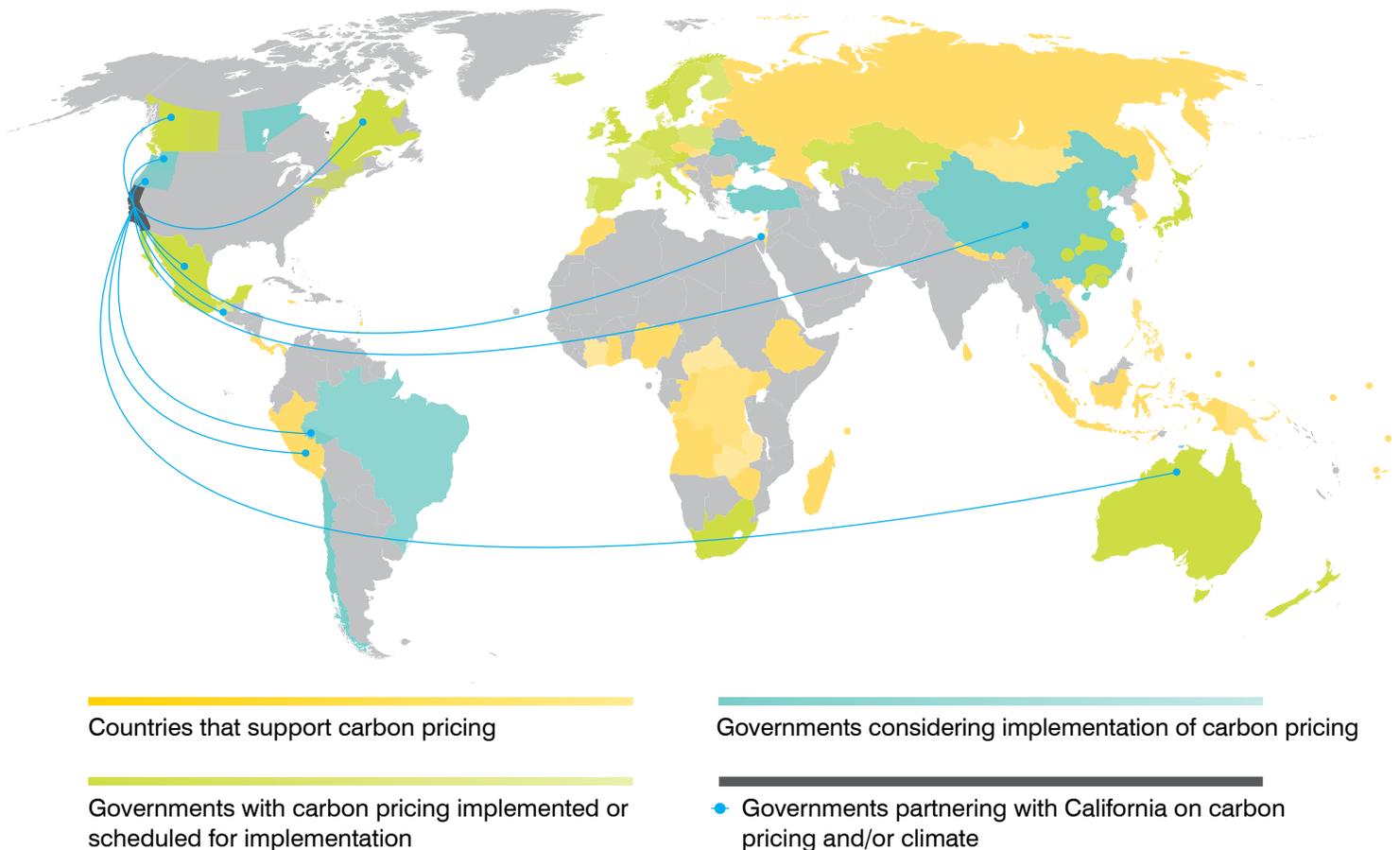
A larger market can be created through the harmonization of separate systems, an outcome that may pave the way for similar linkages around the world.

(for a summary of the first joint auction, the final linkage step, see “Quebec auction results,” page 17).

The culmination of the California-Quebec linkage is an important milestone, demonstrating that a larger market can be created through the harmonization of separate systems, an outcome that may pave the way for similar linkages around the world. Linking can benefit both jurisdictions, as the expanded market creates a larger portfolio of emission reduction opportunities available for regulated companies. With this larger portfolio of options, companies have flexibility to tailor the most cost-effective compliance strategies, reducing overall emission reduction costs and increasing program efficiency. The larger pool of regulated companies in the combined market is also likely to produce more frequent trading activity, reducing the chance of sudden spikes in allowance prices given the continuous stream of buyers and sellers coming to market.

Memorandum of Understanding (MoU) with China:⁷² In September 2013, Governor Brown and Vice Chairman Xie Zhenhua of the National Development and Reform Commission signed an agreement exclusively focused on combatting climate change, an event that foreshadowed the joint announcement made by President Obama and Chinese President Xi Jinping in November 2014. China is the largest GHG emitter in the world and has plans to slow emissions growth and ultimately to peak its carbon emissions on or before 2030. Seven pilot cap-and-trade programs

FIGURE 2-7
Carbon pricing worldwide



Source: The World Bank⁷³

are underway in China, in five of the country's cities (Shenzhen, Beijing, Shanghai, Tianjin, and Chongqing) and two of its provinces (Hubei and Guangdong). These pilots are providing lessons learned and helping build capacity in the run up to 2016 when China is expected to launch a national program that would be the largest in the world. Under the California-China MoU, government officials have exchanged expertise and information about their respective cap-and-trade programs and have sent delegations to the respective jurisdictions to learn directly from stakeholders on the ground.

Memorandum of Understanding with Mexico:⁷⁴ During Governor Brown's trade mission to Mexico in July, California and Mexico signed an MoU committing to enhanced collaboration between the two jurisdictions on climate change, human and environmental health, air quality, wildfires, and clean vehicles. The MoU was signed by Governor Brown, Undersecretary Rodolfo Lacy Tamayo of Mexico's Secretariat of the Environment and Natural Resources (SEMARNAT), and General Director Jorge Rescala Pérez of the National Forestry Commission of the United Mexican States. The two governments will share information and resources about policies and programs of mutual interest, and they identified carbon pricing as an important area for collaboration (Mexico implemented a carbon tax on most fossil fuels in 2014 and is considering cap and trade). See interview with Soffia Alarcón-Díaz, page 45 for more information.

Memorandum of Understanding with Peru:⁷⁵ In February, Governor Brown and Henry Forsyth, the Ambassador of Peru to the United States, came together to sign an agreement to work on issues of mutual concern, including climate change. The MoU calls for the exchange of "experts and joint projects in climate change mitigation and adaptation policies, air quality, forest management, water quality, and water management."

The carbon pricing movement

By Katie Sullivan and Katie Kouchakji, International Emissions Trading Association (IETA)

Carbon pricing is having its moment. Since the disappointing UN climate negotiations in Copenhagen in 2009, we have seen a coalition of the willing evolve across all levels of national, sub-national, and regional governments; the EU ETS, the New Zealand ETS, and the RGGI are no longer the only games in town. China has launched seven pilot cap-and-trade programs as testing grounds for an eventual national program, which would dwarf any other ETS out there—similar stories are playing out in California, Kazakhstan, and the Canadian provinces, while South Korea's ETS launches in 2015. Meanwhile, Mexico has introduced a carbon tax, with an offset program, and similar plans are underway in Chile and South Africa.

In total, the World Bank's State and Trends of Carbon Pricing 2014 report found that about 60 national and sub-national jurisdictions have introduced, or are in the process of designing, carbon pricing programs. To compound this existing activity, 74 governments, 23 sub-national authorities, and more than 1,000 businesses signed the Bank's joint statement on carbon pricing, released ahead of the UN Climate Summit in September 2014.

The hope is that the UN's 2015 Paris climate agreement facilitates the continued development of national and sub-national carbon pricing initiatives, including multilateral programs such as California and Quebec's linked market. **The carbon pricing moment is on track to becoming a movement**, and our companies will be working hard to support the development of markets that can potentially link with one another and the future UN framework.

Capping the aviation sector

By Annie Petsonk, International Counsel at Environmental Defense Fund

Airplanes pollute, spewing carbon dioxide into the atmosphere and worsening climate change. And airlines are growing—fast. Boeing and Airbus forecast that by the time today's first-graders graduate college, 30,000 new large jets will have taken to the skies. Given the rapid growth of this industry's emissions, many are calling for a cap on CO₂ pollution from aviation.

In October 2013, after a decade of inaction, the International Civil Aviation Organization (ICAO)—the intergovernmental agency that sets safety, security, and environmental standards for flights between different countries—decided to develop a cap on the emissions of international flights. The proposal envisions that airlines will be able to use carbon markets to help meet their caps. ICAO set October 2016 as the date for finalizing the program and in the meantime, they are looking at programs like California's to learn about program design.

NGOs, companies, and countries are working with ICAO to define how airlines will measure and report their carbon pollution, and design a program that gives airlines incentives to cut emissions, while giving them access to high-quality carbon credits. The program will need to ensure that if airlines burn biofuels, those fuels are produced in ways that drive emissions down, not up. And it will need to impose tough consequences if airlines fail to meet their targets.

Industry has made clear that it wants a single global market-based system under ICAO rather than a patchwork of different national regulatory programs. Having aviation cap and price carbon through a well-designed market-based measure would provide a powerful example of global cooperation on cutting carbon pollution—and let us all travel the world more responsibly.

Memorandum of Understanding with Israel:⁷⁶ Governor Brown and Israeli Prime Minister Benjamin Netanyahu signed a wide-ranging agreement in March, pledging to develop joint projects to tackle common challenges, including climate change. Both parties agreed to foster the exchange of ideas between their experts and academics on topics such as water conservation and management, alternative energy, and clean technologies.

Pacific Coast Collaborative: California signed an agreement with Washington, Oregon, and British Columbia in October 2013 committing all jurisdictions to pursue common policy approaches, including carbon pricing. Both Governor Kitzhaber of Oregon and Governor Inslee of Washington have announced recently that climate change and carbon pricing policies are priorities for their respective administrations.⁷⁷ Governor Inslee set up a task force that has evaluated both a carbon tax and cap and trade. The task force released its final report on November 17, 2014, laying out the benefits and challenges of each policy, but not recommending one or the other.⁷⁸ The Northwest Economic Research Center recently released a report in compliance with Oregon Senate Bill 306⁷⁹ that explored a “carbon tax and shift.” The report found that this approach can reduce distortionary income taxes, reduce GHG emissions, and have positive impacts on the economy.⁸⁰

Timeline of important milestones: 2014

JAN

- **1/1** Linkage with Quebec's cap-and-trade program begins.
- **1/9** Governor Brown proposes 2014-2015 budget and commits to repaying borrowed cap-and-trade proceeds.
- **1/10** China announces that it will consider establishing a nation-wide trading system for pollution permits.

FEB

- **2/19** California Auction #6
- **2/19** SB 1125 legislation (Pavley and Lara) is introduced and calls for deep cuts in climate pollution beyond 2020.
- **2/20** Senator Darrell Steinberg proposes legislation to take transportation fuels out of the cap-and-trade program and instead impose a carbon tax on sector.
- **2/20** California Chamber of Commerce appeals court decision ruling in favor of the cap-and-trade program.
- **2/26** California signs Memorandum of Understanding with Peru.

MAR

- **3/4** Quebec Auction #2
- **3/5** California signs Memorandum of Understanding with Israel.
- **3/31** CPUC and CARB announce the California Climate Credit, which will be distributed through utility customers' April and October electricity bills.

APR

- **4/14** Senator Steinberg changes his carbon tax proposal (see 2/20, 2014) to a long-term investment strategy for projected cap-and-trade revenues.
- **4/23** The first offsets with a three-year invalidation period are issued by CARB and enter the market.
- **4/25** CARB approves the cap-and-trade regulation amendments and new mine methane offset protocol.

MAY

- **5/16** California Auction #7
- **5/22** CARB approves First Update to the Climate Change Scoping Plan, noting California is on track to meet 2020 goals, and recommending California set a mid-term GHG emissions reduction target.
- **5/27** Quebec Auction #3
- **5/29** CARB announces they will be reviewing compliance offset credits for ODS destruction events at the Clean Harbors Incineration Facility.

JUN

- **6/2** EPA proposes Clean Power Plan to cut greenhouse gas pollution from existing power plants.
- **6/15** California Legislature passes a budget that includes investments of cap-and-trade proceeds to reduce climate pollution, improve health, stimulate the economy, and benefit disadvantaged communities.
- **6/20** Governor Brown signs 2014–2015 state budget.
- **6/30** U.S. Supreme Court declines LCFS case, leaving in place the 9th Circuit decision upholding the program.

● **Market events**

● **Global collaboration events**

● **Legal events**

● **Legislative events**

● **Regulatory and agency events**

JUL

- **7/2** AB 69 (Perea) is the first of three bills introduced that attempts to delay or stop fuels being regulated under the cap-and-trade program.
- **7/28** California signs Memorandum of Understanding with Mexico.
- **7/29** CARB proposes technical amendments to the cap-and-trade regulation.

AUG

- **8/7** California and Quebec hold practice joint auction.
- **8/16** CalEPA releases major update to CalEnviro Screen to direct investments to disadvantaged communities based on socioeconomic and pollution burden data.
- **8/18** California Auction #8
- **8/26** Quebec Auction #4
- **8/31** The California legislative session ends without passage of any bills that would create an obstacle for regulating fuels under the cap-and-trade program starting January 1, 2015.

SEP

- **9/18** CARB adopts guidance for SB 535 investments and technical amendments to the cap-and-trade regulation.
- **9/21** Governor Brown signs package of environmental bills prior to the UN Climate Summit, including SB 1204 and SB 1275 to use cap-and-trade proceeds to incentivize advanced clean cars, trucks, and buses.
- **9/23** Governor Brown speaks at the UN Climate Summit in New York City, highlighting the vital role of sub-national climate programs on the international stage.

OCT

- **10/8** CARB releases a preliminary decision to invalidate about 5% of the Clean Harbors Incineration Facility's ODS offset credits called into question on 5/29.

NOV

- **11/3** First surrender of cap-and-trade allowances.
- **11/14** After taking public comments, CARB releases final decision to invalidate only a portion of the ODS offset credits from Clean Harbors Incineration Facility identified in their preliminary decision made on 10/8.
- **11/18** The CPUC issues Proposed Decision finalizing the 2015 rules for natural gas utility participation in C&T program.
- **11/25** California and Quebec hold first joint auction.

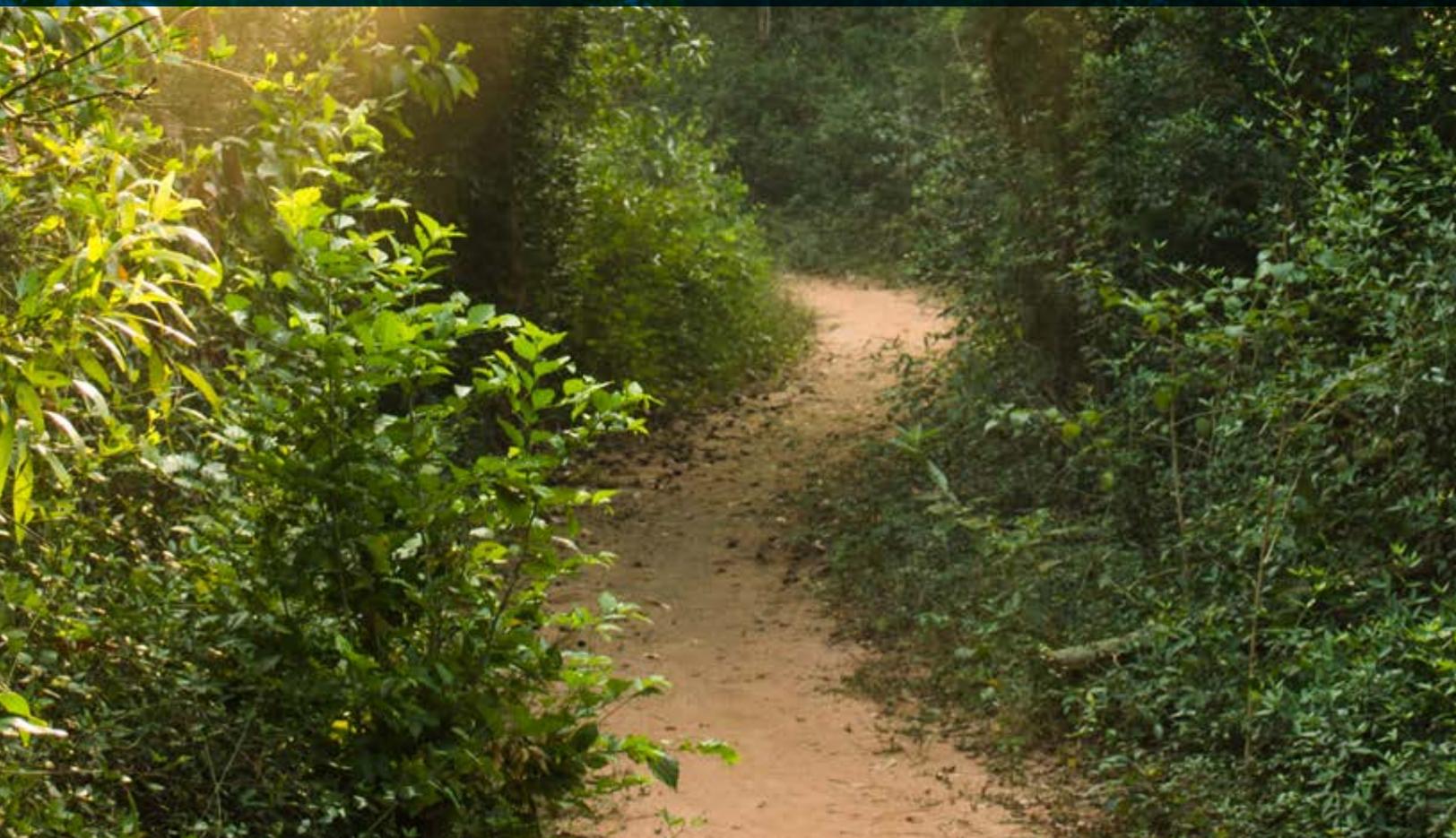
DEC

- **12/09** Oral arguments are heard in offset case appeal.
- **12/18** CARB board directs staff to bring the Rice Cultivation Offset Protocol to the board for final consideration in 2015.
- **12/31** End of Compliance Period 1.



CHAPTER 3

The path forward / 2015 milestones

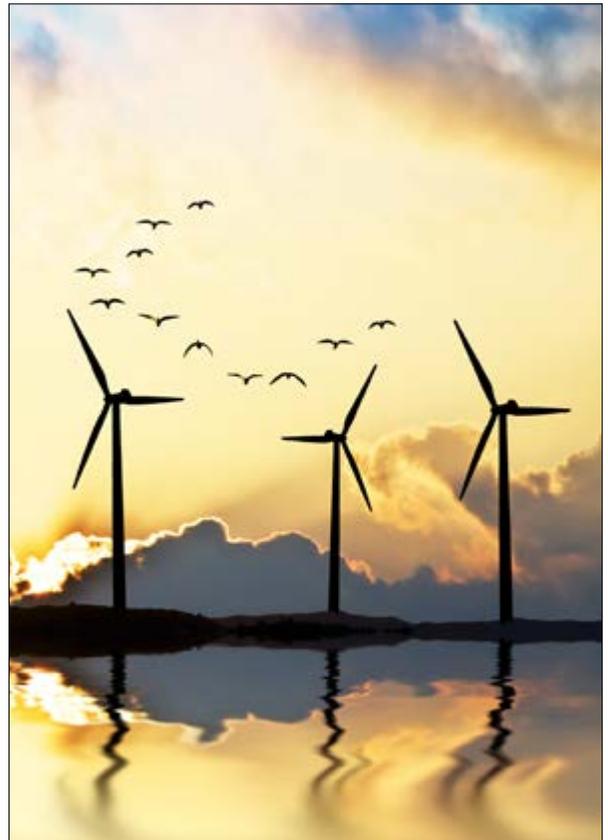


2015 is shaping up to be a year of important milestones that stand to further burnish California's reputation as a climate policy trailblazer with a record of effective policy implementation.

The strong performance of California's cap-and-trade program during Compliance Period One, along with analyses indicating that California is well on its way toward meeting AB 32's 2020 mandate, has built a strong foundation for future action inside and outside of California. From start to finish, 2015 is shaping up to be a year of important milestones that stand to further burnish California's reputation as a climate policy trailblazer with a record of effective policy implementation.

Cap-and-trade expansion: On January 1, 2015, the cap-and-trade program more than doubled in size, as the transportation fuels and natural gas distribution sectors are now regulated under the program. The transportation system is responsible for 38% of the state's total emissions, the most pollution of any sector, and California and Quebec are now the only jurisdiction in the Northern Hemisphere with a cap-and-trade system that covers fuels.

Post-2020 policy development: The Brown administration and the Legislature, along with other key stakeholders, have been ramping up discussions about post-2020 reduction targets and approaches, with the goal of putting California on the path to achieve 80% GHG reductions (below 1990 levels) by 2050. Senator Fran Pavley has already introduced legislation that sets a 2050 cap with potential interim targets in 2030 and 2040. This issue will be deliberated during the 2015 Legislative session, which ends in September. There is broad support for ambitious post-2020 climate action in California, and Governor Brown committed to setting a long-term target during his September 2014 speech to the UN Climate Summit.



GGRF investments: This summer, the Governor and Legislature will hammer out a 2015–2016 state budget that will include another round of GGRF investments that will further cut GHG pollution and benefit communities in the state.

Allowance surrender: In November 2015, businesses in California and Quebec must surrender allowances to cover emissions from Compliance Period One (2013–2014). 30% of 2013 allowances have already been surrendered by entities covered by the California program.

UN COP-21 in Paris: In November and December 2015, national and sub-national leaders from around the world will descend on Paris for the 21st Conference of Parties (COP) to negotiate an agreement on post-2020 climate action. California is expected to have a substantial presence at the conference, and the role of sub-national action and the commitments states and cities around the world are making to take action on climate will be highlighted.

A man in a dark suit is seen from the back, pointing his right hand towards a group of people in a blurred office setting. The background shows a modern office with large windows and other people in business attire.

CHAPTER 4

Expert interviews

EDF interviewed four experts involved with the California cap-and-trade program to glean their unique perspectives on how the state's "grand experiment" is working. These interviews include discussions about major trends in the market, California's international climate partnerships, the economic importance of adding transportation fuels to the program, and the program's effect on regulated companies during the first compliance period.

John T. Bloom, Jr.

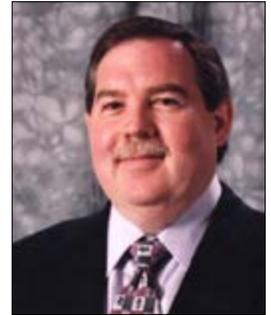
VICE PRESIDENT AND CHIEF ECONOMIST / CEMEX

“In an effort to reduce our GHG emissions, [our company has] invested in new fuel systems to substitute low carbon fuels for fossil fuels.”

—John T. Bloom, Jr.,
Vice President and Chief
Economist, CEMEX

Leakage is defined by CARB as “a reduction in GHG emissions within the state that is offset by an increase in GHG emissions outside the state.”

Professional background: John Bloom is Vice President and Chief Economist for CEMEX’s U.S. operations and is Chairman of the Coalition for Sustainable Cement Manufacturing & Environment that includes all cement companies in California. CEMEX is a global building materials company with operations in over 50 countries and is a founding member of the World Business Council for Sustainable Development’s Cement Sustainability Initiative. Prior to joining CEMEX, Mr. Bloom was Vice President of Planning & Development for Southdown, which CEMEX acquired in 2000. Mr. Bloom has over 25 years of experience in the construction industry and holds a Bachelor’s degree from Colgate University and a Master’s degree in economics from the University of Chicago.



Q: How has California’s carbon market fared in the first compliance period?

A: It has been functioning well. The auctions are going smoothly and the prices are relatively stable and close to the floor. The auction platform was set up successfully and the Compliance Instrument Tracking System Service (CITSS) platform tracks all trading. Covered entities are also getting free allowances based on their leakage risk as they are supposed to under the program rules. So thus far, we don’t see any problems with the carbon market from our perspective.

Q: What do you think are the most important features of a carbon market?

A: I think in terms of the general design of a cap-and-trade program, you want a framework that is environmentally effective, economically efficient, and equitable. Those goals are achieved with the government setting the state-wide emissions cap and letting the market determine the price of carbon. Putting a price on carbon is critical to achieving cost-effective emission reductions, but it is also extremely important to minimize **leakage** to the greatest extent feasible to insure that the program is environmentally effective and equitable. The government allocates free allowances as a function of each sector’s leakage risk using carbon intensity benchmarks which reduces the risk of leakage while maintaining the incentive to reduce emissions. I do believe it is best to use this market-based approach, as it provides the appropriate incentives for all covered entities to look at the carbon price and determine what they can do in the most cost-effective and economical way to optimize their market position. At the end of the day, those who can reduce carbon most cost-effectively do so, and those who can’t end up having to buy allowances. So, a carbon market provides covered entities with more flexibility in meeting their compliance obligations in a cost-effective and equitable way compared to a mandatory approach.

Q: Is California doing all it can do to be cost-effective, equitable, and minimize leakage?

A: I personally believe there should be a more robust carbon offset market to have a program that is as cost-effective as possible. Naturally, CARB wants to make sure the protocols they approve are sound and meet all the necessary criteria, but the market would benefit from more offsets and this is a good way to extend incentives for carbon abatement outside California.

Q: What has the process been for submitting comments to CARB? Has CARB’s regulatory process been transparent?

A: I think it has been a very good and transparent process. CARB had advisory committees on the technical and market sides, as well as a climate action team and sector working groups. We worked very openly with CARB and they committed all the resources necessary

The CARB board has directed staff to consider a pilot **border carbon adjustment** for the cement sector. In February 2014 staff held a technical workshop on the subject.⁸¹ The timeline for developing the pilot is uncertain but staff may take a proposal to the board in 2015.

“I am most optimistic about the contributions our industry can make to the carbon abatement challenge.”

—John T. Bloom, Jr., Vice
President and Chief Economist,
CEMEX

to get a good understanding of our industry and our unique challenges in a carbon-constrained world. We had many meetings, submitted extensive written comments, and in the end they put the cement sector in the high leakage risk category. We are now in the process of working with CARB to develop an incremental **border carbon adjustment** measure that would effectively make all cement suppliers to California responsible for their full carbon footprint. Since the cement sector is highly exposed to leakage and does not get 100% free allowances, an incremental border carbon adjustment is necessary to minimize leakage to the extent feasible.

Q: Has CEMEX initiated any energy efficiency projects as a result of this program?

A: The cement industry has already invested in the best technology to be highly energy efficient since we have a very energy-intensive production process. In general, the primary carbon abatement pathway that is left is to replace fossil fuels with less carbon intensive alternative fuels like biomass. We as a company, in an effort to reduce our greenhouse gas emissions, have invested in new fuel systems to substitute low carbon fuels for fossil fuels. In addition, through the Self-Generation Incentive Program, we put in two wind farms at our Victorville, CA plant.

Q: What is your expectation for the program after 2020? Should CARB establish longer-term goals?

A: I fully expect longer-term targets to be set and CARB has started the process to look beyond 2020. In view of all the discussions we have had with CARB, I know they are committed to having a program that is going to work for industry and that's not going to have a lot of leakage so that it stands out as a model for others to adopt. When you want to try and get a carbon program adopted in other places throughout the U.S. and the world, the biggest issue you face is showing that you can do it in a way that is cost-effective and doesn't disrupt the competitive landscape. If you can show that this is possible, you will overcome a lot of natural resistance to carbon markets.

Q: Have you found that those outside of California are watching?

A: Other cement companies in the U.S. are well informed about California's climate change program. We have had presentations about AB 32 at industry conferences, so they are definitely aware of it.

Q: What are you most optimistic about?

A: I am most optimistic about the contributions our industry can make to the carbon abatement challenge. We have had many discussions with policymakers on how the cement industry can help the state meet its ambitious 2050 GHG emission targets. This includes thinking about how state transportation agencies can be encouraged to make pavement investment decisions based on full life-cycle analyses, which take into account the cost of carbon. This requires an assessment of pavement durability and an accounting of how pavement-vehicle interaction affects fuel efficiency in order to choose the option that truly has the lowest life-cycle cost. We are also looking into how cement can help achieve zero-net energy buildings. When you look from cradle-to-grave in terms of what our products can do as opposed to the alternatives, we can really contribute to the carbon reduction challenge this state faces. We are looking forward to the opportunities that California's policies are creating.

Lenny Hochschild

MANAGING DIRECTOR / EVOLUTION MARKETS

Professional background: Lenny Hochschild is a Managing Director for Evolution Markets, an advisory and brokerage firm specializing in environmental markets. Mr. Hochschild manages Evolution Markets' Global Carbon Markets Group and assists a broad base of clients in assessing risk, establishing market strategies, and executing transactions in the global carbon market.

Q: What are the major trends you've seen on the secondary market for California carbon allowances and offset credits?

A: The main trend over the past year has been lack of volatility in the market, and this is what most market participants and price forecasters anticipated. The auctions so far have been in line with expectations and the secondary market for carbon allowances is moving forward smoothly. We are slowly seeing more covered entities coming into the market to purchase allowances, causing liquidity to increase throughout the year. Liquidity is measured by the volumes of trades being made each day. Volumes are significantly higher this year than they were last year and high volumes without much price volatility is a sign of an orderly market.



Another trend we've seen is that **bid-offer spreads** have tightened between last year and this year. That is a classic sign that the market is becoming more efficient. There have also been more "cost-of-carry" transactions taking place. A "cost-of-carry" transaction happens when a company purchases allowances but finds the cost to hold those allowances until needed for compliance (cost-of-carry) is too high. This company can enter into a futures contract with a company whose cost-of-carry is lower. The fact that more of these transactions are happening is yet another indication that the market is becoming more efficient and mature.

The last trend we've noticed has been a real slowdown in offset trades since the end of May 2014. Offset activity hasn't stopped, but it has slowed dramatically and this is due to CARB's investigation of the ODS offset credits produced by the Clean Harbors Incineration Facility. It is unclear at this point how this trend will change now that CARB has made a final decision that invalidates a percentage of the offsets generated at the site.

Q: What do these market trends say about the overall program?

A: I think they show that the program overall is strong. The fact that pricing right now is just slightly above the floor price shows that the market believes that California is well on track to achieve its 2020 goals, a testament to the effectiveness of policies such as the Renewable Portfolio Standard and the LCFS that are generating GHG reductions alongside the cap-and-trade program.

Q: Have there been any responses in the secondary market prices to specific events this year?

A: There haven't been many notable events that have moved the market in 2014. Going into the fourth quarter of this year, we did see average daily volumes increase dramatically. That is consistent with what we would have thought given we are 12 weeks away from the start of Compliance Period Two when transportation fuel providers come under the cap.

Q: Did you see any reaction in the market to the announcement of legislation introduced to delay or remove fuels from coming under the cap?

A: I think the market ignored all of that. Most market participants believed that the chances of this legislation passing were very small and it was unlikely to result in a change of the regulation. In retrospect, this was a good assumption to make.

The "bid" is the price that someone is willing to pay for an asset, whereas the "offer" is the price at which someone is willing to sell. The difference between the two prices is the **bid-offer spread**. In a market with high liquidity and high volumes of trades, the spread is usually small because the buyer and seller tend to agree about what the price should be.

“In my view, environmental markets are looking much stronger now than they looked two or three years ago.”

–Lenny Hochschild, Managing Director, Evolution Markets

Q: What is the market expectation for the start of joint auctions with Quebec?

A: Due to the relative size of Quebec’s market, the expectation is that California will be the driver of prices. Given Quebec’s reduction target and current energy landscape, where 98% of the province’s energy comes from carbon-free sources, Quebec entities are expected to be small net buyers of credits from California. The biggest difference between the two programs is that Quebec entities do not have to retire 30% of their previous year’s emissions every year like California entities do. The first time Quebec entities have to retire allowances is November 2015 and because of this, Quebec shouldn’t be a major factor in pricing right now.

Q: What are you most concerned about going forward?

A: There is consistent feedback from a wide range of stakeholders, including a number of covered entities, that CARB can do better with the process of managing the cap-and-trade program. One example was the issue of Disclosure of Corporate Associations. This proposed amendment to the regulation would have required covered entities to list all associated entities, regardless of whether or not the associated entity was itself regulated under the program. This would have resulted in an overly burdensome and unnecessary regulation, with no apparent benefit. After significant stakeholder effort, CARB eventually made what we believe to be the correct decision by limiting the reporting of associated entities to those that themselves are regulated. Getting to this decisions took a lot of unnecessary time and we hope that a more efficient process can be put in place for 2015 and beyond. We hope that they will improve on this as we head into 2015.

Q: What are you most optimistic about going forward?

A: Winston Churchill used to say, “Democracy is the worst form of government, except for all the others.” I think policymakers seem to be coming to the conclusion that cap and trade is the worst form of climate policy, except for all the other ones. In my view, environmental markets are looking much stronger now than they looked two or three years ago.

Professor Christopher Knittel

WILLIAM BARTON ROGERS PROFESSOR OF ENERGY ECONOMICS / MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT)

Professional background: Christopher Knittel is a Research Associate in the National Bureau of Economic Research's (NBER) Environmental and Energy Economics, Industrial Organization, and Productivity Programs. He is also the William Barton Rogers Professor of Energy Economics in the Sloan School of Management at MIT, Director of the Center for Energy and Environmental Policy Research at MIT, and Co-Director of the E2e Project at MIT, UC Berkeley, and the University of Chicago. Professor Knittel is the co-editor of the *Journal of Public Economics* and sits on the editorial board of the *Journal of Energy Markets* and the *Journal of Transportation Economics and Policy*. He received his Ph.D. in economics from UC Berkeley, a MA in economics from UC Davis, and a BA in economics and political science from California State University, Stanislaus. Before joining MIT, Professor Knittel held faculty positions at Boston University and UC Davis.



“The most cost-effective way to reduce GHGs is to establish a price on GHG emissions.”

—Professor Christopher Knittel,
William Barton Rogers
Professor of Energy Economics,
Massachusetts Institute of
Technology (MIT)

Q: What is the most cost-effective method available for reducing greenhouse gas emissions across the California economy?

A: The most cost-effective way to reduce GHGs is to establish a price on GHG emissions through an economy-wide carbon tax or a cap-and-trade system. Fundamentally, GHGs can be viewed just like any other “product”: when you raise the price, the resultant quantity demanded will fall. For pollution, placing a price on emissions causes polluters to strive to emit less.

Historically, the price of emitting GHGs has been too cheap—it has been free—meaning society has been dumping GHGs into the atmosphere for free (without much thought of the societal costs). By raising the cost of emitting GHGs, the market finds the cheapest opportunities to cut GHG pollution on its own; policymakers will not have to guess as to where those cheapest opportunities are.

Determining which policy, a carbon tax or a cap-and-trade system, is best suited to reduce pollution depends on a number of factors and reasonable people can disagree as to which is best. While I prefer a carbon tax because it creates long-term price certainty, taxes can't work in every policy context. However, I note that a cap-and-trade program with a price floor can provide similar benefits to a carbon tax and once a program begins it is important to preserve certainty by not dramatically changing tactics mid-course.

Q: Can comprehensive carbon reductions be achieved without including strategies for transportation fuels?

A: No. The transportation sector is responsible for roughly 30% of U.S. greenhouse gas emissions and 38% of California emissions. Even if all other pollution sources in the economy stop discharging and transportation remains the same, California cannot meet its climate goals. Further, if we ignore the transportation sector, the cost required to achieve any given level of GHG reductions will increase.

Q: What would have happened within the transportation sector in California if this price signal on fuels had been eliminated?

A: If California had eliminated the price signal in the transportation sector by removing fuels from cap and trade, consumers would not have seen the true cost of their actions and the cost associated with meeting any level of GHG reductions would increase.

The empirical literature is clear: when carbon pollution is priced, consumers respond by purchasing more fuel-efficient vehicles and driving those vehicles less, they take more public transportation and combine trips. Evidence also exists that consumers make long-term decisions in response to price changes.

Every GHG-related goal is made better through having the price signal in the transportation sector. If we take this away, society will have to achieve reductions through other, more expensive means. While these other methods might hide their true costs, they will, in fact, be more expensive.

Q: How would allowance prices have been affected if fuels were taken out of the cap-and-trade program?

A: Taking fuels out of the cap-and-trade program would have ultimately increased allowance prices as well as their volatility. Basically, by taking fuels out of the cap, you take away one of the options the market has for reducing GHGs. This can only push to increase allowance prices. Furthermore, by taking away this option you run a great risk of having much more volatile allowance prices.

Q: Should allowances be freely allocated to the transportation sector or auctioned?

A: Giving away allowances to fuel suppliers, as opposed to auctioning them off will have little effect on the aggregate emissions reductions as long as the total pollution cap remains the same. However, by auctioning off allowances, policymakers can raise and direct revenues to uses that cut transportation pollution such as public transport, low carbon infrastructure, and reducing the cost of lower emitting vehicles.

Regardless of whether allowances are given away for free or auctioned, the cap will be met. But there are real-world consequences of each option that matter a great deal. As just one example, there is always the potential for windfall profits from free allocation. In many situations businesses are able to pass the market value of allowances through to consumers, even though they themselves received allowances for free. This is what happened in the EU's wholesale electricity market. Short of fundamental market reform, the easiest step to reduce the potential for such undue profits is to auction allowances, a step the EU has since taken.

Q: What are some of the co-benefits associated with regulating the transportation sector?

A: Some of my recent work suggests that the co-benefits from carbon pricing in transportation are much higher than we ever thought. We have found that the dirtiest cars on the road, measured by their criteria pollutants such as NO_x, VOCs, and CO, respond more to a price on carbon. Therefore, the reduction in pollutants associated with carbon pricing and the co-benefits that come as a result are routinely understated because we previously assumed that all cars respond in the same way. These co-benefits include lower respiratory illnesses, fewer trips to the hospital, and a healthier labor force. In addition, through a price on carbon, people drive fewer miles, yielding co-benefits in terms of reduced congestion and accident risk.

“These co-benefits [of regulating the transportation sector] include lower respiratory illnesses, fewer trips to the hospital, and a healthier labor force.”

–Professor Christopher Knittel,
William Barton Rogers
Professor of Energy Economics,
Massachusetts Institute of
Technology (MIT)

Soffia Alarcón-Díaz

DIRECTOR OF CLIMATE CHANGE MITIGATION POLICY / MEXICO MINISTRY OF ENVIRONMENT AND NATURAL RESOURCES (SEMARNAT)

Professional background: Soffia Alarcón-Díaz currently serves as Director of Climate Change Mitigation Policy at Mexico's Secretariat of Environment and Natural Resources (SEMARNAT), where she is responsible for the design and operation of the National Emissions Registry. She also supports the design and implementation of mitigation policies established in the National Climate Change Strategy, Special Climate Change Program, and the state-level climate change programs. Before joining SEMARNAT, Ms. Alarcón-Díaz worked as a fellow at the World Resources Institute (WRI) where she conducted research for a working paper on the linkages between national and corporate GHG inventories. She holds a master's degree in Public Administration from Columbia University and a bachelor's degree in International Relations from El Colegio de México.



“Mexico is planning to take a comprehensive look at every policy California has designed in the past few years so we can consider developing our own policies.”

—Soffia Alarcón Díaz, Director of Climate Change Mitigation Policy, Mexico SEMARNAT

Q: What are Mexico's climate goals?

A: Mexico has three specific climate targets. The first is to reduce greenhouse gas emissions by 30% by 2020 with respect to a business-as-usual baseline. The second is to reduce emissions by 50% from 2000 levels by the year 2050. The third is to procure 35% of the country's electricity from renewable energy sources by 2024.

Q: What are the most critical areas of work outlined in the California-Mexico MoU? What does Mexico hope to gain from this partnership with California?

A: The first step for us is to gather information about the best practices and lessons learned from California so that we can follow a model that from our standpoint has been successful. To the extent possible, Mexico is mirroring California's climate change-related actions based on the premise that there are similarities between both jurisdictions. Mexico is planning to take a comprehensive look at every policy California has designed in the past few years so we can consider developing our own policies with similar nomenclature, technical inputs, and methodologies. Given the ambitiousness of Mexico's climate targets, the state will need a mix of policies, like what California has, to meet its goals. Right now, we are studying how the third party verification is carried out in California as well as how the reporting tool works. On October 28, 2014, the regulations for the National Emissions Registry were published. Starting in March 2015, all sectors across the economy will be required to report direct and indirect emissions above the 25,000 tons CO₂e threshold. As a result of this process, Mexico is currently seeking best practices for utilizing mandatory reporting requirements like the ones California applies.

Q: Do you think this year was a particularly significant time for Mexico and California to sign an MoU?

A: It was very important for the Mexican government that California, the most advanced jurisdiction in the world in terms of climate policy in my opinion, looked to Mexico. While Mexico is a developing country, it is leading and innovating in terms of tackling climate change. But until now, we've had no partner to learn so closely from. This was an important point in time to sign an MoU because of the energy reform we are going through in Mexico. We are restructuring the entire energy sector, which hasn't been changed for over 70 years. We are looking at best practices in Europe, Canada, and the U.S., but we would prefer to learn from those jurisdictions we share so much with in terms of territory, people, and culture, like California.

Q: What are the prospects that Mexico will develop a cap-and-trade program?

A: Cap and trade within the electricity sector was proposed by the Congress earlier this year. The proposal has since been revised by SEMARNAT and the Secretary of Energy (SENER). There was great interest in its approval and we anticipate it will be contemplated again next year.

Q: What are you most optimistic about and most concerned about going forward?

A: When there is political will to take action, things happen very fast. There is political will in Mexico now to make things happen in developing the renewable sector, transforming the electricity sector, and getting greenhouse gas reductions. But this is also something we need to watch out for. If cap and trade is approved in the near-term along with a lot of other policies, there will be intense time pressure to properly design the regulations. That is why we are taking time beforehand to look at the best practices from California so that infrastructure is in place before these decisions are made. I've learned from other jurisdictions that cap-and-trade implementation can take a few years, but I trust that our California colleagues will be of help during this time.

Notes

- ¹ U.S. Bureau of Labor Statistics. "California Economy at a Glance." Last modified December 30, 2014. <http://www.bls.gov/eag/eag.ca.htm>
- ² Wright, Joshua. "Breaking Down California's Jobs Comeback." *Forbes*. May 8, 2014. <http://www.forbes.com/sites/emsj/2014/05/08/breaking-down-californias-jobs-comeback/>
- ³ Bridges, Scott. "California Job Growth Outpaces Rest of Nation." *L.A. Biz*. June 13, 2014. <http://www.bizjournals.com/losangeles/news/2014/06/13/california-job-growth-outpaces-rest-of-nation.html>
- ⁴ Public Policy Institute of California. "California's Future: Economy." January 2014. http://www.ppic.org/content/pubs/report/R_114SBR.pdf
- ⁵ California Department of Finance. "California Income Data." Last modified September 30, 2014. http://www.dof.ca.gov/HTML/FS_DATA/LatestEconData/FS_Income.htm
- ⁶ Office of Governor Edmund G. Brown Jr. "Governor Brown Signs Bill to Increase Minimum Wage in California." September 25, 2013. <http://gov.ca.gov/news.php?id=18224>
- ⁷ See note 4.
- ⁸ Philips, Peter. "Environmental and Economic Benefits of Building Solar in California." November 10, 2014. <http://irle.berkeley.edu/vial/publications/building-solar-ca14.pdf>
- ⁹ California Air Resources Board. "California Greenhouse Gas Inventory for 2000–2012—by Category as Defined in the 2008 Scoping Plan." Last modified March 24, 2014. http://www.arb.ca.gov/cc/inventory/data/tables/ghg_inventory_scopingplan_00-12_2014-03-24.pdf (California's economy-wide emissions for 2013 were conservatively calculated using CARB's MRR data and an estimate of the emissions not reported under MRR based on 2012 data with a growth factor equal to the growth of reported non-covered emissions from 2012 to 2013).
- ¹⁰ California Department of Finance. "Miscellaneous Economic Data." Financial & Economic Data. Last modified June 11, 2014. http://www.dof.ca.gov/html/fs_data/latestecondata/FS_Misc.htm
- ¹¹ Bureau of Labor Statistics. "Databases, Tables & Calculators by Subject." Last modified January 7, 2015. <http://www.bls.gov/data/#employment>
- ¹² Data received from Next 10 and Collaborative Economics on October 24, 2014.
- ¹³ Advanced Energy Economy Institute. "California Advanced Energy Employment Survey." December 2014. <http://info.aee.net/hs-fs/hub/211732/file-2173902479-pdf/PDF/aeei-california-advanced-energy-employment-survey-fnl.pdf>
- ¹⁴ Next 10. "California Green Innovation Index." May 22, 2014. <http://next10.org/sites/next10.huang.radicaldesigns.org/files/2014%20Green%20Innovation%20Index.pdf>
- ¹⁵ See note 14.
- ¹⁶ See note 14.
- ¹⁷ Schwarz, Hunter. "California's Economy Is Large Enough It Could Be Admitted into G-8." *The Washington Post*. July 8, 2014. <http://www.washingtonpost.com/blogs/govbeat/wp/2014/07/08/californias-economy-is-large-enough-it-could-be-admitted-into-g-8/>
- ¹⁸ See note 10.
- ¹⁹ Center for the Continuing Study of the California Economy. "California Once Again the World's 8th Largest Economy." Numbers in the News. July 2014. <http://www.ccsce.com/PDF/Numbers-July-2014-CA-Economy-Rankings-2013.pdf>
- ²⁰ Tomain, Joseph P. and Richard D. Cudahy. *Energy Law in a Nutshell*. 2nd ed. St. Paul, MN: West, 2011.
- ²¹ For emission data, see note 9. For GDP data, see note 10.
- ²² U.S. Energy Information Administration. "State-Level Energy-Related Carbon Dioxide Emissions, 2000–2011." August 1, 2014. <http://www.eia.gov/environment/emissions/state/analysis/pdf/stateanalysis.pdf>
- ²³ California Air Resources Board. "Mandatory GHG Reporting—Reported Emissions." Last modified November 4, 2014. <http://www.arb.ca.gov/cc/reporting/ghg-rep/reported-data/ghg-reports.htm>
- ²⁴ California Air Resources Board. "Energy Efficiency and Co-Benefits Assessment for Large Industrial Sources—Regulatory Activities." Last modified July 30, 2014. <http://www.arb.ca.gov/cc/energyaudits/energyaudits.htm>
- ²⁵ California Air Resources Board. "Energy Efficiency and Co-Benefits Assessment of Large Industrial Sources, Refinery Sector Public Report." June 6, 2013. <http://www.arb.ca.gov/cc/energyaudits/eeareports/refinery.pdf>
- ²⁶ Zuckerman, Julia, Karen Laughlin, Dario Abramskiewh and Xueying Wang. "Cap and Trade in Practice: Barriers and Opportunities for Industrial Emissions Reductions in California." Climate Policy Initiative. June 2014. <http://climatepolicyinitiative.org/wp-content/uploads/2014/07/Cap-and-Trade-in-Practice-Full-Report.pdf>
- ²⁷ California Air Resources Board. "Archived Auction Information and Results." Auction Information. Last modified January 12, 2015. http://www.arb.ca.gov/cc/capandtrade/auction/auction_archive.htm
- ²⁸ Ibid.
- ²⁹ Ibid.
- ³⁰ Ibid.
- ³¹ Ibid.
- ³² California Air Resources Board. "ARB Offset Credit Issuance." Last modified December 10, 2014. <http://www.arb.ca.gov/cc/capandtrade/offsets/issuance/issuance.htm>
- ³³ Ibid.
- ³⁴ Quebec Ministry of Sustainable Development, Environment and the Fight against Climate Change. "Cap-and-Trade Auction Notices and Results." The Carbon Market. Last modified December 3, 2014. <http://www.mddelcc.gouv.qc.ca/changements/carbone/avis-resultats-en.htm>
- ³⁵ Ibid.
- ³⁶ See Global Warming Solutions Act, Sec. 38562(b).
- ³⁷ California Air Resources Board. "Auction Proceeds Funded Programs and Events." Last modified January 5, 2015. <http://www.arb.ca.gov/cc/capandtrade/auctionproceeds/ggrfprogrampage.htm>
- ³⁸ California Air Resources Board. "Investments to Benefit Disadvantaged Communities." August 22, 2014. <http://www.arb.ca.gov/cc/capandtrade/auctionproceeds/workshops/arb-sb-535-interim-guidance-08-22-2014.pdf>

- ³⁹ Next 10. "Using the Allowance Value from California's Carbon Trading System." May 2012. Accessed January 7, 2015. http://www.next10.org/sites/next10.huang.radicaldesigns.org/files/12-NXT-008_Cap-Trade_r2.pdf
- ⁴⁰ Saha, Bansari and Jan Mazurek. "Modeling the Economic Impacts of AB 32 Auction Proceeds Investment Opportunities." December 1, 2013. <http://www.icfi.com/insights/reports/2013/modeling-economic-impacts-of-ab-32-auction-proceeds-investment-opportunities>
- ⁴¹ Governor's Office of Planning and Research. "The Governor's Environmental Goals and Policy Report." September 2013. http://opr.ca.gov/docs/EGPR_ReviewDraft.pdf
- ⁴² American Public Transportation Association. "Transit Savings Report." November 1, 2013. <http://www.publictransportation.org/tools/transitsavings/Pages/default.aspx>
- ⁴³ Tutt, Eileen. "CalETC Comments Re April 25, 2013 Board Agenda Item #13-5-4." April 25, 2013. <http://www.arb.ca.gov/lists/com-attach/325-ghgreductfund13-UDNQN1c6Aw8GZVcj.pdf>
- ⁴⁴ U.S. Department of Energy. "eGallon: Compare the Costs of Driving with Electricity." Accessed November 30, 2014. <http://energy.gov/maps/egallon>
- ⁴⁵ Roland-Holst, David. "More Jobs per Gallon: How Vehicle Efficiency Fuels Growth in California." April 2011. http://policyinstitute.ucdavis.edu/files/BEAR_JobsMPG110325.pdf
- ⁴⁶ Environmental Defense Fund and UCLA Luskin School of Public Affairs. "Los Angeles Solar and Efficiency Report." Accessed December 5, 2014. <http://www.edf.org/los-angeles-solar-and-efficiency-report>
- ⁴⁷ Edgar & Associates, Inc. "Beyond Waste." April 2013. <http://www.calrecycle.ca.gov/75percent/Comments/EEEdgar3.pdf>
- ⁴⁸ Ibid.
- ⁴⁹ Regional Greenhouse Gas Initiative. "CO₂ Allowances Sold for \$5.21 in 26th RGGI Auction." December 5, 2014. http://www.rggi.org/docs/Auctions/26/PR120514_Auction26.pdf
- ⁵⁰ Regional Greenhouse Gas Initiative. "Regional Investment of RGGI CO₂ Allowance Proceeds, 2012." February 2014. <http://www.rggi.org/docs/Documents/2012-Investment-Report.pdf>
- ⁵¹ Hibbard, Paul, Susan Tierney, Andrea Okie and Pavel Darling. "The Economic Impacts of the Regional Greenhouse Gas Initiative on Ten Northeast and Mid-Atlantic States." November 15, 2011. http://www.analysisgroup.com/uploadedfiles/publishing/articles/economic_impact_rggi_report.pdf
- ⁵² California Public Utilities Commission. "California Climate Credit." Last modified October 1, 2014. <http://www.cpuc.ca.gov/PUC/energy/capandtrade/climatecredit.htm>
- ⁵³ California Air Resources Board. "Amendments to the California Cap on Greenhouse Gas Emissions and Market-based Compliance Mechanisms." May 2014. <http://www.arb.ca.gov/regact/2013/capandtrade13/ctfsor.pdf>
- ⁵⁴ California Air Resources Board. "Appendix A: What Is Resource Shuffling?" Cap-and-trade Regulation Instructional Guidance. November 2012. http://www.arb.ca.gov/cc/capandtrade/guidance/appendix_a.pdf
- ⁵⁵ California Air Resources Board. "Proposed Amendments to the California Cap on Greenhouse Gas Emissions and Market-based Compliance Mechanisms." July 29, 2014. <http://www.arb.ca.gov/regact/2014/capandtrade14/capandtrade14isor.pdf>
- ⁵⁶ California Air Resources Board. "Air Resources Board Issues Nearly \$1 Million in Fines for Failures to Report Greenhouse Gas Emissions." News Release. January 27, 2014. <http://www.arb.ca.gov/newsrel/newsrelease.php?id=567>
- ⁵⁷ California Air Resources Board. "ARB Takes Action against Cap-and-trade Program Bidding Violations." News Release. February 14, 2014. <http://www.arb.ca.gov/newsrel/newsrelease.php?id=575>
- ⁵⁸ California Air Resources Board. "Important Process Information Regarding the Air Resources Board Compliance Offset Investigation Destruction of Ozone Depleting Substances." October 8, 2014. http://www.arb.ca.gov/cc/capandtrade/ods_preliminary_determination.pdf
- ⁵⁹ United States Environmental Protection Agency. "Fact Sheet: Clean Power Plan Overview." Carbon Pollution Standards. Last modified June 13, 2014. <http://www2.epa.gov/carbon-pollution-standards/fact-sheet-clean-power-plan-overview>
- ⁶⁰ Environmental Defense Fund. "The Carbon Pollution Standards for Existing Power Plants: How They Work." Accessed December 10, 2014. <http://www.edf.org/sites/default/files/content/edfactsheet-how111dworks.pdf>
- ⁶¹ See note 59.
- ⁶² California Air Resources Board. "Clean Power Plan Proposed Rule (111(d)) Discussion Paper." September 2014. http://www.arb.ca.gov/cc/powerplants/meetings/discussion_paper.pdf
- ⁶³ Adler, Ben. "Steinberg: Replace Cap-and-Trade With Carbon Tax for Vehicle Fuels." Capital Public Radio. February 20, 2014. <http://www.capradio.org/articles/2014/02/20/steinberg-replace-cap-and-trade-with-carbon-tax-for-vehicle-fuels/>
- ⁶⁴ The California Channel. "Senate Pro Tem Steinberg Proposes Permanent Sources of Funding for Housing and Transit." April 14, 2014. <http://www.calchannel.com/senate-pro-tem-steinberg-proposes-permanent-sources-of-funding-for-housing-and-transit/>
- ⁶⁵ California Energy Commission. "2014 Draft Integrated Energy Policy Report Update." November 2014. <http://www.energy.ca.gov/2014publications/CEC-100-2014-001/CEC-100-2014-001-D.pdf>
- ⁶⁶ California State Legislature. "Glossary of Legislative Terms." Accessed November 21, 2014. <http://www.legislature.ca.gov/quicklinks/glossary.html>
- ⁶⁷ Lee, Morgan. "Energy Dealmaker Girds for New Sacramento Battles." U-T San Diego. September 24, 2014. <http://www.utsandiego.com/news/2014/sep/24/next-energy-battle-sacramento/>
- ⁶⁸ Various Authors. "Joint Letter of Economic and Energy Experts to Mary Nichols on Maintaining Beneficial, Low-Carbon Transportation Policies in California." July 16, 2014. <http://blogs.edf.org/californiadream/files/2014/07/Joint-Letter-of-Economic-and-Energy-Experts-Fuels-Under-the-Cap-FINAL-July-16-2014.pdf>
- ⁶⁹ The World Bank. "73 Countries and More Than 1,000 Companies and Investors Support a Price on Carbon." September 22, 2014. <http://www.worldbank.org/en/news/press-release/2014/09/22/73-countries-1000-companies-investors-support-price-carbon>

- ⁷⁰ UN News Centre. "Ban Hails 'bold' Announcements on Tackling Climate Change as Historic UN Summit Closes." September 23, 2014. <http://www.un.org/apps/news/story.asp?NewsID=48806#.VDHh1PIdWSo>
- ⁷¹ Siders, David. "Jerry Brown Calls for 'more Ambitious' Climate Change Action at U.N." *The Sacramento Bee*. September 23, 2014. <http://www.sacbee.com/2014/09/23/6730193/jerry-brown-defends-cap-and-trade.html>
- ⁷² Office of Governor Edmund G. Brown Jr. "Photo Release: Governor Brown Expands Partnership with China to Combat Climate Change." September 13, 2013. <http://gov.ca.gov/news.php?id=18205>
- ⁷³ The World Bank. "State & Trends Report Charts Global Growth of Carbon Pricing." News. May 28, 2014. <http://www.worldbank.org/en/news/feature/2014/05/28/state-trends-report-tracks-global-growth-carbon-pricing> and "We Support Putting a Price on Carbon." Accessed January 5, 2015. <http://siteresources.worldbank.org/EXTSDNET/Resources/carbon-pricing-supporters-list-092114.pdf>
- ⁷⁴ "Memorandum of Understanding to Enhance Cooperation on Climate Change and the Environment between the State of California of the United States of America and the Ministry of Environment and Natural Resources and the National Forestry Commission of the United Mexican States." Accessed November 20, 2014. http://gov.ca.gov/docs/7.28_ClimatE_MOU_Eng.pdf
- ⁷⁵ Office of Governor Edmund G. Brown Jr. "California and Peru Sign Agreement to Strengthen Economic, Environmental Ties." February 26, 2014. <http://gov.ca.gov/news.php?id=18423>
- ⁷⁶ Office of Governor Edmund G. Brown Jr. "California and Israel Sign Pact to Strengthen Economic, Research Ties." March 5, 2014. <http://gov.ca.gov/news.php?id=18438>
- ⁷⁷ Brunner, Jim. "Inslee Committed to Pursuit of Climate-change Bill despite Election's Outcome." *The Seattle Times*. November 5, 2014. http://seattletimes.com/html/localnews/2024963033_insleeex.xml.html and Massey, Nathanael. "Republican Gains in Wash. Legislature Spoil Plans for a West Coast Bloc of Climate Action States." Regions. November 6, 2014. <http://www.eenews.net/stories/1060008481/print>
- ⁷⁸ Carbon Emissions Reduction Taskforce. "Report to the Washington State Governor's Office." November 14, 2014. http://www.governor.wa.gov/issues/climate/documents/CERT_Final_Report.pdf
- ⁷⁹ The Oregonian. "Senate Bill 306." 2013 Session. Accessed December 13, 2014. <http://gov.oregonlive.com/bill/2013/SB306/>
- ⁸⁰ Northwest Economic Research Center, College of Urban and Public Affairs, and Portland State University. "Carbon Tax and Shift: How to Make It Work for Oregon's Economy." March 1, 2013. <http://www.pdx.edu/nerc/sites/www.pdx.edu.nerc/files/carbontax2013.pdf>
- ⁸¹ California Air Resources Board. "California Cap-and-Trade Program Potential Border Carbon Adjustment for the Cement Sector." February 5, 2014. <http://www.arb.ca.gov/cc/capandtrade/meetings/020514/border-carbon-adjustment.pdf>



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