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CALIFORNIA CARBON MARKET EVALUATION

Quantitative insights into the balance of supply and demand

BY CHRIS BUSCH ● AUGUST 2016

The status of California's cap-and-trade program, which creates a market for tradable emission permits known as allowances, has grown in interest and importance as America and the world have begun decarbonizing. This analysis makes use of the quarterly compliance instrument reports released by CARB (current version, released on July 7, 2016, available here) to offer insights into the balance of supply and demand in California's carbon market.

California is in the middle of the second of three compliance periods for cap-and-trade, which runs from 2015-2017 (inclusive). Because large polluters covered under the program (capped entities) have a year after the end of the compliance period to finalize their submissions of allowances and offsets,[1] an exact accounting will not be possible until the end of 2018.

This analysis develops hypothetical scenarios to provide likely bounds on what policymakers should expect. Given the linkage and joint auctions between California and Quebec (and Ontario, starting in 2017), the analysis treats these as a unified market.

This evaluation concludes 24-45 percent (or 104-268 million metric tons) of current vintage allowances slated for distribution for the remainder of this compliance period will not be needed for compliance.

SCENARIO INPUTS

The first input to scenario development is the balance of supply and demand revealed in the first compliance period, 2013-2014. Capped entities acquired but did not use 62 million metric tons (MMT), or 20.6 percent, of the allowances distributed for the first compliance period, as shown in Figure 1 under the Source Material section at the end of this document. These allowances acquired in the first compliance period could be saved or "banked" for the second compliance period.

[1] Offsets are emission reduction credits generated outside of the sectors directly covered by California's cap-and-trade program. They can account for up to 8 percent of a capped entities emissions.

The next step is to establish the current number of allowances in capped entity hands and the number of current vintage allowances slated for distribution this compliance period. This is a relatively straightforward accounting, shown in Figure 2. Capped entities are in possession of 736 MMT in allowances available for use in the second compliance period. The governments of California and Quebec are in possession of 596 MMT in current vintage allowances (i.e. allowance valid for use in the second compliance period).

The key unknown is the forecast of future emission demand by capped entities. The most current statewide inventory data and facility level data do not extend past 2014. Even if more real-time data were available, some uncertainty would be implicit in a future forecast to the end of 2017. Two key factors that could lead to stronger demand in the second compliance period relative to the first are:

1. **Stronger economic growth.** Compared to 2013-2014, 2015 and the first half of 2016 have demonstrated faster economic growth. If this trend continues, demand for allowances would increase.
2. **The expansion of the scope of the program in the second compliance period.** The extension of coverage to embodied emissions in petroleum-derived transportation fuels like gasoline and diesel, i.e. the coverage of tailpipe emissions from vehicles, is another factor providing upward pressure on demand. In the first compliance period, electricity generation was the single largest covered emissions source. The electricity sector has been an over-performer in terms of reducing greenhouse gas emissions. The state is adding impressive amounts of renewable electricity, and utilities are ahead of schedule for achieving the 33 percent by 2020 renewable portfolio standard. The transportation sector, however, is generally recognized as more challenging to decarbonize: State data show gasoline use started climbing again in 2013 after experiencing annual declines as compared to the previous years from 2009-2012.

One factor reducing demand relative to the first compliance period is the opportunity for capped entities to use more offsets for compliance than they did during the first compliance period when offsets were used to cover four percent of emissions. The limit on offset use allows for up to eight percent of emissions to be covered through offsets.

LOWER AND UPPER BOUND SCENARIOS ON DEMAND

As a preference to our own scenario development, we note CARB's own forecasts shows emissions under the cap-and-trade program remaining below cap levels through 2020, as seen in slide 7-8 at this CARB workshop presentation.

Scenarios are defined in relation to the full amount of allowances available for the second compliance period. CARB's compliance instrument report shows these in the "total allowance" column cells corresponding to 2015-2017 in Figures 1 and 2 below. Leaving aside the voluntary renewable energy set aside (a small carve-out that is also ignored in assessing the first

compliance period), approximately 1,281 MMT in allowances in total are available for the second compliance period. This is not a forecast, but the total known number of allowances scheduled for distribution.

The forecasting comes in developing scenarios building from the total known number of allowances. Two scenarios are developed as upper and lower bounds. In light of the two factors increasing demand and the one factor that could reduce pressure on demand, we use the level of oversupply from the first compliance period as the upper bound on the extent of oversupply. For the lower bound, we develop a scenario in which the overall demand for the compliance period is stronger. In this lower bound scenario, overall emissions are seven percent less than total allowances available for the second compliance period.

- The lower bound on demand is also the upper bound on oversupply: 17 percent. This would imply total demand for allowances of 1,063 MMT for the second compliance period.
- The upper bound on demand is also the lower bound on oversupply: seven percent. This would imply total demand for allowances of 1,191 MMT for the second compliance period.

RESULTS

The next step is combining the foregoing components.

Table 1. Estimating oversupply

	Total demand over 2nd compliance period	Allowances currently held by entities and available for use in 2nd compliance period	Allowances in government hands for distribution in 2nd compliance period	Excess supply	Excess supply (% of remaining allowances, i.e. % of 596MMT)
Lower bound on oversupply (stronger demand)	1191 MMT	736 MMT	596 MMT	104 MMT	24%
Midpoint	1127 MMT	736 MMT	596 MMT	204 MMT	34%
Upper bound on oversupply (weaker demand)	1063 MMT	736 MMT	596 MMT	268 MMT	45%

Given these scenarios, 24-45 percent of allowances remaining for distribution in this compliance period would not be needed to cover capped emissions. At the midpoint, 204 MMT, or 34 percent, of allowances still slated for distribution would not be needed.

This analysis suggests allowance demand in the market is not likely to fully recover until entities have strong confidence in the future of the cap-and-trade program beyond 2020 period, which would create demand for allowances entities could bank for future compliance periods.

Auctions can continue to sell out even under current circumstances, but only if there is confidence in future market requirements for emission reductions (i.e. certainty regarding caps in 2021 and beyond). It is worth emphasizing the root cause of carbon market volatility is that reducing emissions is turning out to be cheaper and easier than had been previously expected. Lower emissions reduce demand for allowances, which leads to our current situation.

SOURCE MATERIAL

Figure 1.

Allowances submitted by capped entities to the government are shown in green highlighted cells. Total retired = 301.7 MMT of CO_2.

Allowances distributed in the first compliance period, acquired by capped entities, and banked are shown in orange highlighted cells.

Total banked = 62.11 MMT. Total available = banked (62.11) + retired (301.7) = 363.8

Percentage banked = 62.11/363.8 = 17.1%

California Environmental Protection Agency
Air Resources Board

Released July 7, 2016

Linked California and Québec Cap-and-Trade Programs Compliance Instruments Aggregated by Type and Account

This report summarizes the number of compliance instruments held by entities in the Linked California and Québec Cap-and-Trade Programs. The data is presented by instrument type (allowances by vintages and offset credits by project type), and is aggregated for each type of account. Unless denoted with the issuing jurisdiction in parentheses (CA) or (QC), all instrument types are issued by both California and Québec. For program participants in California and Québec, the accounts include: General (Holding) Accounts; Compliance Accounts; and Limited Use Holding Accounts. The California and Québec jurisdiction accounts include: Voluntary Renewable Electricity Account; Auction, Issuance and Allocation Accounts; Allowance Price Containment Reserve Account; Retirement Account; Invalidation Account; Environmental Integrity Account; and the Forest Buffer Account.

This information was pulled from the Compliance Instrument Tracking System Service (CITSS) as of 9am (Pacific) and noon (Eastern) on July 5, 2016. This information is specific to the account holdings of entities registered in CITSS pursuant to the California and Québec Regulations. The report includes all instruments issued in the linked California and Québec Cap-and-Trade Programs and is summarized by instrument type, regardless of the issuing jurisdiction (for example, account holdings of vintage 2013 instruments includes all 2013 allowances issued in California and Québec). The account holdings of California entities may contain compliance instruments (allowances and offsets) issued by Québec and the account holdings of entities registered in Québec may contain compliance instruments issued by California. This report is typically updated on the third business day of each calendar quarter. Due to holidays in Canada and the United States data for this report were pulled on July 5, 2016.

	Entity Accounts			Jurisdiction Accounts						All Accounts
Vintage	General	Compliance	Limited Use Holding Account***	Voluntary Renewable Electricity***	Auction + Issuance + Allocation	Retirement**	Invalidation	Reserve	Environmental Integrity****	Total
2013	6,583,059	2,226,707	0	605,134	1,774	174,718,480	0	0	4,846	184,140,000
2014	28,758,576	24,544,550	0	798,500	5,694	126,963,680	0	0	0	181,071,000
2015	165,288,149	260,182,874	0	986,250	5,516,435	9,434,292	0	0	0	441,408,000
2016	115,663,944	97,657,771	26,203,319	956,000	185,366,662	1,918,704	0	0	0	427,766,400
2017	32,852,900	1,742,100	0	926,000	378,699,800	0	0	0	0	414,220,800
2018	41,106,500	0	0	895,750	346,049,550	0	0	0	0	388,051,800
2019	10,275,000	0	0	865,750	363,788,750	0	0	0	0	374,929,500
2020	0	0	0	835,500	360,878,700	0	0	0	0	361,714,200
Non-Vintage Québec Early Action Allowances (QC)	89,349	0	0	0	0	1,950,677	0	0	0	2,040,026
Non-Vintage Price Containment Reserve Allowances	0	0	0	0	0	0	0	141,818,300	0	141,818,300
Allowances Subtotal	**400,617,477**	**386,354,002**	**26,203,319**	**6,868,884**	**1,640,307,365**	**314,985,833**	**0**	**141,818,300**	**4,846**	**2,917,160,026**
California										
U.S. Forest Project Offset Credits+	12,192,381	624,610	0	0	0	6,215,762	0	0	0	19,032,753
Urban Forest Project Offset Credits	0	0	0	0	0	0	0	0	0	0
Ozone Depleting Substances Offset Credits	5,276,699	513,381	0	0	0	5,826,692	88,955	0	0	11,705,727
Livestock Manure Digesters Offset Credits	1,529,335	15,950	0	0	0	847,213	0	0	0	2,392,498
Mine Methane Capture Offset Credits	2,706,832	1	0	0	0	184,243	0	0	0	2,891,076
Rice Cultivation Project Offset Credits	0	0	0	0	0	0	0	0	0	0
Québec										
Destruction of Ozone Depleting Substances Offset Credits	458,619	0	0	0	0	0	0	0	9,189	467,808
Landfill Site Methane Destruction Offset Credits	27,939	0	0	0	0	0	0	0	867	28,806
Offset Credits Subtotal	**22,191,805**	**1,153,942**	**0**	**0**	**0**	**13,073,910**	**88,955**	**0**	**10,056**	**36,518,668**
TOTAL	**422,809,282**	**387,507,944**	**26,203,319**	**6,868,884**	**1,640,307,365**	**328,059,743**	**88,955**	**141,818,300**	**14,902**	**2,953,678,694**

2016 Q2 / 2016 Q1 / 2015 Q4 / 2015 Q3 / 2015 Q2 / 2015 Q1 / 2014 Q4 / 2014 Q3 / 2014 Q2

Ready

Figure 2.

Entities are in possession of 736 MMT in allowances available for use in the second compliance period, as shown in orange highlighted cells.

The governments of California and Quebec are in possession of 596 MMT in current vintage allowances (i.e. allowances valid for use in the second compliance period), as shown in green highlighted cells. The "limited use holding account" cell showing 26 MMT are allowances that are consigned for future auctions. Thus, these allowances are counted as those scheduled for future distribution.

California Environmental Protection Agency
Air Resources Board

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Linked California and Québec Cap-and-Trade Programs Compliance Instruments Aggregated by Type and Account

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