

California GHG Cap and Trade

When and why will allowance prices rise?

December 2017

Patrick Luckow, Associate Director, +1 617 866 5365, patrick.luckow@ihsmarket.com



Key Insights

The California GHG market remains structurally oversupplied and allowance pricing remains relatively close to the programmatic price floor (roughly \$14 per ton)

- Annual covered emissions remain lower than annual allowance supply
- Moreover, a large private bank of allowances has accumulated

Increased certainty has emerged that the California-Quebec-Ontario linked markets will be extended beyond 2020

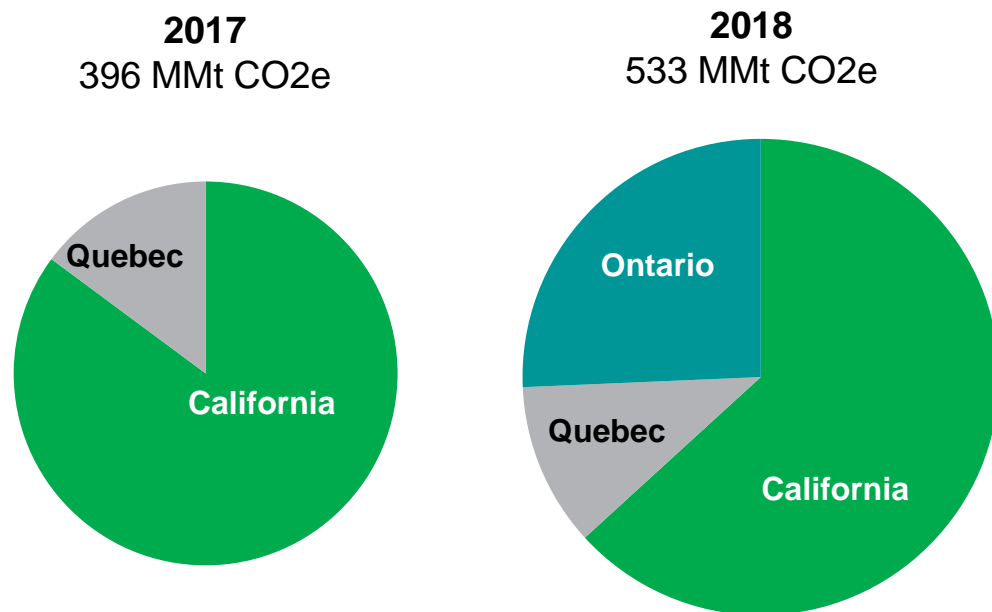
Market fundamentals across the three jurisdictions will tighten as cap declines begin to outpace emission declines, but the accumulated allowance bank could extend oversupply into the mid 2020s

IHS Markit expects allowance prices to more than double within a decade, but the timing and ultimate extent of price escalation will depend on key uncertainties:

- Yet to be determined cost containment regulations for 2021–30
- Market participants' risk appetite and allowance procurement / banking strategies

The California GHG cap and trade program is the cornerstone of a larger set of linked programs

Combined GHG emission program caps, 2017 and 2018



Source: IHS Markit, California Air Resources Board (CARB), Quebec Ministry of Sustainable Development, Environment, Wildlife and Parks, Environment Canada National Inventory Report

Notes:MMt CO₂e=Million Metric Tons of carbon dioxide equivalent

© 2017 IHS Markit

The already linked California and Quebec GHG cap and trade programs cover nearly 400 MMt of CO₂e emissions

- **Nearly** economy wide coverage: electricity, industrial, transportation fuels, and natural gas
- Each allowance (primary compliance instrument) represents permission to emit one metric ton of CO₂e
- Allowances are tradable, creating a market for them
- Allowance reciprocity “links” the markets (i.e., creates a single market)
- The market will grow by over 30% with the 2018 linkage of Ontario

Certainty has increased for the long-term sustainability of the combined market

- 2017 California legislation erased doubts regarding program constitutionality and extension (beyond 2020)
- Ontario and Quebec are expected to join California in post-2020 market reforms

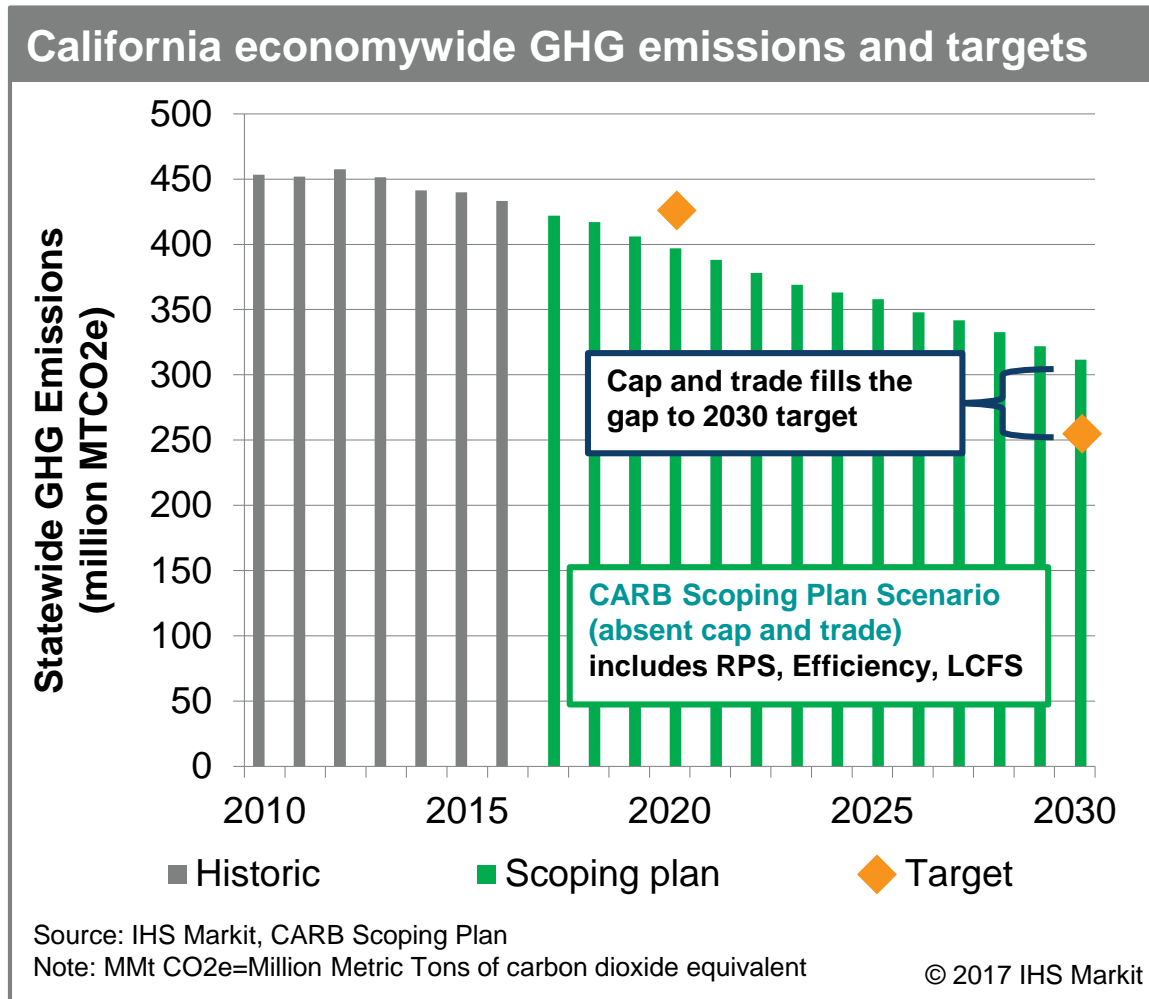
Key program elements

Key program elements	
Applicability	<ul style="list-style-type: none"> • Subject emitters: Covered sectors include electricity generation and imports, industrial, petroleum, and natural gas distributors above a 25,000 tCO₂e per year threshold
Allowances, auctions, and auction revenues	<ul style="list-style-type: none"> • Compliance requirements: California carbon allowances (CCAs) are either purchased at auction or via secondary market. Three year control periods, with an interim annual compliance obligation • Allowance distribution: Allowances are freely allocated to electric and natural gas utilities, as well as at-risk industries • Auction timing: Auctions are held quarterly. All results are reviewed by a market monitor • Banking and trading: Allowances can be traded and can be banked for use in a subsequent CP without restriction
Auction allowance price controls through 2020	<ul style="list-style-type: none"> • Allowance Price Containment Reserve: A fraction of each years budget is placed into a reserve tier, available if prices reach a set threshold • Price floor: The reserve price is a firm price floor. The 2017 reserve price is \$13.57, and increases annually at 5% plus inflation
Offsets	<ul style="list-style-type: none"> • Offsets limited to 8% of each entity's compliance obligation, coming from six offset categories. After initial fears of invalidation, offset usage has been robust, though well below compliance limits

Source: IHS Markit

© 2017 IHS Markit

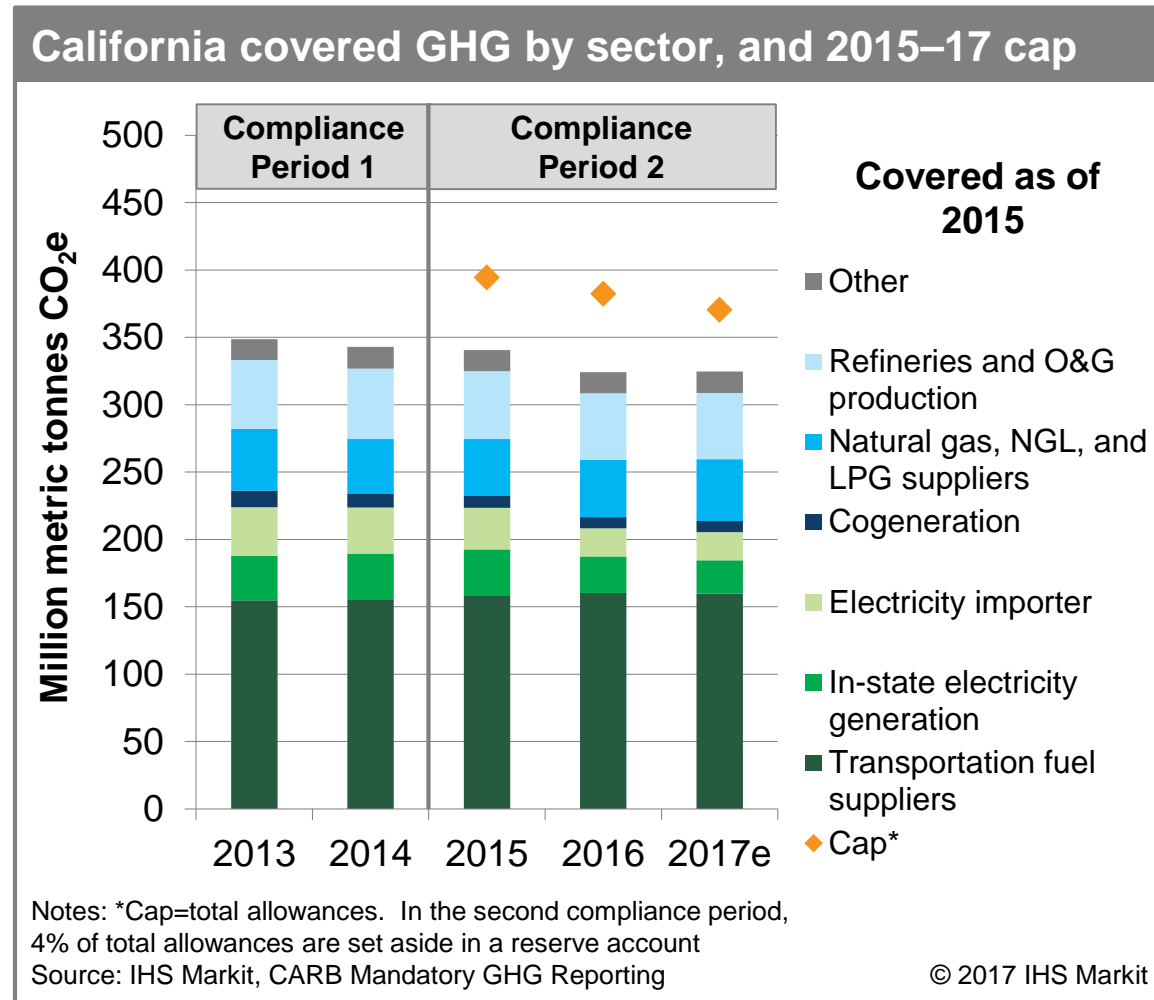
Cap and Trade for “last mile” of emissions reductions in California



A suite of policies is intended to reduce California economywide GHG emissions to statutory targets

- Assembly Bill 32 (2006) and Senate Bill 32 (2016) codified economywide emission targets of 431 MMt by 2020 and 260 MMt by 2030, respectively (relative to 1990 levels)
- Sector specific policies are intended to do much of the work, including:
 - Renewable Portfolio Standard, set at 50% by 2030
 - Energy efficiency savings in natural gas and electricity end uses
 - Low Carbon Fuel Standard, achieving 10 percent reduction in emissions intensity by 2020, proposed to grow to 18% by 2030
 - Zero emissions vehicle requirements
- Cap-and-trade is intended to drive emissions to specific levels that the targeted policies and other drivers may not achieve
- The State Regulator’s latest analysis (i.e., Scoping Plan) anticipates cap and trade will need to reduce 2030 GHG emissions a further 60 MMT

The California allowance market is structurally oversupplied, and well beyond Quebec's incremental needs



California total covered emissions have been coming in at approximately 15% below annual caps

- Annual caps to 2020 were established in 2011
- Targeted policies have evolved, most notably the renewable portfolio standard

Transportation fuels is the largest covered sector

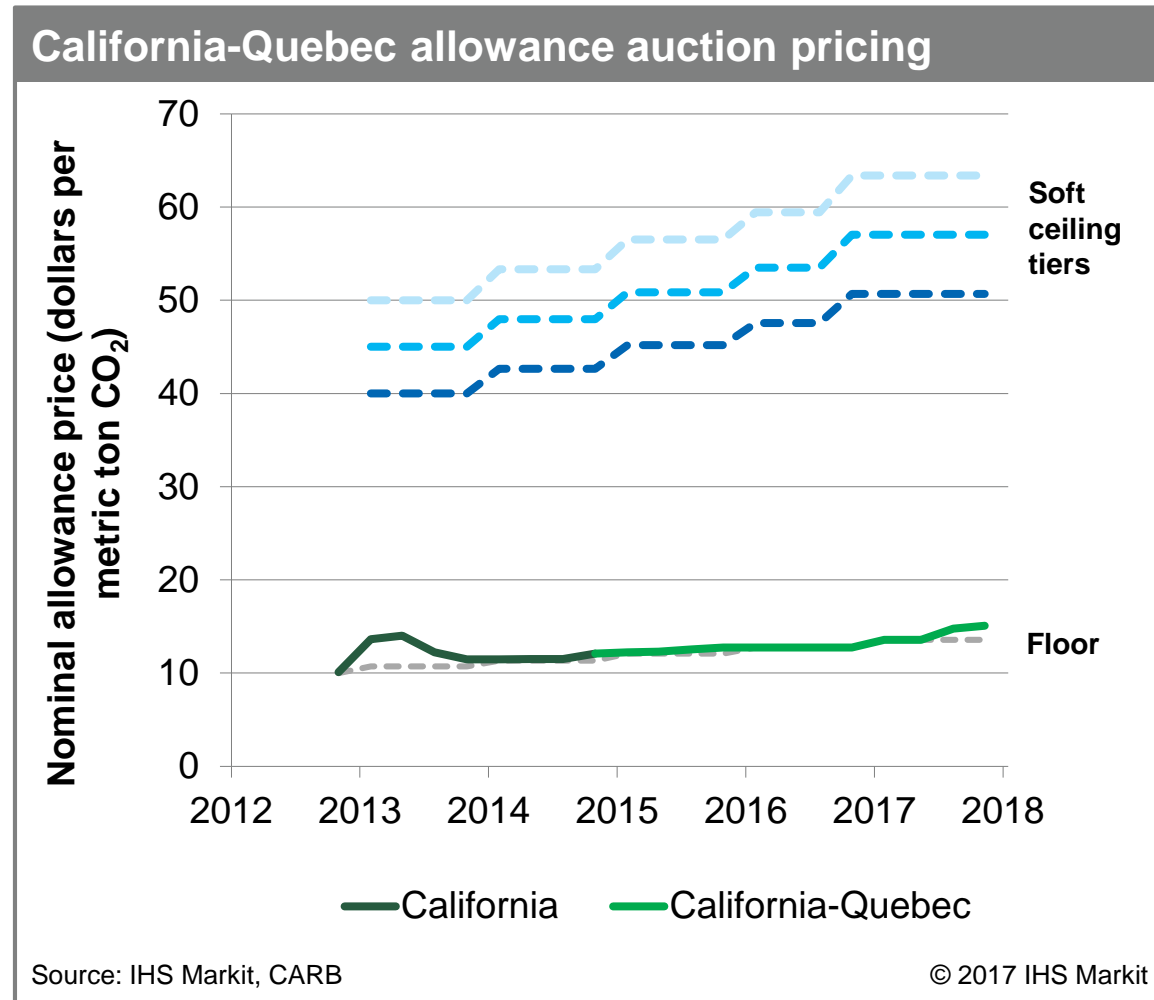
- Transportation fuel emissions currently represents approximately 50% of total covered emissions

A large private bank of California allowances has accumulated

- Banking of allowances for future compliance needs is permitted
- IHS Markit estimates private entities have approximately 170 million extra allowances after satisfying 2017 compliance needs across the program

Quebec's current incremental allowance needs are a fraction of California's excess

California and Quebec allowance pricing has reflected the combined market's oversupply



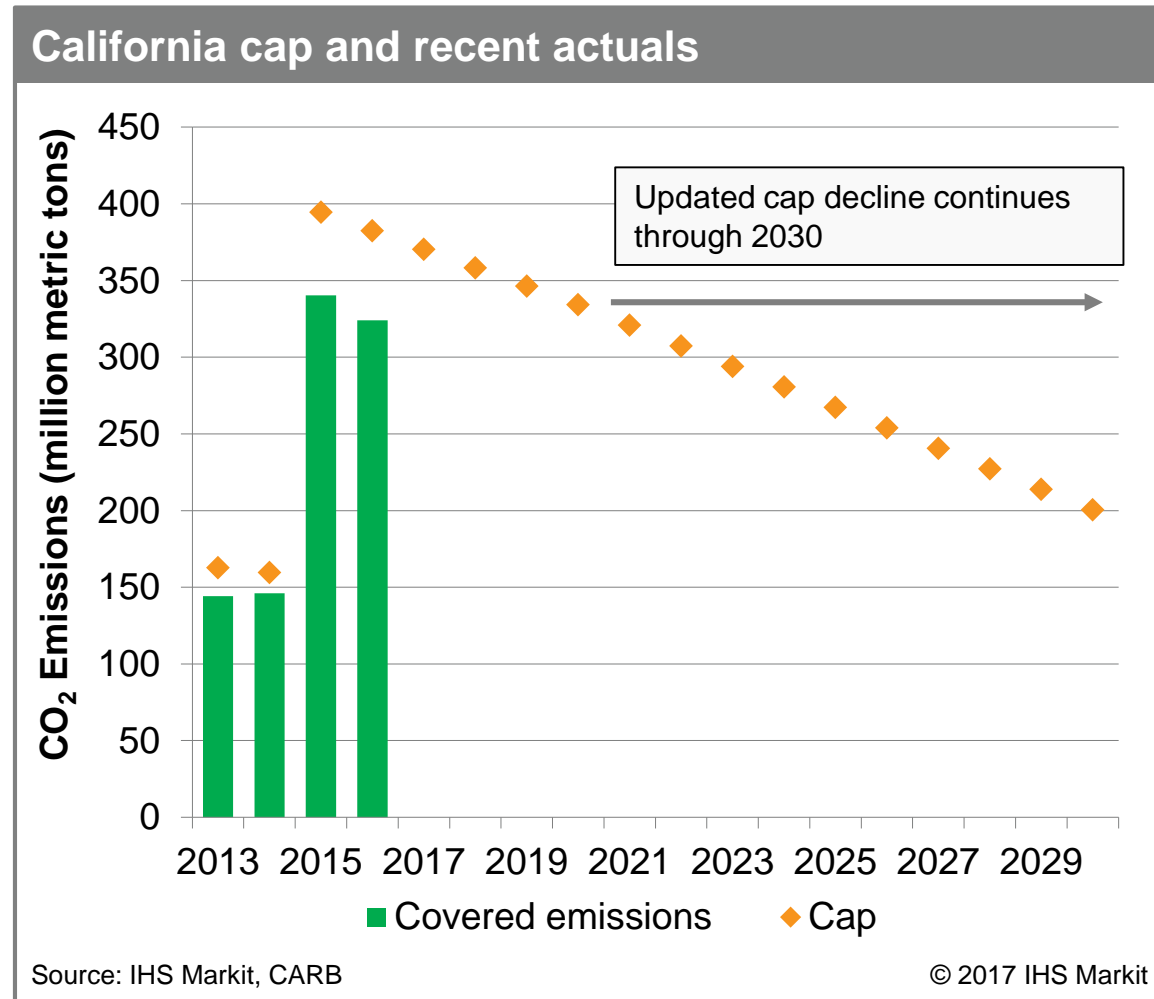
Allowances prices have been persistently low

- Quarterly allowance auctions in joint auctions cleared within 5% of the programmatic price floor through early 2017
- Auction prices escalated modestly beginning in mid 2017 after program extension certainty emerged

Soft price ceilings have never been reached

- A soft price ceiling mechanism allows for the auction of a limited number of additional (“reserve”) allowances at three different price tiers
- Reserve allowances accumulate annually through the setting aside of a fraction of each year’s total

Certainty and some details have emerged regarding extension of the California Program beyond 2020



2017 legislation and accompanying regulations clarify some important California program extension details

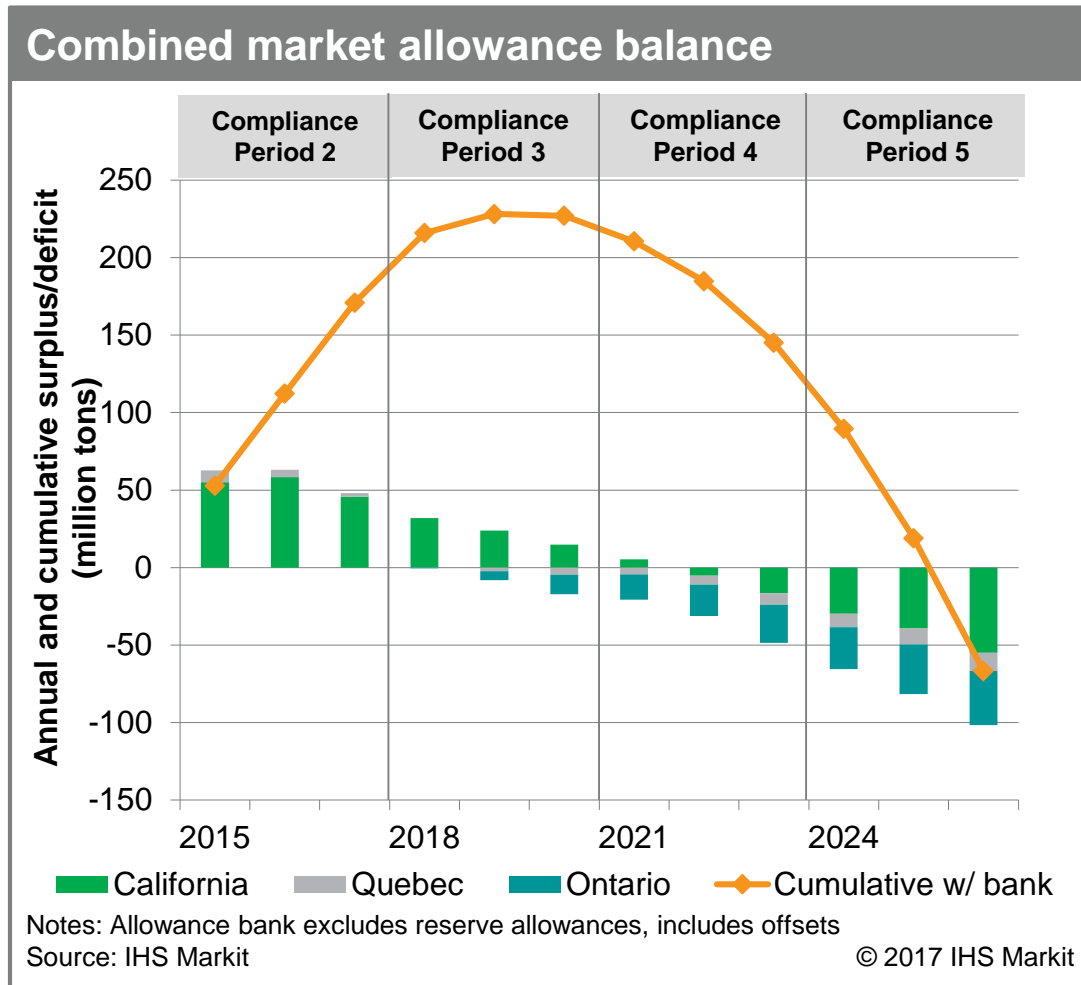
- The annual cap will decline by 40% between 2020 to 2030
- The limit on the use of offset credits will be reduced from 8% to 4%, with California benefits requirement.

CARB has yet to finalize other details

- The level of a post 2020 firm price ceiling
- The level of post 2020 soft price ceilings (known as Allowance Price Containment Reserve [APCR]).
- Stakeholder processes in 2018

Quebec and Ontario have regulatory processes underway to similarly extend their programs

Combined market annual allowance supply and demand will be roughly equal around 2020, but the private bank extends oversupply into mid 2020s



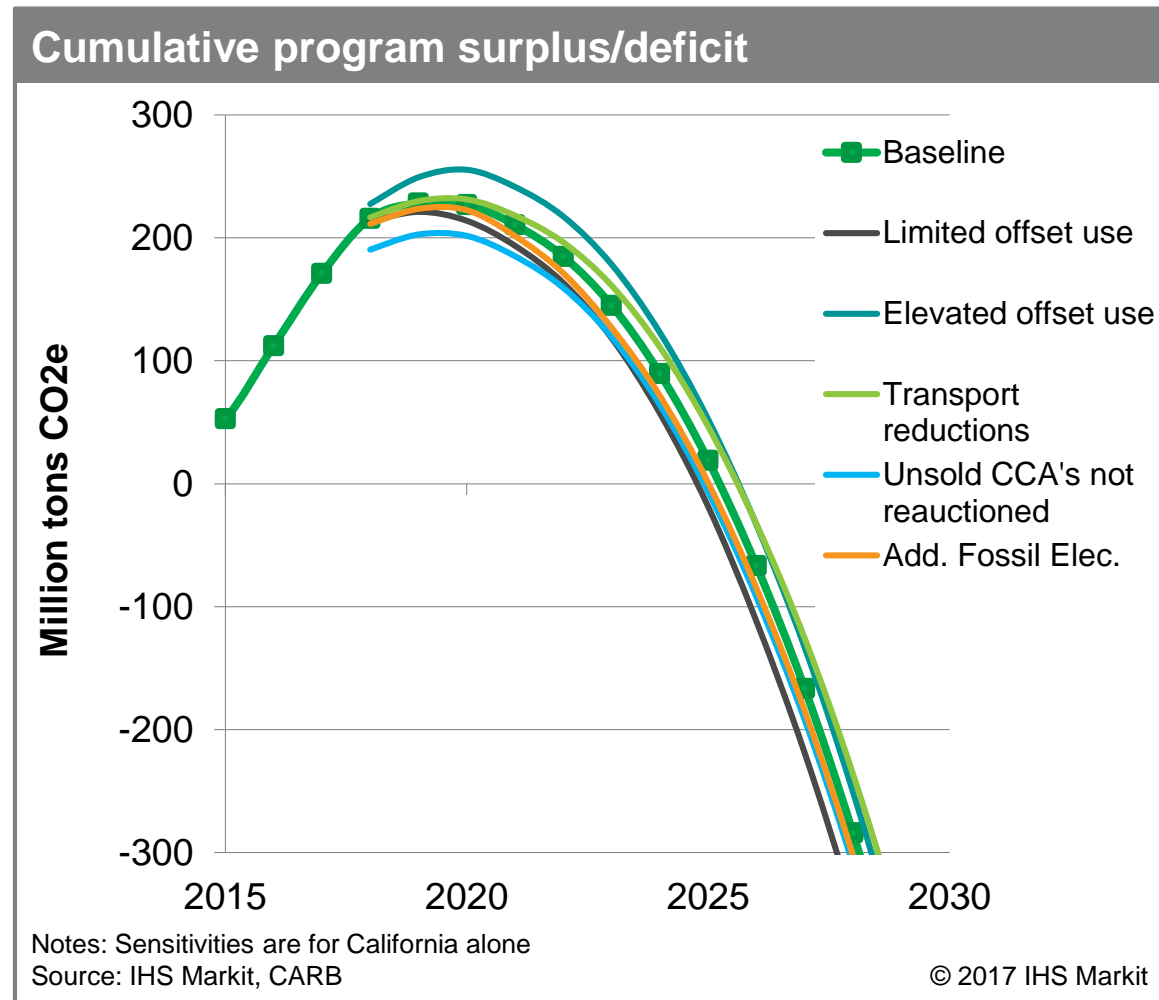
IHS Market anticipates that cap declines will outpace emission declines going forward, reducing the combined market annual allowance surplus

- Quebec and Ontario have relatively low carbon electric power sectors and little initial annual allowance surplus
- California’s RPS will drive further emission reductions but its electric power sector represents less than 20% of total covered emissions
- Transportation fuels across the three markets represent 49% of total covered emissions. California’s LCFS will be impactful, as will other transport specific policies including MPG standards and ZEV targets

The private bank of allowances will extend the cumulative surplus of allowances to mid 2020s.

- As complementary policies get more difficult (or expensive), compliance entities will increasingly rely on banked allowances
- IHS Markit projects the allowance bank will be depleted in CP 5, however, requiring access to (high priced) reserve allowances.

The combined market allowance bank balance can be influenced by a range of uncertainties

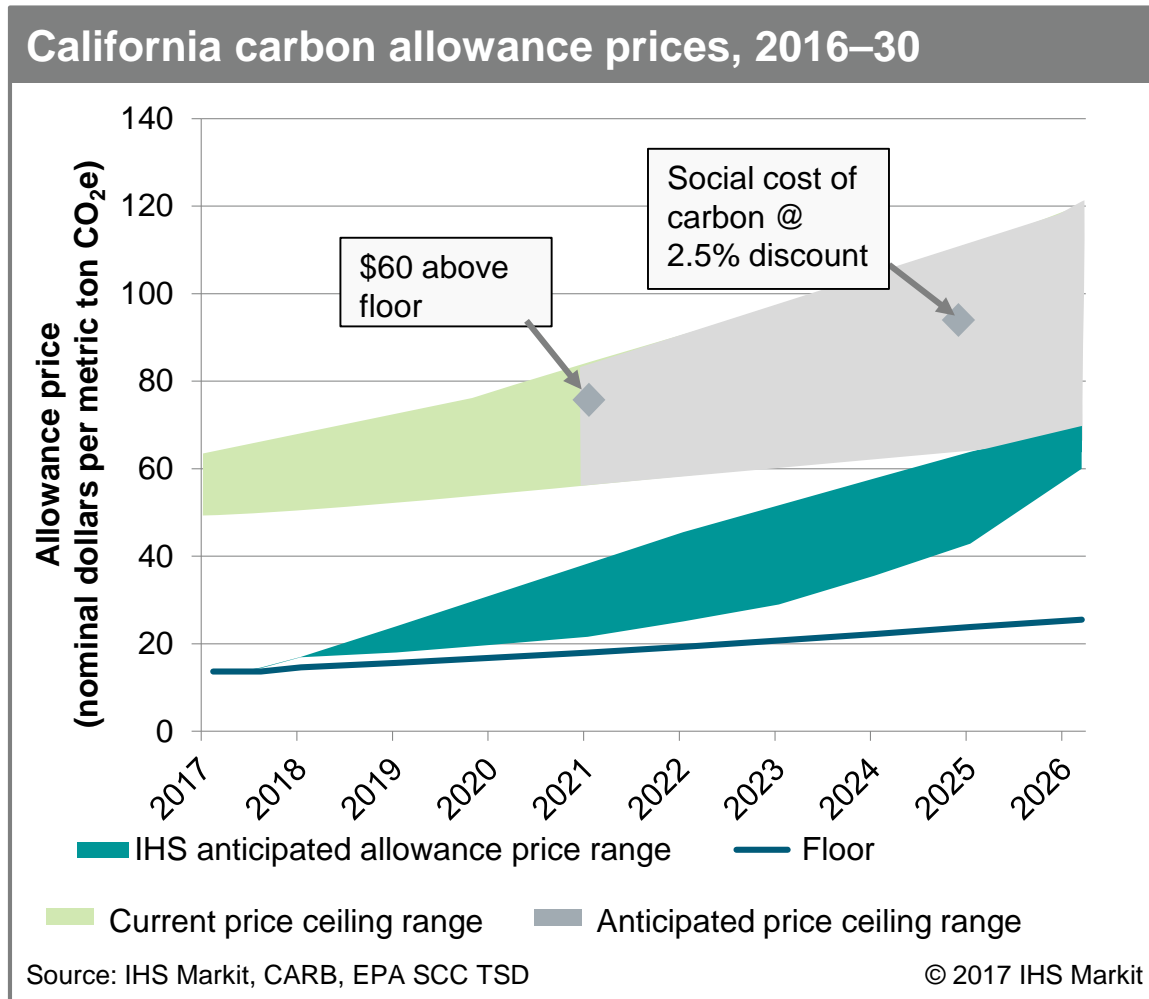


Five California-specific uncertainties have a modest impact on the bank size

- When the bank is drawn to zero (and high priced reserves will be required) can shift by up to two years
- Cumulative impacts ranges from -130 MMt to +60MMt
- One lesson from this is broader program design decisions can have a substantial impact on surplus/deficit—potentially more so than complementary policies

Broadening this analysis to Ontario and Quebec would increase impacts

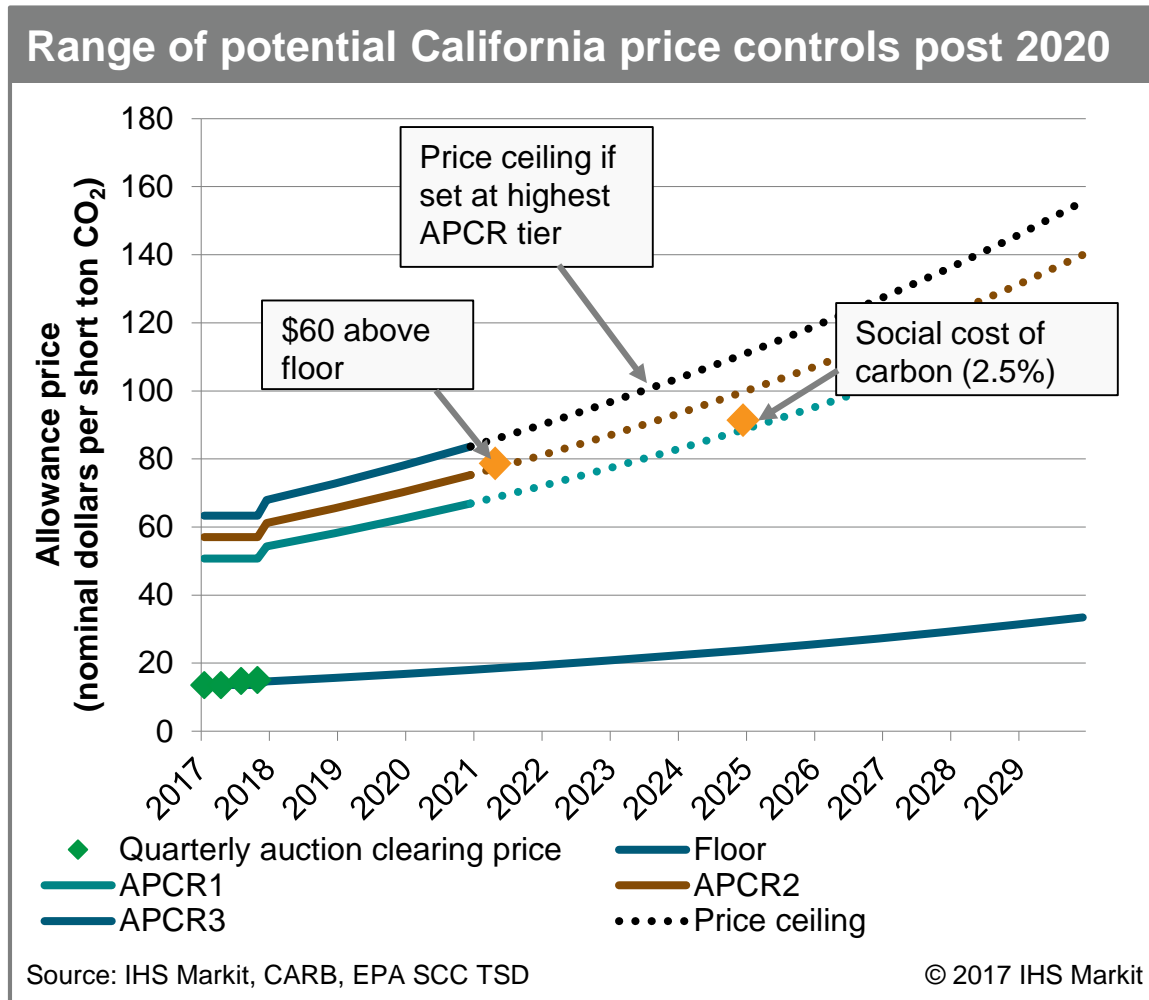
2017 legislation puts the California cap-and-trade program on firmer ground



The timing and ultimate extent of allowance price escalation is uncertain.

- In addition to fundamentals, allowance price formation will be influenced by final price ceiling details, market participants' risk appetite, and allowance procurement strategies.
- It is reasonable to expect that CARB will establish 2021–30 price ceilings at the lower end of the range (discussed later), or that policy intervention at a later date tempers escalation much beyond the \$60–70 per ton. Under this assumption
 - Pricing could remain below \$40 to the mid 2020s and then sharply increase toward soft price ceiling tiers by 2026 if market participants' risk tolerance for future prices is low
 - Pricing could rise sooner if market participants have higher confidence in program certainty, or increased risk tolerance

Some price containment provisions still to be determined, and likely to play significant role in pricing development



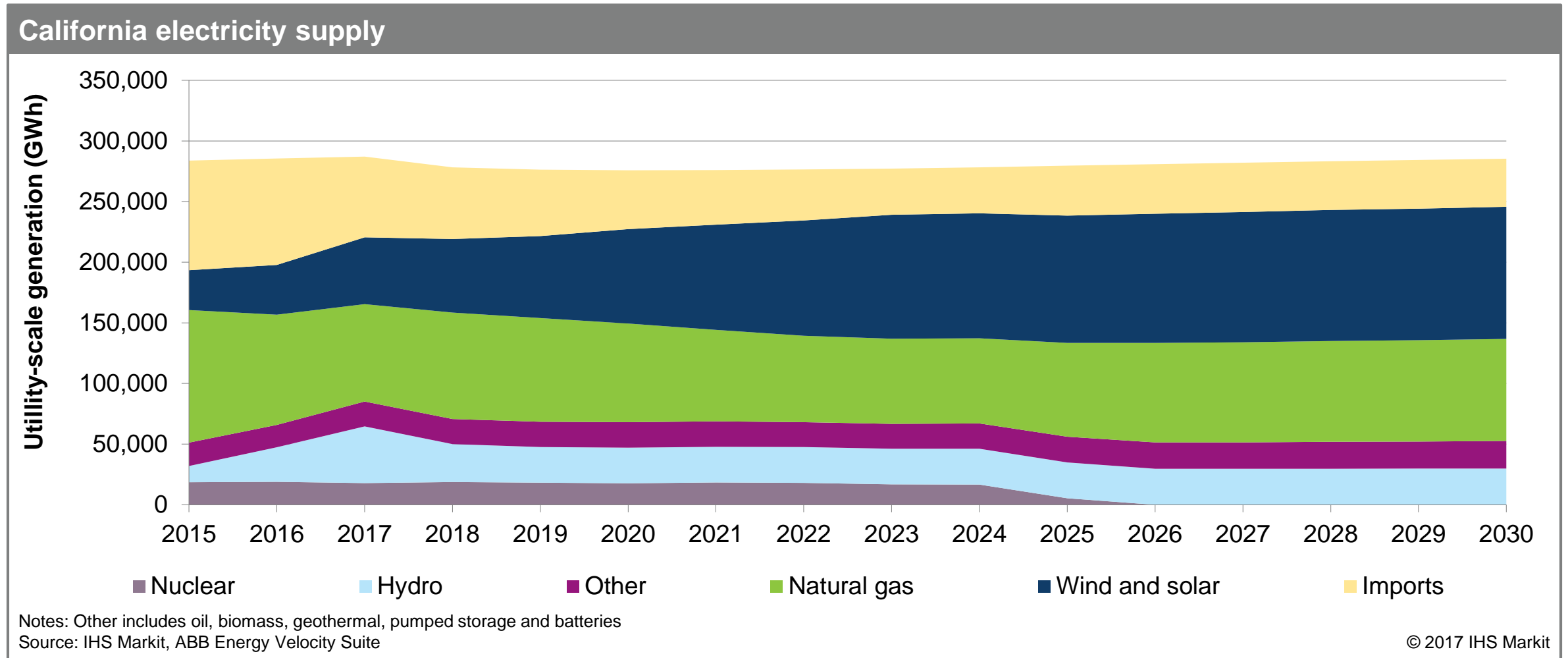
Post 2020 APCR price levels will be set by CARB

- CARB mandated to consider 2020 APCR tiers, social cost of carbon, reserve price, leakage, and cost to achieve statewide emissions goals
- Earlier, CARB staff suggested a single APCR tier at \$60 above floor price

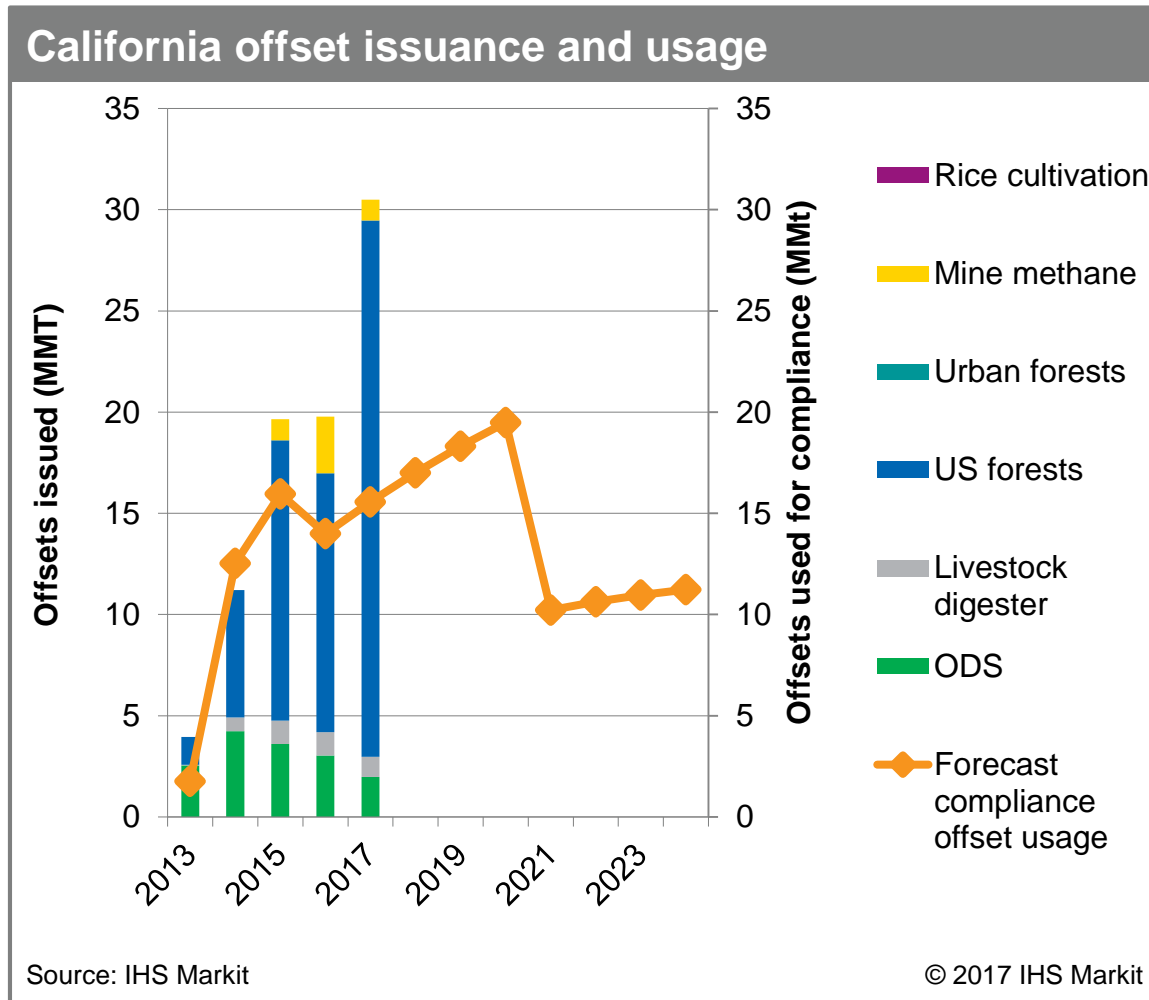
Other changes to APCR price tiers may play an important role

- Two thirds of allowances remaining in price reserve accounts at the end of 2017 will be divided equally among two APCR tiers post 2020.
- Beginning in 1 January 2018, unsold allowances that remain unsold in holding accounts for more than 24 months will be transferred to APCR
- All allowances remaining in reserve at end of 2020 will be placed into price ceiling reserve

Renewables displace imports and in-state gas



Offsets usage remains below limit through 2020



Offsets may also be used to meet 8% of compliance needs, dropping to 4% post 2020.

- Offset limit is per compliance entity. Some entities likely to be long on allowances due to complementary policies
- Invalidation risk was an early barrier—in 2014, CARB invalidated 88,955 ozone depleting substance offsets generated at an incineration facilitated in Arkansas
- In first compliance period entities used about half the offset maximum
- Contracts that transfer invalidation risk to the seller have emerged as a solution to offset risk, as have insurance policies

What's next for California?

- The linkage with Ontario in 2018 will signal a significant expansion of the cap, and is likely to increase program stringency as caps continue to decline for all participants.
- The first joint auction will be held in 2018 and give some signals as to changes in the market
- Finalization of Quebec/Ontario post-2020 program details may impact compliance pathways, but likely to be in line with California changes.
- CARB 2018/19 processes to finalize post-2020 regulation will determine APCR and price ceiling tiers
- Potential new entities may join post-2020 and future expand the program, both in the Western United States and Canada (in the US, this is driven by subnational policies, while in Canada the national CO₂ pricing backstop may encourage additional participation)

IHS Markit Customer Care

CustomerCare@ihsmarkit.com

Americas: +1 800 IHS CARE (+1 800 447 2273)

Europe, Middle East, and Africa: +44 (0) 1344 328 300

Asia and the Pacific Rim: +604 291 3600

Disclaimer

The information contained in this presentation is confidential. Any unauthorized use, disclosure, reproduction, or dissemination, in full or in part, in any media or by any means, without the prior written permission of IHS Markit Ltd. or any of its affiliates ("IHS Markit") is strictly prohibited. IHS Markit owns all IHS Markit logos and trade names contained in this presentation that are subject to license. Opinions, statements, estimates, and projections in this presentation (including other media) are solely those of the individual author(s) at the time of writing and do not necessarily reflect the opinions of IHS Markit. Neither IHS Markit nor the author(s) has any obligation to update this presentation in the event that any content, opinion, statement, estimate, or projection (collectively, "information") changes or subsequently becomes inaccurate. IHS Markit makes no warranty, expressed or implied, as to the accuracy, completeness, or timeliness of any information in this presentation, and shall not in any way be liable to any recipient for any inaccuracies or omissions. Without limiting the foregoing, IHS Markit shall have no liability whatsoever to any recipient, whether in contract, in tort (including negligence), under warranty, under statute or otherwise, in respect of any loss or damage suffered by any recipient as a result of or in connection with any information provided, or any course of action determined, by it or any third party, whether or not based on any information provided. The inclusion of a link to an external website by IHS Markit should not be understood to be an endorsement of that website or the site's owners (or their products/services). IHS Markit is not responsible for either the content or output of external websites. Copyright © 2017, IHS Markit™. All rights reserved and all intellectual property rights are retained by IHS Markit.

