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California's Cap-and-Trade Program for Greenhouse Gases – AB 32 As 2015 Approaches



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AB 32 As 2015 Approaches:

- California's Cap-and-Trade Program
- ARB* Allowance Auction Results
- Allowance Price Forecasts
- Open Issues & What Should ARB Do Now?
- EPA's Clean Power Plan
- Litigation Update
- About Van Horn Consulting



GHG – Greenhouse Gases

*ARB – California Air Resources Board

EPA – U. S. Environmental Protection Agency

Appendices: More on Related Topics

- Linkage with Quebec & Others
- California Carbon Offsets
- The Low Carbon Fuel Standard
- EPA's Proposed New Source Performance Standards (NSPS) for New Power Plants
- EPA's Proposed Clean Power Plan for Existing Power Plants
- Legal and Legislative Challenges





AB 32 As 2015 Approaches

California's Cap-and-Trade Program

- California's Cap-and-Trade (C&T) program is a market-based approach that caps overall emissions of greenhouse gases (GHG) from electricity, industrial, commercial and residential sectors and transportation fuels.
- C&T requires California Carbon Allowances (CCAs) to be acquired, banked & surrendered for each metric tonne (MT) of emissions from facilities with CO₂e emissions over 25,000 tonnes/yr.



California's Cap-and-Trade Program

- Electric power and industrial facilities are the focus of the first cap-and-trade compliance period (CP1: 2013-2014) with a compliance date of November 1, 2015.
- The second compliance period, CP2, is three years, 2015-2017, with a compliance date for CCA surrender: November 1, 2018.
- In 2015 natural gas suppliers and fuel distributors will also be covered by California's economy-wide C&T approach, encompassing about 85% of California's statewide total GHG emissions.



California's Cap-and-Trade Program

- The third compliance period, CP3, is from 2018-2020, has a compliance date of November 1, 2020.
- Each year from 2014 forward, CCAs must be surrendered to cover 30% of the prior year's covered GHG emissions.
- To cover the fuels and transportation sectors, the CCA emissions cap will increase from 162.8 MMTCO₂e in 2013 to 394.5 million tonnes in 2015, then decline by about 3.4% per year to 2020.

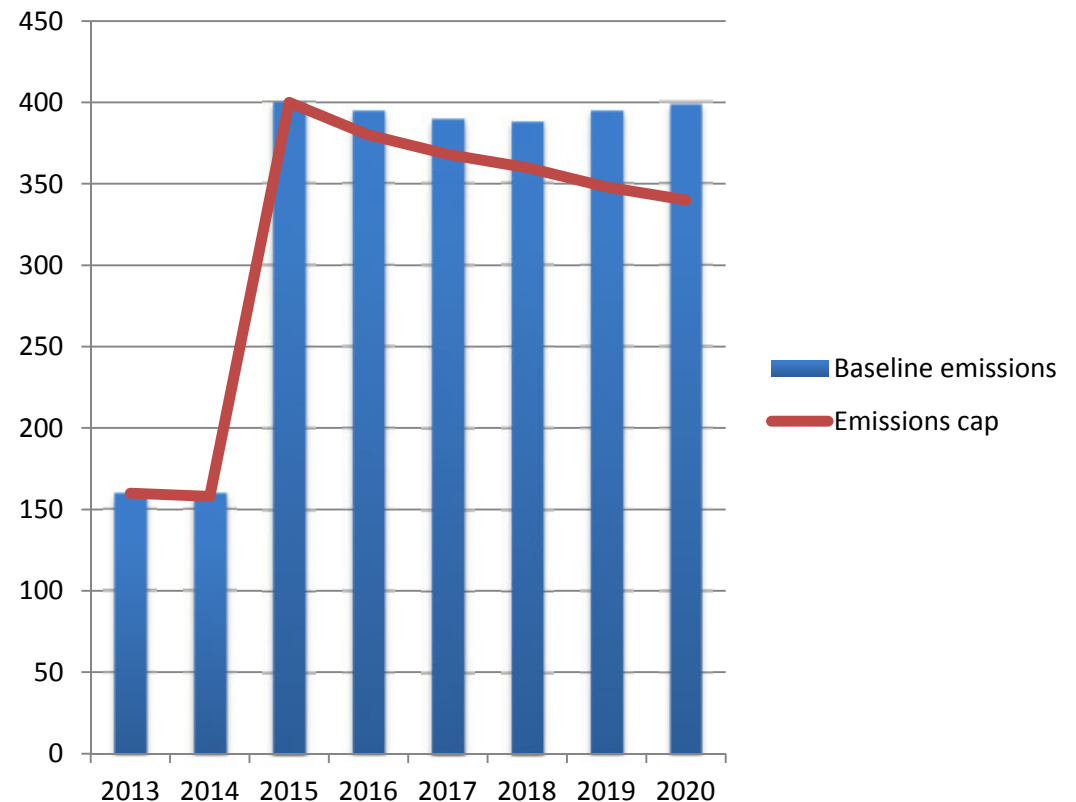


California's Declining Emissions Cap

- The 2020 C&T emissions cap will be adjusted to reach the overall statewide GHG goal, depending on reductions achieved by complementary programs.

Year Million Allowances

■ 2012	165.8
■ 2013	162.8
■ 2014	159.7
■ 2015	394.5
■ 2016	382.4
■ 2017	370.4
■ 2018	358.3
■ 2019	346.3
■ 2020	334.2



Complementary Programs

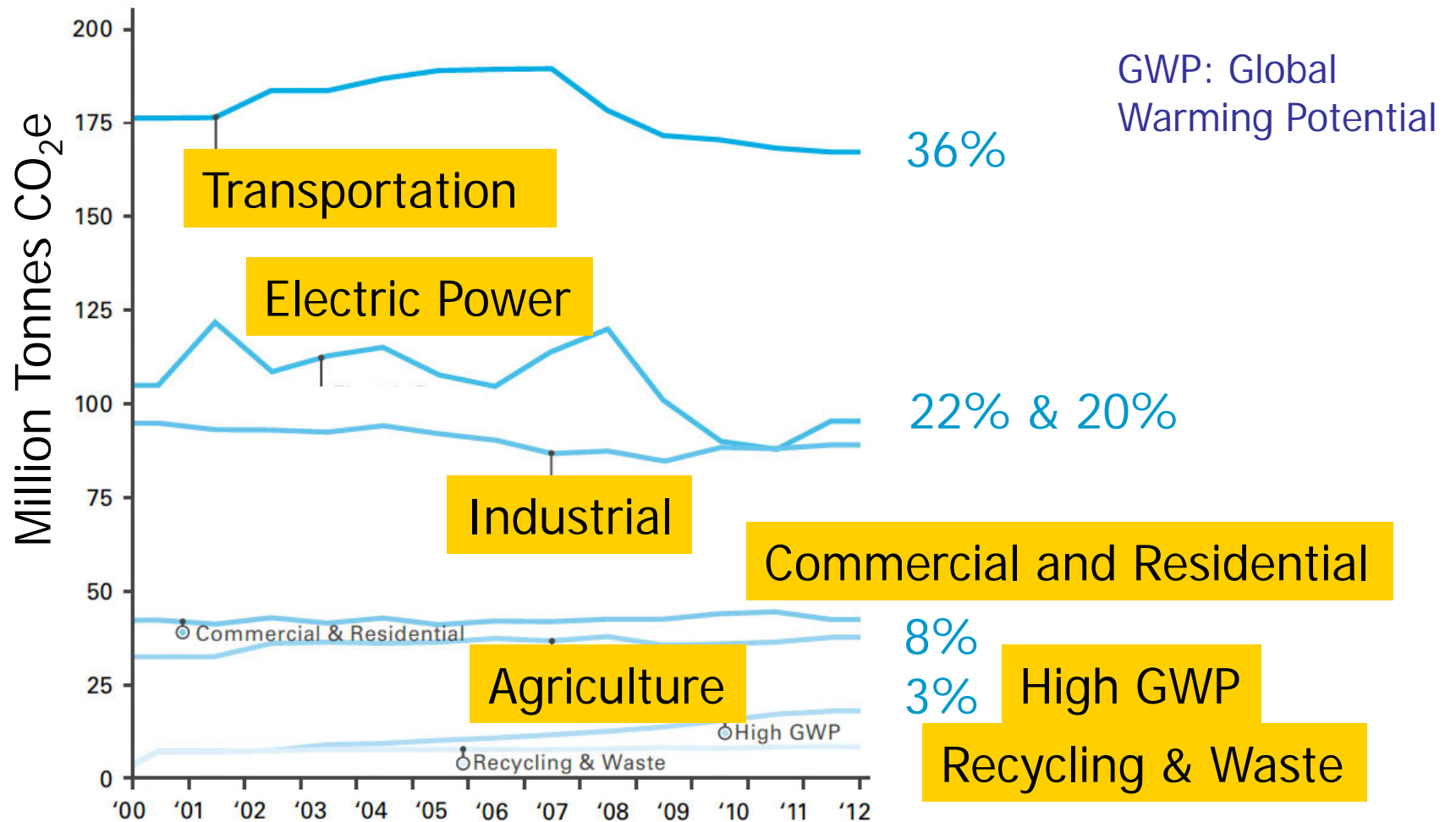
Contributing to GHG reductions are complementary measures outside of the Cap-and-Trade program:

- Energy Efficiency Standards,
- Low Carbon Fuel Standard (LCFS),
- 33% Renewable Portfolio Standard,
- Advanced Clean Cars,
- CA Solar Initiative,
- Mandatory Commercial Recycling,
- High Speed Rail, and
- Water Efficiency.



California GHG Emissions by Sector

From 2000 to 2012 total CA GHG emissions decreased from 466 MMTCO₂e to 459 MMTCO₂e.

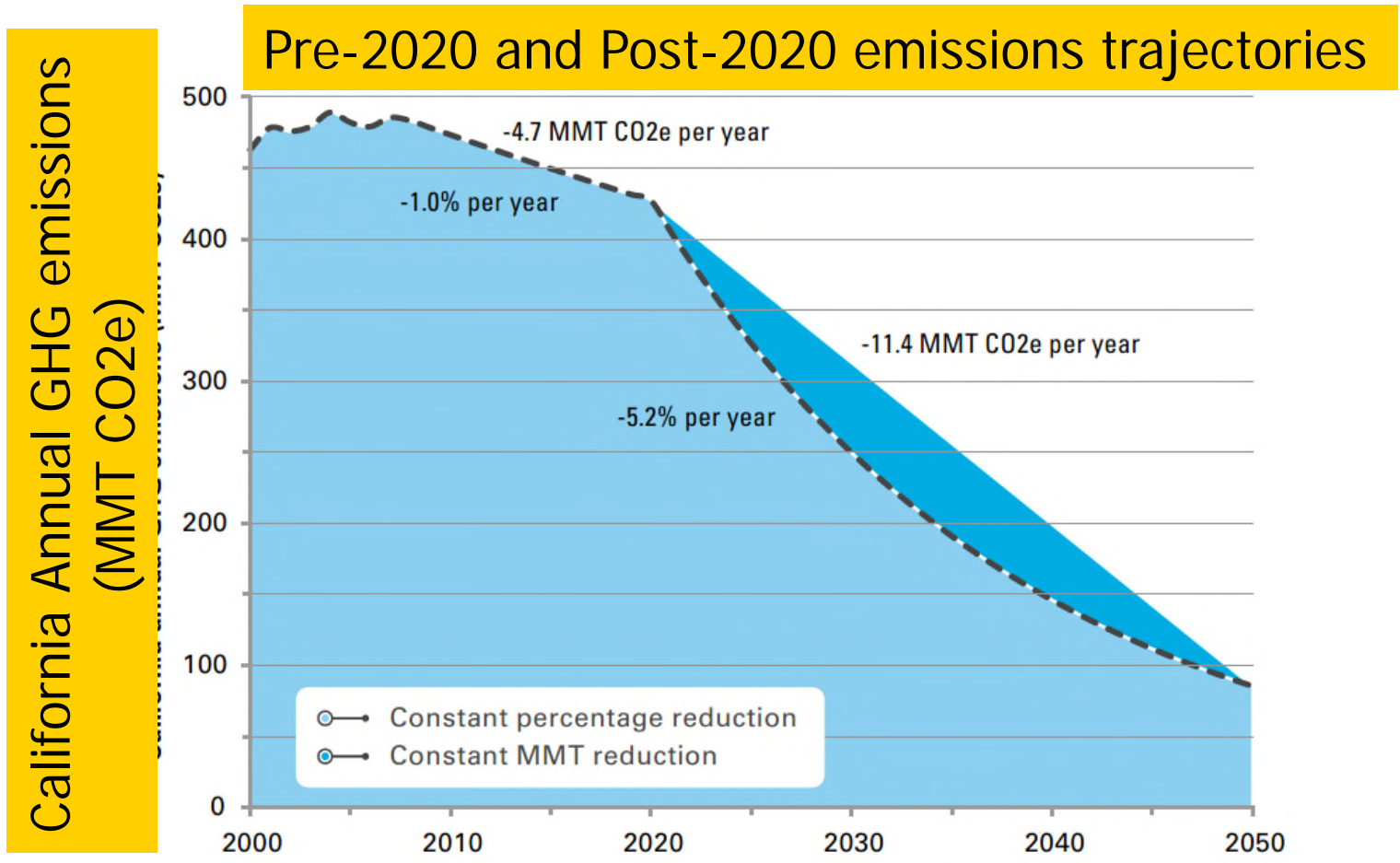


ARB's First Scoping Plan Update

- The Scoping Plan discusses California's programs to reduce statewide emissions of greenhouse gases back to the 1990 level.
- Every 5 years the AB 32 Scoping Plan is updated, in order to
 - "continue to consider future achievement of maximum technologically feasible and cost-effective GHG emission reductions," and
 - present the "priorities and recommendations for achieving the State's longer-term emission reduction objectives."
- The first update was finished in May 2014.



The ARB Scoping Plan: A Path to 2050



2012 reported sector emissions

Electricity (~22%): 100.4 MMTCO₂e = 41.6 CA production + 14.4 cogen + 44.4 Imports

Transportation (~36%): 160 MMTCO₂e

2020 BAU_{electricity} = 110 MMTCO₂e from a Business-As-Usual projection published in 2010



ARB's Scoping Plan Update^{cont'd}

■ How Will the 2020 Emission Target Be Met?

Category	2020 (MMTCO ₂ e)**
AB 32 Forecast Emissions (2020 BAU)	509
Expected Sector-based Reductions	
Energy	25
Transportation	23
High Global Warming Potential Gases	5
Waste	2
Cap-and-Trade Reductions*	23* up from 18
2020 AB 32 Limit	431 up from 427

* Cap-and-Trade emission reductions depend on the emission forecast.

** Based on AR4 GWP values.



ARB, First Update to the Climate Change Scoping Plan:
Chapter IV: Accomplishments and Next Steps, May 2014, p. 93.

ARB's Allowance Surrender Schedule

- California Carbon Allowances (CCAs) for 30% of the prior year's GHG emissions must be surrendered by November 1 of the next year. E.g., 30% of 2013 emissions must be covered by allowances surrendered by November 1, 2014.
- The remainder of 2013 and 2014 emissions must be surrendered by November 1, 2015.
- A similar schedule applies for CP2: 2015-2017 and CP3: 2018-2020, where all remaining CP emissions must be covered by November 1, 2018 and November 1, 2021, respectively.



Anheuser-Busch InBev plant in Fairfield uses wind energy and biogas fuel in addition to purchasing system power.



Carbon Markets in CA & QC Are Linked

- Effective January 1, 2014, the California and Quebec allowance markets were linked with fungible allowances and floor prices.
- Quebec facts:
 - Covered GHG emissions ~82.5 million tonnes in 2010, with a 2020 target of 69.7 MMT, BAU emissions in 2020 ~ 84 MMT.
 - 95 % hydro-electric generation.
- A joint practice auction was conducted on August 7 with 28 qualified bidders.
- The first actual joint auction may be carried out on November 17, 2014.



Status of CCA Compliance Accounts

- As of July 1, 2014 83.7 million vintage 2013 CCAs and Quebec (QC) emissions allowances had been placed into Compliance Accounts.
 - These CCAs may not be returned into holding accounts or transferred to another participant.
 - The 30% annual surrender requirement in CA on November 1, 2014, (30% of 2013 emissions) would be about 48.8 million, if emissions were at the 2013 cap.
 - Quebec does not require annual surrender, only surrender after the compliance period.



Status of CCA Compliance Accounts

- As of July 1, 2014, 43.5 million V2014 CCAs were also in “one-way” Compliance Accounts.
 - Allowances in Compliance Accounts can’t be traded!
- Allowances are placed in Compliance Accounts to:
 - Prepare for CCA surrender to comply, or
 - Create Limited Exemptions from each year’s Holding Limit for “current” CCAs, or
 - Because of legal requirements.
- No offset allowances (ARB Offset Credits) were in Compliance Accounts as of July 1.



What Are Holding Limits?

- Holding Limits are intended to prevent market manipulation.
- Unfortunately, “one-size-fits-all” Holding Limits can have unintended, adverse consequences.

Holding Limits apply to the sum of allowances held in the Compliance Account and the Holding Account.

- ❖ Separate limits apply to “current” and “advance” CCAs.
- ❖ Limited Exemption (LE) allowances are CCAs in the Compliance Account that do not count against the holding limit.
- ❖ On July 1, 2014, the maximum Limited Exemption (LE) is the sum of a firm’s verified emissions in their 2012 and 2013 annual emissions data reports, i.e., 2011 and 2012 covered emissions.
- ❖ On November 2, the LE will be increased by verified emissions in the 2014 annual emissions data report.



What Are Cost Containment Rules?

- The Allowance Price Containment Reserve (APCR) can provide additional allowances at auction, six weeks after regular quarterly auctions, when a request is made.
- Qualified bids will be satisfied at one of three price tiers, escalated from \$40, \$45, and \$50/tonne.
- To make the APCR more viable, ARB implemented changes in 2013.
- However, in 2014 the Market Simulation Group recommended more changes to expand the APCR.



Open Issues

- A comprehensive energy plan will be prepared by the third compliance period (CP3, 2018-2020) to describe ARB's long-term GHG reduction goals and address:
 - Post-2020 program elements, including 2030 and mid-term emission targets,
 - Cost containment issues,
 - Integration and linkage with other geographic regions,
 - Compliance with EPA's June 2014 Clean Power Plan, which requires reductions from the electric power sector.



Open Issues^{cont'd}

- Ongoing allocations to Energy Intensive, Trade Exposed and other industries:
 - In April 2014, true-up allocations were approved for certain facilities with qualified thermal output.
 - An amendment to be considered by ARB on Sept. 18, 2014 would allow electric generators with legacy contracts with industrial counterparties to receive free allocations to the end of those contracts.
 - ARB may provide additional transition assistance in the form of free allowances to industrial producers through 2018, instead of 2017, while new leakage studies are being conducted.



Open Issues^{cont'd}

- Revisions to APCR price containment,
- Revisions to Holding Limits,
 - An amendment scheduled for September 18, 2014 consideration would exclude allowances held in Exchange Clearing holding accounts, which are only for clearing purposes,
- Revisions to LCFS reporting rules requiring “chain of custody reporting” and 5-year records retention.
- Written comments to ARB must be received by 5 p.m. on September 15, 2014.



Open Issues^{cont'd}

Future AB 32 program evaluations will include:

- Ex-post assessment of the costs, benefits & cost-effectiveness of current measures & programs, including health impacts of co-benefits.
- Updating the three-year Cap-and-Trade Auction Proceeds Investment Plan and funding new investments needed to achieve GHG reductions and other environmental and public health benefits.
- Allocation of auction revenues:
 - Actions to apply >25% of auction funds to benefit disadvantaged communities (SB 535).
 - Twice a year, Investor-Owned Utility (IOU) electricity consumers will receive a “climate credit,” which averaged about \$35 in April 2014.



What Should ARB Do Now?

- Improve viability of the Allowance Price Containment Reserve by
 - Allowing conversion of more future-vintage allowances, or, instead, by
 - Implementing a hard price cap.
- Allow trading of surplus banked allowances out of “one-way” Compliance Accounts.
- Modify carbon allowance Holding Limits + Limited Exemptions away from the existing approach that will increase future prices and price volatility, as well as making market manipulation easier.



What Should ARB Do Now?^{cont'd}

- Approve new “Offset” protocols and continue to verify ARB Offset Credits
- Reduce potential market volatility by
 - Holding more frequent auctions, for example, between the end of a compliance period and the CCA surrender date on the next November 1.
 - Simplifying market rules.
- Seek additional partners for market linkage.
- Evaluate how to adapt the AB 32 program to satisfy EPA’s proposed Clean Power Plan for reduction of state’s GHG emissions.



Recommended ARB Rule Changes

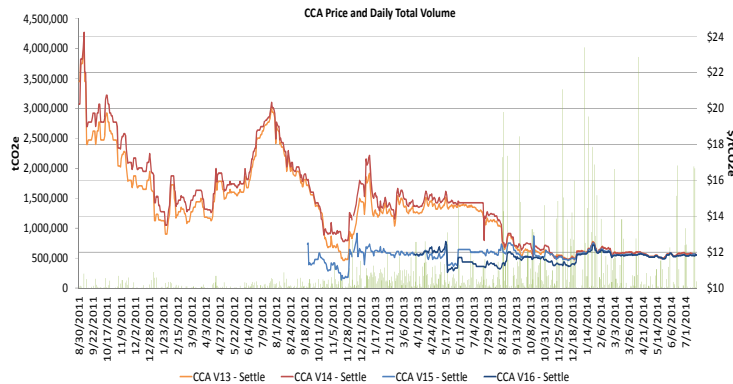
- A research paper discussing the effects of existing market rules and recommendations to modify critical rules is referenced as:

Van Horn, Andrew. "California's Cap-and-Trade Market for Greenhouse Gases: AB 32 Auction Update, Effects of Market Rules and Policy Recommendations." Van Horn Consulting Working Paper. September 2014.





California Auction Results & Allowance Prices



California Allowance Auctions

- California Carbon Allowance (CCA) auctions are held in the second month of each quarter during a 3-hour window.
- Upcoming CCA auction dates are:
 - November 19, 2014,
 - February 18, 2015,
 - May 19, 2015,
 - August 18, and
 - November 17, 2015.
- Revisions to the auction schedule, purchase limits and transparency of results are being evaluated.



California Allowance Auctions

- Allowance Price Containment Reserve (APCR) sales will be held six weeks after each auction, if needed.
- To date, no APCR sales have been requested. (If requested CCAs will be made available for auction in each of the escalated \$40, \$45, & \$50/tonne tiers.)
- Starting in 2015, APCR allowances will be increased in each year's sale prior to November 1, if needed.



California Allowance Auction Results

Auction Date	Vintage Year	# Offered	# Sold	# Qualified Bids/ # Available	Reserve Price (\$/tonne)	Clearing Price (\$/tonne)	Bought by Qualified Compliers	# Qualified Bidders
November 14, 2012	2013	23,126,110	23,126,110	1.06 (3.10)	10.00	10.09	97.0%	73
November 14, 2012	2015	39,450,000	5,576,000	0.14	10.00	10.00	91.0%	
February 19, 2013	2013	12,924,822	12,924,822	2.47	10.71	13.62	88.2%	91
February 19, 2013	2016	9,560,000	4,440,000	0.46	10.71	10.71	100.0%	
May 16, 2013	2013	14,522,048	14,522,048	1.78	10.71	14.00	90.2%	81
May 16, 2013	2016	9,560,000	7,515,000	0.79	10.71	10.71	86.5%	
August 16, 2013	2013	13,865,422	13,865,422	1.62	10.71	12.22	95.5%	79
August 16, 2013	2016	9,560,000	9,560,000	1.69	10.71	11.10	96.3%	
November 19, 2013	2013	16,614,526	16,614,526	1.82	10.71	11.48	96.2%	77
November 19, 2013	2016	9,560,000	9,560,000	1.64	10.71	11.10	91.3%	



California Allowance Auction Results

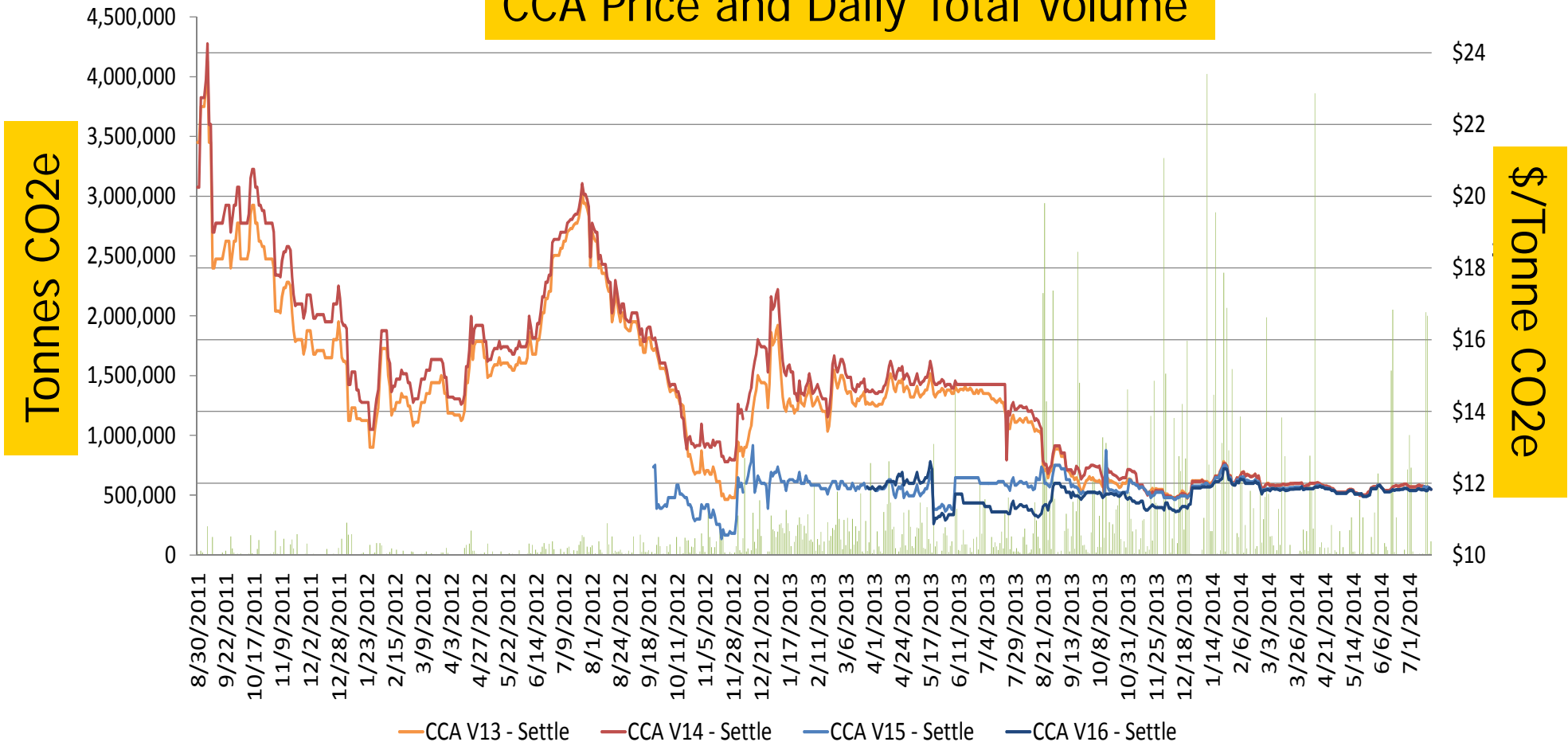
Auction Date	Vintage Year	# Offered	# Sold	# Qualified Bids/ # Available	Reserve Price (\$/tonne)	Clearing Price (\$/tonne)	Bought by Compliers	# Qualified Bidders
February 19, 2014	2014	19,538,695	19,538,695	1.27	11.34	11.48	84.5%	71
February 19, 2014	2017	9,260,000	9,260,000	1.11	11.34	11.38	83.5%	
May 16, 2014	2014	16,947,080	16,947,080	1.46	11.34	11.50	89.5%	74
May 16, 2014	2017	9,260,000	4,036,000	0.44	11.34	11.34	100.0%	
August 18, 2014	2014	22,473,043	22,473,043	1.14	11.34	11.50	87.7%	71
August 18, 2014	2017	9,260,000	6,470,000	0.70	11.34	11.34	89.2%	
November 25, 2014	2014	23,070,987	23,070,987	1.73	11.34	12.10	97.6%	83
November 25, 2014	2017	10,787,000	10,787,000	1.92	11.34	11.86	85.2%	

- Only about 100 of the 360 covered entities in CP1 have bid into the ARB's quarterly allowance auctions.
- Over 700 entities are reporting their GHG emissions.
- Not all offered "advance" allowances have been sold.



California Carbon Allowance Prices

CCA Price and Daily Total Volume



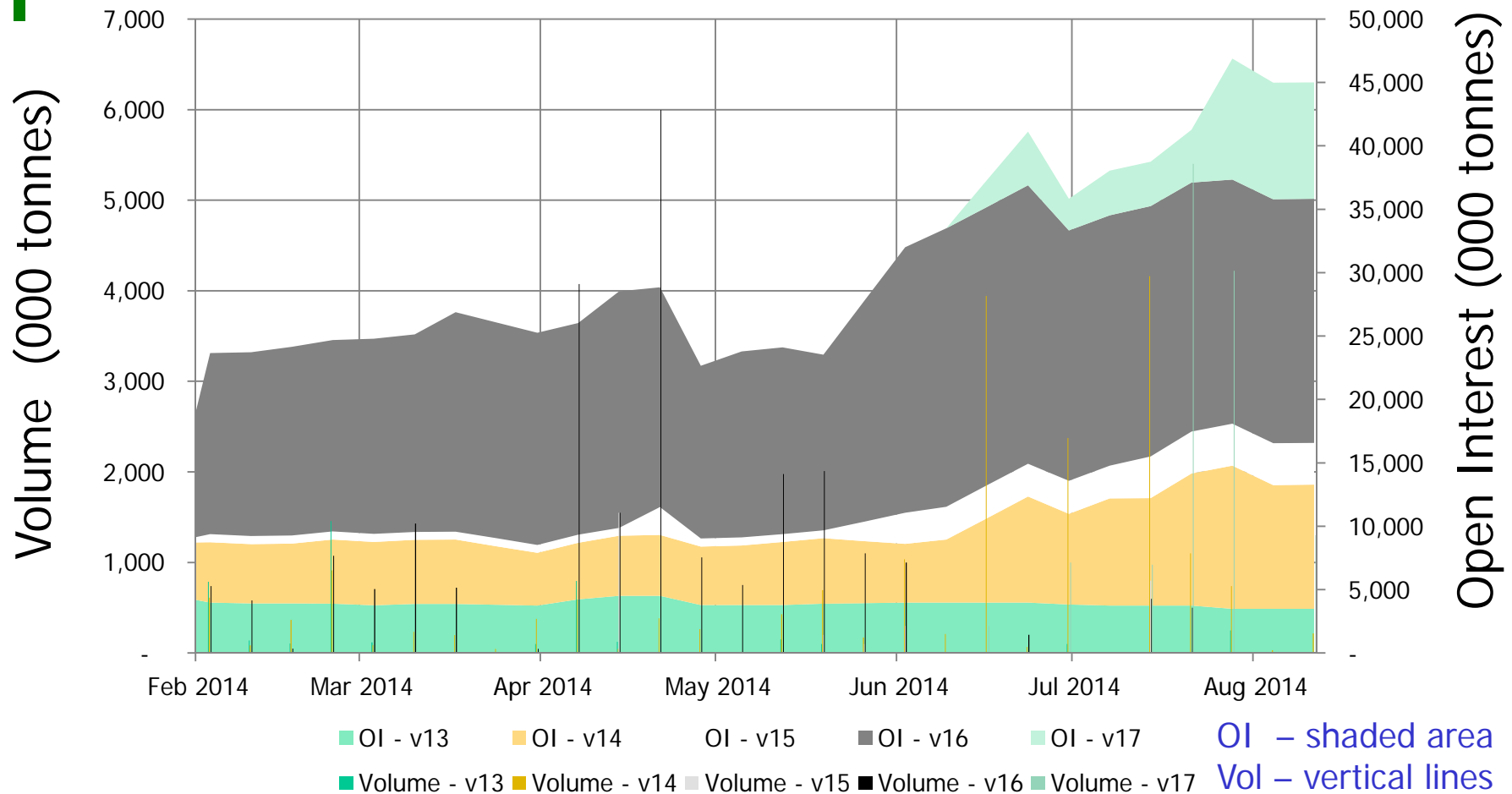
Mid-August prices: V2014 (Dec '14 delivery) \$11.85/tonne, V2015 (Dec '14) \$11.85, V2016 (Dec '14) \$11.65, V2016 (Dec '15) \$12.25, V2017 (Dec '14) \$11.65.

Source of Data: Intercontinental Exchange (ICE).

Graphic provided by Morgan Hagerty, CE2 Capital Partners, Solana Beach, CA.



CCA Trading Volumes & Open Interest

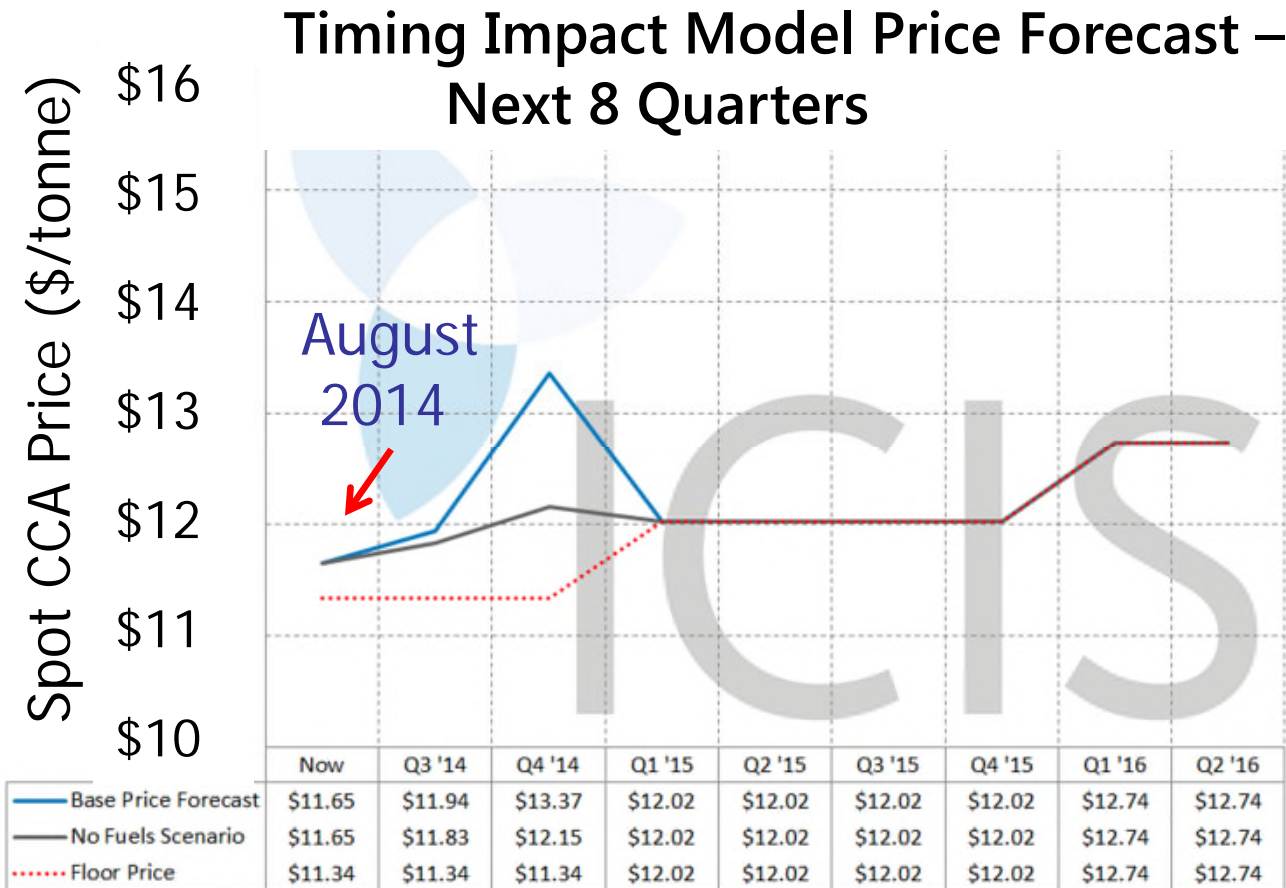


- Data from Intercontinental Exchange
- Graphics provided by jan.frommeyer@icis.com
ICIS – <http://analytics.icis.com>



Allowance Price Projections

- ICIS short-term price forecasts for spot CCAs are based on the positions and preferences of affected firms and their projected allowance trading behavior.



Data from Intercontinental Exchange.

Graph provided by
jan.frommeyer@icis.com

ICIS –
<http://analytics.icis.com>



Allowance Price Projections^{cont'd}

- There are plausible scenarios where the price ceiling could be exceeded.
- Updated price projections by the Market Simulation Group (MSG) suggest that it is most likely that CCA prices
 - Will remain near (or even below) the price floor, or
 - Will spike above the first tier APCR price in compliance period 3 (2018-2020).
- Features of California's market design make hair-trigger price swings possible.

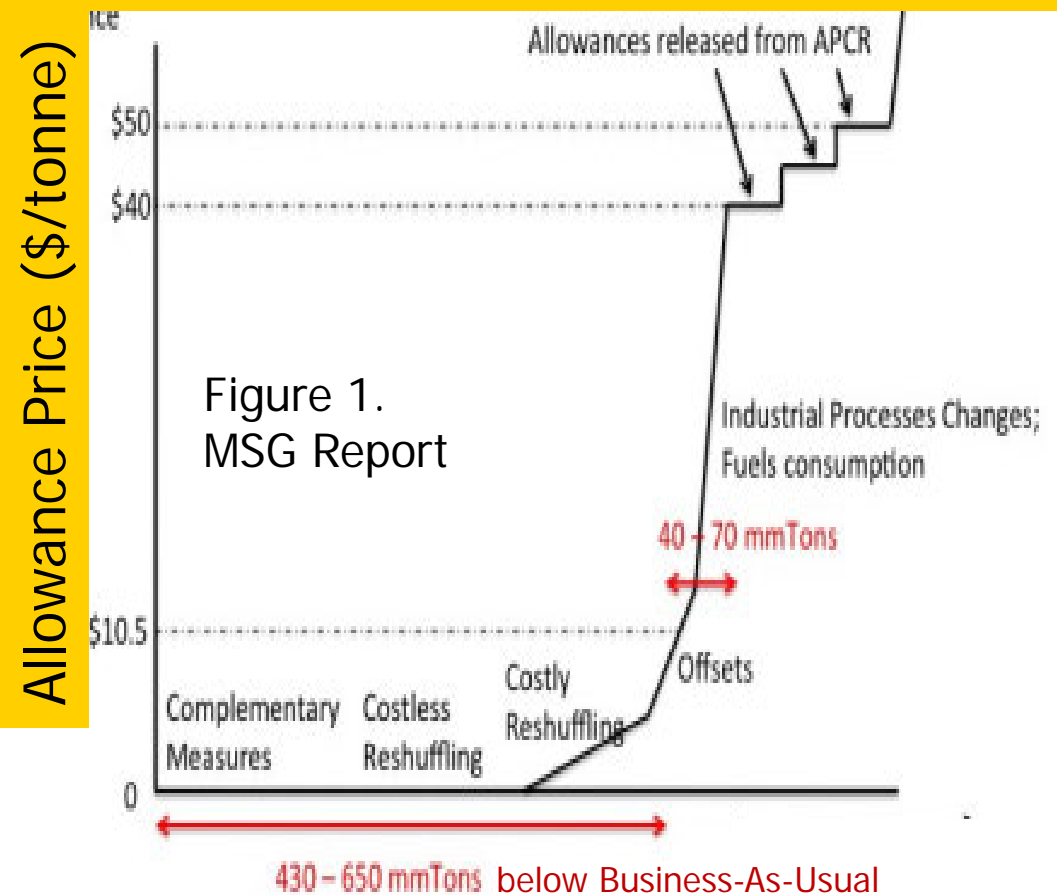
Shobe, Wm, Holt, C. & T. Huetteman. "Elements of Emission Market Design: An Experimental Analysis of California's Market for Greenhouse Gas Allowances." *Journal of Behavioral Economics*. JEBO-3346, 2014.



MSG's Allowance Supply Curve

- MSG eight-year CCA supply curve (emissions - CCAs) is quite steep and assumes no banking of CCAs will occur.
- Uncertainties in emissions and shortfall in reductions from complementary policies, electricity imports or offsets could lead to price shocks past 2017.

Marginal Costs of Allowance Supply (2013-2020)



GHG Reductions Needed
(million metric tons)



"Report of the **Market Simulation Group** on Competitive Supply/Demand Balance in the California Allowance Market and the Potential for Market Manipulation."

Severin Borenstein, James Bushnell, Frank A. Wolak, and Matthew Zaragoza-Watkins. June 2014



Stop the Hidden Gas Tax!

On January 1, 2015, a new hidden gasoline tax will go into effect. With prices already around \$4.00 per gallon, this new tax is expected to increase the cost of gas between 16 cents and 76 cents per gallon, according to the California Air Resource Board. There is still time to stop it, but we must act now. Contact state officials today and urge them to put the brakes on this new hidden gas tax!

Sign the Petition

 www.CaliforniaDriversAlliance.org



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**What will
Cap and Trade
cost you?**

\$

Will the Cap-and-Trade Market Function Effectively?

Will the Cap-and-Trade Program Function Effectively?

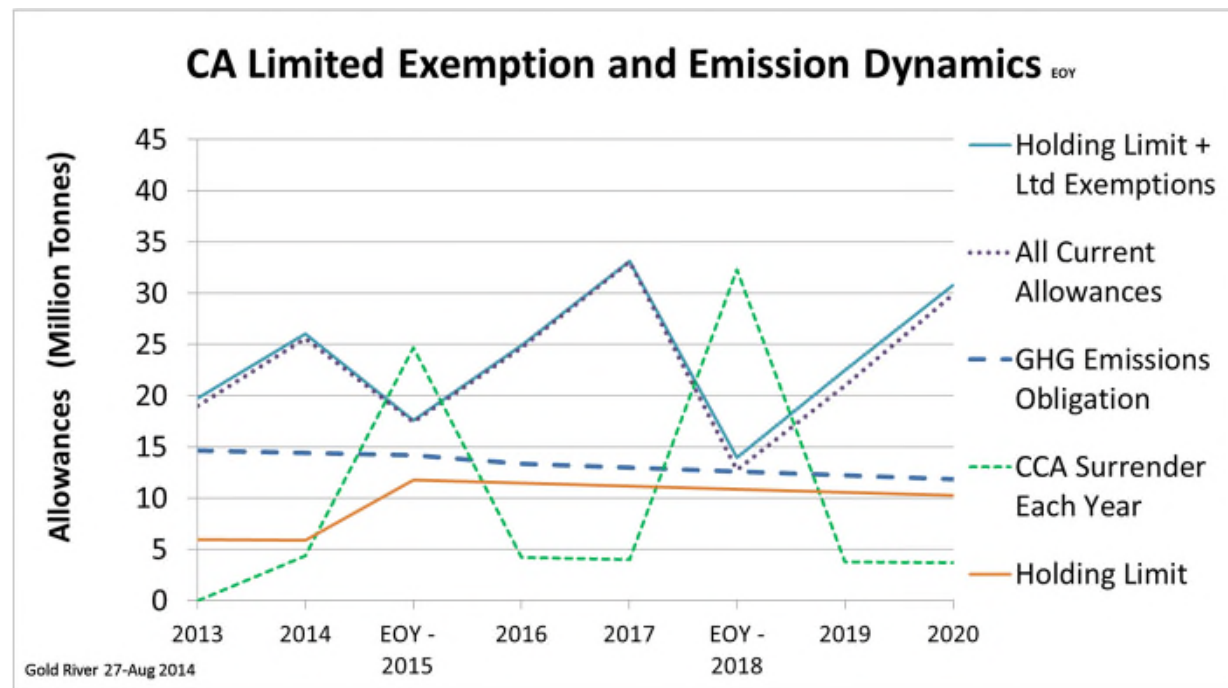
- Compliance is a paramount concern for all regulated firms.
- Prudent firms will acquire a CCA bank:
 - to ensure compliance needs will be met, and
 - to minimize expected compliance costs, especially in markets with rising floor prices.
- By assuming NO banking & perfect trading of allowances by market participants, MSG may have under-estimated the probability that prices exceed the APCR price after 2017.



Will Cap-and-Trade Function Effectively?

- Compliance Account rules & Holding Limits + Limited Exemptions will restrict trading by the highest emitters and tighten CCA supplies for trading at the ends of CP2 and CP3.

Year	Holding Limit (million tonnes)
2013	5.945
2014	5.868
2015	11.738
2016	11.435
2017	11.135
2018	10.833
2019	10.533
2020	10.230



UVA/PEAR, Inc. Report: "Investigation of the Effects of Emission Market Design on the Market-Based Compliance Mechanism of the California Cap on Greenhouse Gas Emissions," February 12, 2013.

Will the Cap-and-Trade Program Function Effectively?

- Factors leading to tradable CCA shortages:
 - Uncertainties about future emissions and market conditions,
 - Imperfect market information,
 - Participant behavior:
 - Many need to minimize near-term cash flows and will rely on the spot market,
 - Others buy early to ensure compliance.
 - Unneeded regulatory restrictions that could trigger hyper-sensitive market responses.



Will the Cap-and-Trade Program Function Effectively?

- Some of ARB's market design rules were developed to prevent market manipulation.
- Unfortunately, some rules are too complex and may have unintended consequences.
 - "One-way" Compliance Accounts,
 - Holding Limits, and
 - Limited Exemptions – All may
 - Encourage, rather than prevent, market manipulation
 - Reduce flexibility needed for a well-functioning market.



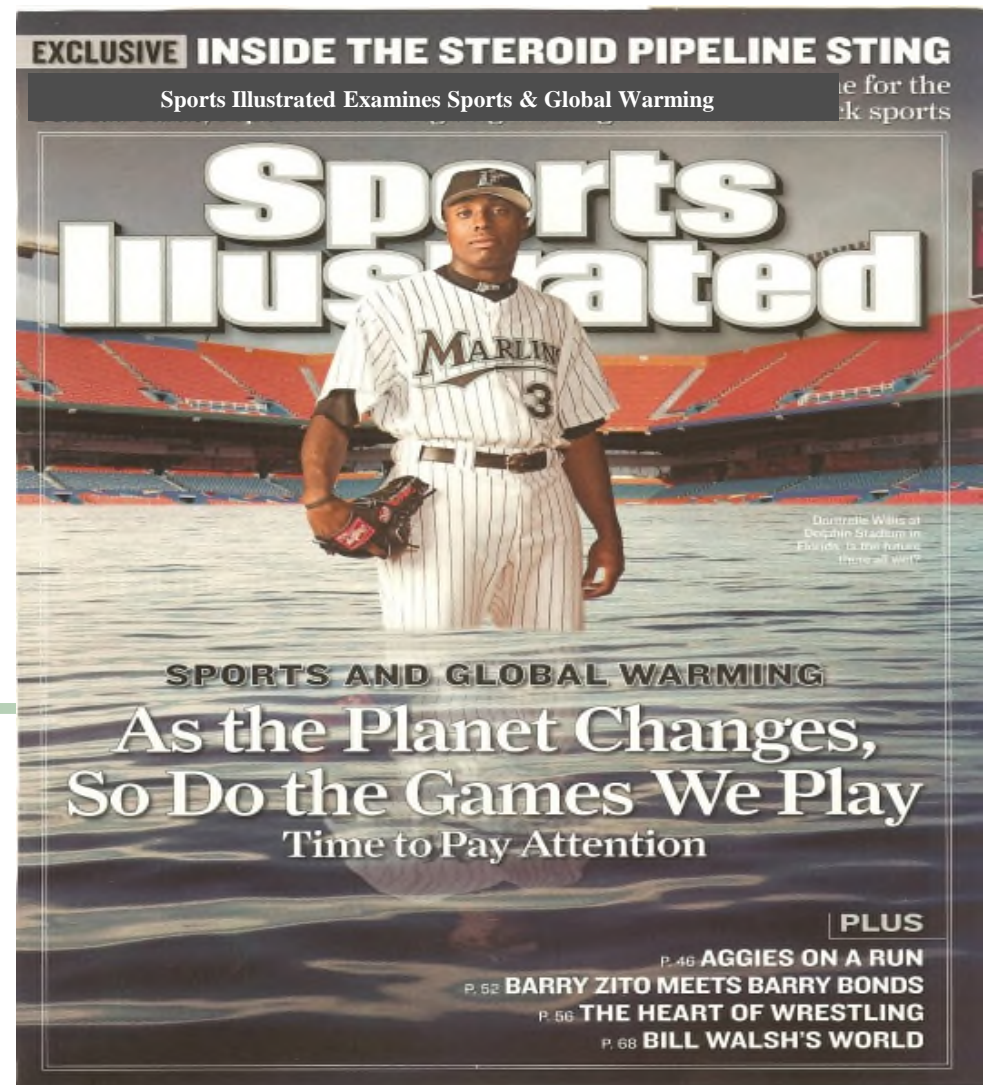
Will the Cap-and-Trade Program Function Effectively?

- Bank sizes and firm behavior can be simulated.

2012 CO₂e Emissions from the Largest Emitters

Firm	Approximate 2012 (MMT)		
	Narrow Scope Emissions	Broad Scope Emissions	Total
Chevron U.S.A. Inc.	9.74	32.16	41.90
Tesoro Refining & Marketing Co.	8.10	26.71	34.81
BP West Coast Products		23.88	23.88
Phillips 66 Company	4.52	18.91	23.42
Southern California Gas Co.	0.17	22.55	22.71
Pacific Gas and Electric Co.	3.36	18.90	22.26
Valero Marketing and Supply Co.	3.73	14.00	17.73
Shell Energy North America	4.24	10.71	14.95
LADWP	12.91	0.00	12.91
Exxon Mobil Co.	3.39	8.61	12.00
Southern California Edison Co.	9.96	0.00	9.96
Calpine Energy Services	9.41	0.00	9.41





Appendices: GHG Topics



Linkages with Quebec & Others



Linking Allowance Markets in CA & QC

- Quebec facts:
 - Covered GHG emissions ~82.5 million tonnes in 2010, w 2020 target of 69.7 MMT, BAU emissions in 2020 ~ 84 MMT.
 - 95 % hydro-electric generation.
- Elements of the CA-Quebec linkage agreement effective January 1, 2014, include:
 - Completely fungible GHG allowances using the CITSS.
 - Linked allowance auction floor prices,
 - Provisions for termination of the agreement. However, Quebec has
 - Different offset location and liability/risk requirements from CA, and
 - Like CA, Quebec allowance holding limits are lower than the annual allowance needs of some large emitters.



Linking Allowance Markets in CA & QC

- On August 7, 2014, CA and Quebec conducted a practice auction to test the updated auction platform using Compliance Instrument Tracking System Service (CITSS) accounts.
 - New features supported the joint auction, such as handling both Canadian and U.S. currency.
 - 28 qualified bidders participated in the practice auction: 23 were covered entities, opt-in covered entities, and emitters, while 5 were general market participants.
 - Canadian participants could choose either U.S. or Canadian currency, with a fixed exchange rate of 1.0926 USD to CAD.



Linking Allowance Markets in CA & QC

- On August 18, 2014 California held its most recent carbon allowance auction, while Quebec will hold its auction separately on August 26, 2014.
- Subject to ARB approval, the first real, joint CA-QC allowance auction may be held November 17, 2014.
 - The relative numbers of participants in the auction from each jurisdictional will be affected by the timing of the first allowance surrender date in each program:
CA – November 2014, QC – November 2015.



Linking Allowance Markets

- Expanding C&T linkages to other areas will lower capital, operating and administrative costs below the costs imposed by command-and-control regulations that cover the same geographic scope.
- CA has MOUs with Australia and China's National Development and Reform Commission, as well as climate change cooperation agreements with Peru and Israel.
- In July 2014, Governor Brown signed an environmental and trade agreement with Mexico to coordinate efforts in
 - Pricing carbon pollution,
 - Increasing renewable energy use and development,
 - Addressing short-term climate pollutants,
 - Cleaning up the transportation sector, and
 - Reducing emissions from deforestation and forest degradation.



Linking Allowance Markets



- The EPA's June 2014 Clean Power Plan offers the prospect of creating a common cap-and-trade program with other states or devising other forms of linkage.
 - Linking with Regional Greenhouse Gas Initiative (RGGI) states located in the Northeast poses very difficult fungibility issues.
 - Linking with other Western Climate Initiative states, e.g., Oregon and Washington, is more likely, but may be politically difficult to accomplish before 2018, when multi-state plans are due.





California Carbon Offsets



Allen Dusault – March 2007



Carbon Offsets Help Reduce GHG

- Companies can meet up to 8% of their compliance requirement *in each year* by surrendering offset credits, which are rigorously verified emission reductions that occur from projects outside the scope of the Cap-and-Trade program.
- Offsets are governed by explicit protocols for reductions that are “additional” to any regulatory requirement and not business-as-usual.
- Two crediting periods apply:
 - Non-sequestration projects (7-10 years, two renewals),
 - Sequestration projects (10-30 years, unlimited renewal)
- Verification, invalidation and liability are ongoing concerns.



Carbon Offset Protocols

- Prior to 2014, there were only four adopted ARB offset protocols:
 - U.S. forest projects,
 - Ozone Depleting Substances (ODS),
 - Urban forests, and
 - Livestock manure (anaerobic digesters).
- A protocol for Mine Methane Capture (MMC) abatement from active underground mines, active surface mines & abandoned underground mines was approved in 2014.

Acronyms & Rules:

- CP1 – Compliance Period 1 (2013-2014)
- EAOC – Early Action Offset Credit
- CRT – Climate Reserve Tonne
- ROC – Registry Offset Credit
- ROCs and CRTs are not convertible.
- ROCs can be traded between Offset Project Registry accounts.
- **EAOCs & ROCs must be converted to ARB Offset Credits (ARBOCs) to be used for AB 32 compliance.**



New Protocols Are Being Developed

Additional protocols are being developed for ARB consideration:

- A rice cultivation protocol could be adopted in 2014.
- There is a placeholder for potential international sector-based offsets from programs to Reduce Emissions from Deforestation and Forest Degradation (REDD).
 - REDD policy recommendations were provided in July 2013 for consideration by ARB, Acre (Brazil), and Chiapas (Mexico).
- “ARB will continue to evaluate additional offset protocols with an emphasis on in-state opportunities.”



Offsets Are Needed

- Offsets are important to keep costs down and expand the scope of GHG reductions.
- Offsets (CCOs or ARBOCs) will be cheaper than CCAs because of
 - Verification risk,
 - Invalidation and Liability risk,
 - Non-standard transactions (but IETA has a proposed contract),
 - Timing relative to market demand,
 - The usual uncertainties.
- In August 2014, fully compliant California Carbon Offsets (CCOs) are valued at a discount to the prevailing price of California Carbon Allowances (CCA futures.)
 - CCOs vs. CCAs (\$9/tonne vs. ~\$11.85/tonne, 2014 vintage)
 - Non-guaranteed California eligible protocol offsets @ ~\$8-8.50/tonne,
 - Forestry version 3.xx CRTs ~\$7-8.50/tonne,
 - Voluntary offsets @ ~\$0.50-\$0.90/tonne.



Status of ARBOCs

- In September 2013, ARB issued the first ARB Offset Credits (ARBOCs) under the early action and compliance programs.
- ARBOCs are issued on 2nd & 4th Wednesdays each month.
- By November 1, 2013, 1.1 million ARBOCs had been issued.
- In July 2014, a record-low 35,983 ARBOCs were issued.
- However, on July 9, the CT Lakes forestry project was issued 1,442,579 Registry Offset Credits (ROCs) by the American Carbon Registry (ACR). These ROCs are greater than the total number issued to all other ACR compliance projects and have been submitted to ARB.
- In early August 171,077 ARBOCs were awarded to four projects, three of which were livestock digesters.
- By mid-August 2014, only 11.45 million ARBOCs have been issued, while up to 13 million ARBOCs could, in principle, be retired for compliance by November 1, 2014.



Clean Harbors' ARBOCs Under Review

- In May 2014, 4.4 million ARBOCs from destruction of Ozone Depleting Substances (ODS) were subjected to an invalidation review to examine the project's potential regulatory non-compliance with the federal resource conservation and recovery act (RCRA).
 - Most of these ARBOCs are being held in a jurisdictional holding account to prevent transfers.
- 2.3 million Early Action Offset Credits and 190,000 Registry Offset Credits generated by Clean Harbors remain unconverted to ARBOCs.
- The review includes a 25-day information submission period and a 30-day formal investigation period, which did not start immediately following the information gathering period.





The Low Carbon Fuel Standard

The LCFS Program

- California's transportation sector contributes about 40 percent of California's GHG emissions.
- The Low Carbon Fuel Standard (LCFS) is intended to reduce the carbon intensity of fuels sold in California by ten percent by 2020, under Health and Safety Code Sections 38500-38599 (AB 32).
- In 2010, the LCFS was projected to achieve $\sim 15 \times 10^6$ tonnes per year of GHG emission reductions.
- Any shortfall in LCFS reductions will increase the reductions required by the cap-and-trade program, which in 2010 were projected to be about 18 million tonnes per year in 2020, and are now projected to require about 23 million.



The LCFS Program



- LCFS covered fuels must have approved lifecycle carbon intensity pathways, which generate credits or deficits compared to declining carbon intensity targets.
- Tradable credits can be generated and banked by
 - Biofuel blending – corn, sugarcane, and cellulosic ethanol, biodiesel, renewable diesel and renewable gasoline.
 - Biofuels should account for 60% of LCFS credits through 2020.
 - Advanced vehicles – electric, natural gas (CNG, LNG, biogas), and hydrogen.



The LCFS Program

- Monthly credit trading activity reports are published on the second Tuesday of every month.
- LCFS credit prices rose from about \$12/tonne in August 2012 to about \$65+/tonne CO₂e in September 2013, and in July 2014 ranged from \$20 to \$43 with an average price of \$28.
- Some analysts believe LCFS credits may be short in 2017-2018.
- Later this year, ARB will propose enhancements to strengthen the LCFS program.
- ARB will also consider extending the LCFS beyond 2020, perhaps, seeking a 15 to 20 percent reduction in average carbon intensity below 2010 levels by 2030.



Monthly LCFS Credit Trading Activity Report for July 2014

Posted on August 12, 2014

Time Period	Transfers ¹ (number)	Total Volume ^{1,2,3} (credits-MTs)	Avg. Price ^{1,4} (\$ per Credit)
July 2014	25	107,000	\$28
<u>Previous Three Months</u>			
June 2014	19	105,000	\$40
May 2014	22	57,000	\$33
April 2014	22	129,000	\$32
<u>Previous Three Quarters</u>			
Q2 2014	63	291,000	\$35
Q1 2014	62	172,000	\$51
Q4 2013	62	288,000	\$70
<u>Previous Years</u>			
CY 2013	202	887,000	\$55
CY 2012	24	164,000	\$17

Price Range in July 2014^{1,4} = \$20 to \$43 per Credit

Entities Participation in Transfers through July 2014⁵:

- **Number only Selling = 37**
- **Number only Buying = 23**
- **Number Selling and Buying = 23**

Total Credits Transferred through July 2014^{2,3,5} = 1,550,000 MT

¹ Includes transfers that were proposed and completed as well as those that were proposed and still pending buyer's confirmation in the LCFS Reporting Tool and Credit Bank & Transfer System (LRT-CBTS).

² Rounded to the nearest thousand.

³ Excludes an intra-company credit transfer with a zero price.

⁴ Some credit transfers were reported with a zero or near-zero price. The price shown excludes these transfers.

⁵ Data excludes transfers that were proposed but were still pending buyer's confirmation in the LRT-CBTS.





U.S. EPA's Proposed GHG Emission Performance Standards for New Power Plants (NSPS)



New Source Performance Standards

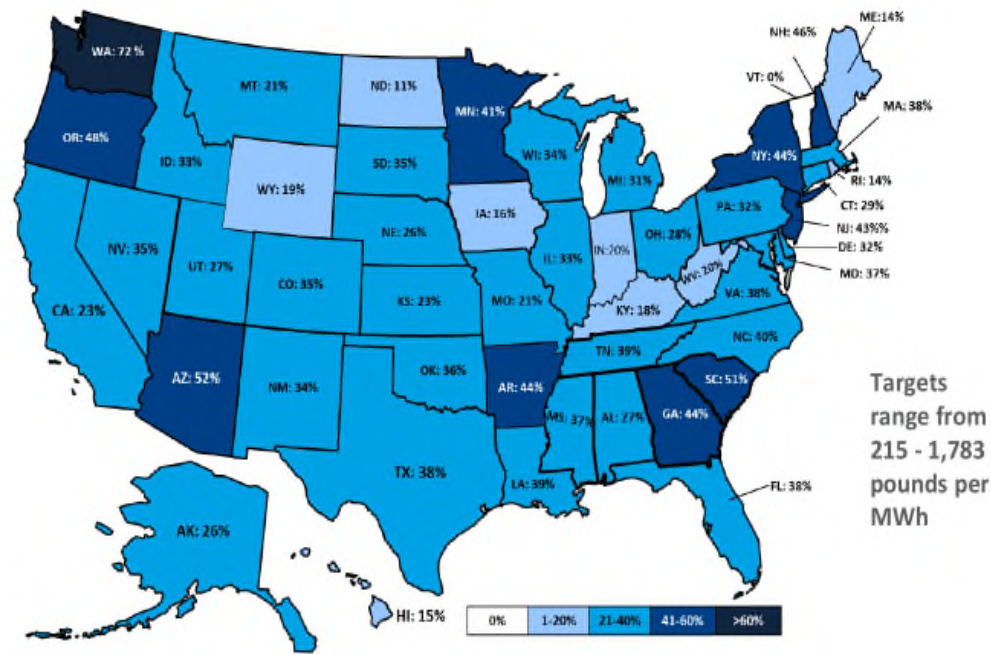
- In September 2013, the U.S. EPA proposed NSPS for fossil-fired electric generating units under §111(b).
 - Large natural gas units: 1,000 lb CO₂/MWh
 - New coal & small gas units: 1,100 lb CO₂/ MWh.
 - Coal units may average emissions over 7 years, if they meet a standard between 1000 and 1050 lb CO₂/ MWh.
- California's AB 1368 performance standard for contracts of 5 years or more is 1,100 lb. CO₂/MWh.
- EPA assumes partial Carbon Capture & Sequestration (CCS), ~40% removal, is an adequately demonstrated "Best System of Emission Reduction" (BSER) for coal, but not for natural gas.
- EPA concludes CCS costs are reasonable for coal-fired plants, but not for natural gas-fired plants.



New Source Performance Standards

- The EPA's technology forcing approach regarding CCS under §111(b) is different from prior NSPS applications, when baghouses and FGD were demonstrated BACT in the 1977 and 1990 Clean Air Act (CCA) amendments.
- If CCS systems fail, new coal plants could not operate nor recover their costs.
- For many reasons, very few coal plants are now being built, so GHG emissions reductions from NSPS would be relatively small.
 - Since year 2000, more than 150 proposed coal plants have been cancelled.
 - No current or foreseeable coal-fired power plants could meet the proposed NSPS limits without carbon capture.





Source: <https://www.federalregister.gov/articles/2014/06/18/2014-13726/carbon-pollution-emission-guidelines-for-existing-stationary-sources-electric-utility-generating>

EPA's Proposed Clean Power Plan for Existing Power Plants

EPA's Proposed Clean Power Plan

- The plan, announced on June 2, 2014^{*}, covers existing electric power plants.
 - In contrast, AB 32 is an economy-wide approach.
 - The goal is to cut carbon emissions from existing power plants in the U.S. by 30% from 2005 levels by 2030.
- Power plants are the largest source of U.S. GHG emissions, accounting for 40% of total GHG.
- Existing power plants are the highest CO₂ emitters, but before existing facilities can be regulated under section §111(d), new and modified plants must be regulated under section §111(b) of the CAAA.
 - NSPS and §111(b) regs to be finalized in early 2015.
 - Clean Power Plan regs to be finalized in June 2015.

^{*}Federal Register, June 18, 2014, initiating a 120-day comment period.



EPA's Proposed Clean Power Plan

- Each state can adopt a state-specific, “tailored” permitting process to comply with the Prevention of Significant Deterioration (PSD) regulation under §111(d).
- Under CAA sections 111(a)(1) and (d), the EPA is authorized to determine the Best System of Emissions Reduction (BSER) and to calculate the emissions reduction achievable through BSER.
- Each state is authorized to identify the standard(s) of performance and measures to implement and enforce those standards.
- The state must submit its plan to the EPA, and the EPA must approve the plan.



EPA's Proposed Clean Power Plan

- The primary metric is a "rate-based" approach measured by MWh-weighted CO₂e lbs./net MWh, across all affected Electric Generating Units (EGUs).
 - A mass-based approach would also be allowed.
 - The net MWh denominator includes nuclear, but no hydro.
- States shall apply "the Best System of Emissions Reduction" (BSER) to existing power plants.
 - Does BSER include flexible actions outside the plant boundary?
 - Will flexible, multi-state plans, including regional cap-and-trade programs, be judged to comply with the Clean Air Act?
 - What happens if a state chooses not to submit a plan, or to contest EPA's suggested target rates, or if a state implementation plan (SIP) is not approved?



EPA's Proposed Clean Power Plan

- EPA's proposal has four primary building blocks.
 - **Heat rate/efficiency improvements** at individual power plants,
 - **Increased dispatch of natural gas-fired plants** to substitute for coal-fired generation,
 - **Increased use of zero or low-carbon generation technologies** to substitute for fossil-fired generation, and
 - **Demand-side energy efficiency improvements** that will reduce emissions.



EPA's Proposed Clean Power Plan Schedule

- EPA is accepting comments on the proposal until October 16th, 2014.
- Post-2020 State Implementation Plans (SIPs) are due by June 2016, or June 2017, if a delay is requested, or June 2018, if the plan is part of a multi-state compliance plan.
- An "Option 1" plan would be fully implemented by 2030, with averaging between 2020 and 2029 to meet an interim target, or an "Option 2" plan would implement fewer reductions, but would reach its emissions rate goal by 2025.



State Elements of EPA's Clean Power Plan

Each state plan must contain the following:

- Identification of affected entities,
- Description of plan approach and geographic scope,
- Identification of state emission performance level,
- Demonstration that the plan is projected to achieve the required emission performance level,
- Identification of emission standards,
- Identification of monitoring, reporting, and recordkeeping requirements,
- Identification of milestones, and
- Identification of backstop measures.



Emission Rate Targets from EPA's Analysis

- Option 1 interim rate targets can be met by averaging across years between 2020 and 2029.
- After 2030, the goal is intended to be met each year.
- The EPA is proposing emission guidelines for states to use in developing their plans. (Some will be litigated.)

■ **Table ES-1. Proposed State Goals (Adjusted MWh-Weighted-Average Pounds of CO₂ per Net MWh from all Affected Fossil Fuel-Fired EGUs) for Options 1 and 2**

State ²	Option 1		Option 2	
	Interim Goal (2020-2029)	Final Goal (2030 Forward)	Interim Goal (2020-2024)	Final Goal (2025 Forward)
Alabama	1,147	1,059	1,270	1,237
Alaska	1,105	1,017	1,175	1,138
Arizona *	735	702	779	763
Arkansas	968	910	1,083	1,058
California	556	537	582	571
Colorado	1,159	1,108	1,265	1,227

- California will need to reduce its existing power plant emissions by 23% from 2012 = 698 lbs./MWh.



How Will California Adapt Its AB 32 Plan?

- California faces some complex hurdles to adapt its cap-and-trade program:
 - California's program only goes to 2020, not 2030,
 - California's program is economy-wide, not specific to the electric sector,
 - California's program covers both new and existing sources and exempts some cogeneration facilities,
 - Offset credits aren't allowed under the EPA plan,
 - Accounting for "leakage," the GHG content of imported power and the treatment of exported power may not agree with other states' plans,
 - Regional multi-state plans will take time (and legislation) to develop.



CA Estimated CO2e Emissions in 2030

Estimating California's 2030 Emissions Profile						
Projections for California		2012	2020	2024	2030	EPA Targets
1	In-State: BAU Electricity Emissions (MMT)	48	53.9	52	49.3	
2	In-State: BAU Cogen UTO Emissions (MMT)	2.5	2.5	2.5	2.5	
3	In-State: Reductions (MMT)	-	-	-	-	
4	Total In-State Emissions (MMT)	50.4	56.4	54.5	51.8	
5	In-State: Natural Gas and Cogeneration (GWh)	101,500	122,000	119,100	114,900	
6	In-State: Cogeneration UTO (as GWh)	5,500	5,500	5,500	5,500	
7	Sub-Total for Emissions Determination (GWh)	107,000	127,500	124,600	120,400	
8	In-State: Nuclear: Diablo Canyon (GWh)	17,700	17,800	19,000	19,000	
9	In-State: Nuclear: SONGS (GWh)	800	-	-	-	
10	In-State: Clean SONGS Replacement (GWh)	-	-	-	-	
11	In-State: Other Generation: Large Hydro (GWh)	23,200	27,900	27,900	27,900	
12	In-State: Other Generation: Small Hydro (GWh)	4,300	3,900	3,900	3,900	
13	In-State: RPS Eligible Renewables Excl. Small Hydro (GWh)	28,300	72,300	76,800	87,300	
14	In-State: Energy Efficiency (GWh)	-	9,500	14,100	14,100	
15	In-State: California Solar Initiative (PV) (GWh)	-	5,500	7,200	10,900	
16	Total In-State Generation (GWh)	181,300	264,400	273,500	283,500	
17	Total GRID EF (lbsCO2e/MWh)	613	470	439	403	Interim 556 Final 537
18	Average Annual Growth Rate for Natural Gas and Cogeneration 2020-2024		-0.61%			
19	Average Annual Growth Rate for RPS Renewables Excl. Small Hydro 2020-2024		1.50%			
20	Average Annual Growth Rate for California Solar Initiative (PV) 2020-2024		7.20%			

ARB Clean Power Plan Workshop, September 9, 2014



Questions About Our Compliance Plan?

- How difficult will it be for California's existing power plants to comply with the EPA requirements after
 - Older fossil steam plants retire,
 - California's generation mix moves beyond 33% renewables,
 - System heat rates fall significantly, and
 - Energy efficiency programs succeed? (If they do...)
- How robust must our plan be, in order to account for
 - Low hydro years,
 - Increasing coastal and Central Valley temperatures,
 - Additional nuclear plant retirements,
 - Population growth,
 - Changes in technology,
 - Actions of other states and the federal government, and
 - Unforeseen events.





Legal & Legislative Challenges



Commissions will look closely at utility allowance purchases.



Is AB 32 an Illegal Tax or a Fee?

- In November 2012, CalChamber and tomato processor, Morningstar, represented by Pacific Legal Foundation, sued ARB about the legality of AB 32 allowance auctions, alleging AB 32 imposes an unconstitutional tax on business.
 - New state taxes require a 2/3 majority vote in both the Senate and Assembly. Fees are o.k.
 - See the 1997 California Supreme Court ruling in the case *Sinclair Paint Co. v. State Bd. of Equalization*, 15 Cal. 4th 866, 876 (1997).
- On November 12, 2013 Judge Timothy M. Frawley of the Superior Court of California, County of Sacramento, issued a ruling that affirmed ARB's authority to distribute allowances.



Low Carbon Fuel Standard Litigation

- The measurement of lifecycle carbon intensity was alleged to violate the dormant commerce clause of the U.S. Constitution by imposing a different requirement on out-of-state fuels.
- On December 29, 2011 a U.S. District judge in Fresno ruled that ARB's method for assigning a higher carbon intensity (CI) value to ethanol produced in the Midwest and to crude oil from Canada infringes on Congress's constitutional authority over interstate commerce.
- On January 6, 2012 the state appealed, arguing that the LCFS does not discriminate based on the geographic location of the seller.



Low Carbon Fuel Standard Litigation^{contd}

- On January 24, 2012, U.S. District Judge O'Neill denied ARB's motion, stating that the LCFS program is unconstitutional and violates the Interstate Commerce Clause. ARB appealed.
- In September 2013, the 9th U.S. Circuit Court of Appeals upheld the LCFS program, but remanded the decision back to the District Court.
 - The court found that LCFS is neither facially discriminatory in violation of the Commerce Clause nor does it impermissibly regulate extra-territorial activities.
 - This state appeals court decision keeps the current LCFS targets in place through 2014.
 - Ultimately, this case could go to the U.S. Supreme Court.



U.S. EPA & State Regulatory Litigation

- In 2007 the Supreme Court ruled in Massachusetts vs. EPA that CO₂ is an air pollutant that must be regulated by EPA.
- A 2011 Supreme Court decision allowed EPA to require permits to meet Prevention of Significant Deterioration (PSD) standards for GHG under §111 of the Clean Air Act.
- In April 2014, the Supreme Court upheld the EPA's rule to limit "cross-state air pollution" (CSAPR)
 - The Cross-State Air Pollution Rule requires 28 states in the eastern half of the U. S. to reduce power plant emissions that cross state lines and contribute to ground-level ozone and fine particle pollution in other states.
 - A cap and trade system would be used to reduce the target pollutants—sulfur dioxide and nitrogen oxides.



U.S. EPA & State Regulatory Litigation

- On October 15, 2013, the U.S. Supreme Court agreed to hear *UARG v. EPA* on the question:
 - Does EPA's authority to regulate GHG emissions from mobile sources under Title II, which was upheld in *Massachusetts v. EPA, 2007*, extend to stationary sources under Title I?
 - The court declined to review EPA's finding that GHG emissions endanger the public health and safety.
- On June 23, 2014, the Supreme Court issued a split decision in *Utility Air Regulatory Group v. EPA*, striking down part of an EPA rule requiring pre-construction permits for large sources of greenhouse gas (GHGs) emissions, while upholding EPA's authority to require inclusion of GHGs in pre-construction permits mandated for other pollutants.



U.S. EPA GHG Regulatory Litigation

- In its decision on June 23, 2014, in *Utility Air Regulatory Group v. EPA*, the Court invalidated the "Tailoring Rule," whereby EPA rewrote statutory emissions thresholds to allow it to operate a pre-construction permit process for large sources of GHG emissions.
- The Court held that the Clean Air Act neither compelled nor required EPA to apply GHG regulations to stationary sources, once it set GHG limits for cars and trucks.
- The Court also concluded that EPA had the discretion to require sources to apply the "Best Available Control Technology" to GHG emissions, when securing pre-construction permits based on emissions of conventional pollutants.



Litigation Against the Clean Power Plan

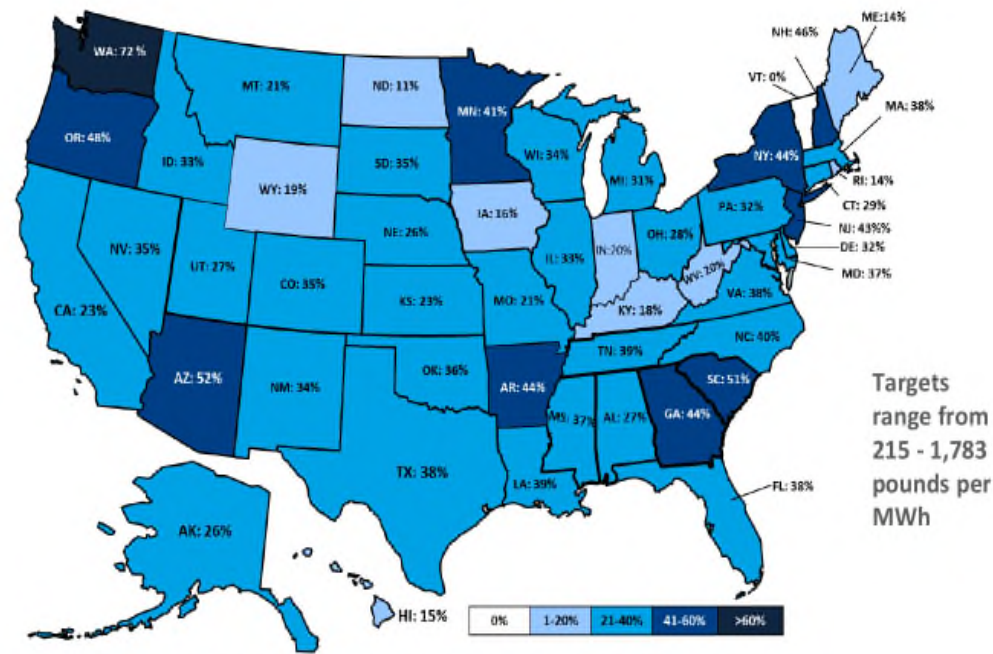
- In the future, the Supreme Court may examine EPA actions that would impact the power sector at-large and reduce energy demand.
 - Opponents argue that §111 (d) does not authorize EPA to implement such sweeping regulation of the power sector, acknowledging tension between EPA's state-centric approach and the regional structure of energy markets.
- Arguments regarding the "Best System of Emission Reduction" will go first to the U.S. Court of Appeals for the District of Columbia.
 - In the last year, four new Obama appointees have joined this court, tilting the majority in favor of Democrats over Republicans for the first time since the 1980s.
 - Nevertheless, this matter will almost certainly go the Supreme Court and be resolved in the next administration.



Legislation Against CA Cap-and-Trade

- In January 2013, California Assemblyman Henry Perea put forward AB 69 to delay the 2015 entry of fuels and transportation into the cap-and-trade program for one compliance period.
- On April 25, 2013 the amended bill was passed by the Assembly, Ayes: 53, Noes: 23, Abstain: 3.
- On July 1, 2014, a Joint Letter was sent to Mary Nichols by a list of economic and energy experts about "Maintaining Beneficial, Low-Carbon Transportation Policies in California."
- After deliberations throughout 2014, on July 3, the amended AB 69 was withdrawn from the California Senate's Agricultural Committee.





Source: <https://www.federalregister.gov/articles/2014/06/18/2014-13726/carbon-pollution-emission-guidelines-for-existing-stationary-sources-electric-utility-generating>

More on Price Containment

Price Containment Rules

- The rising allowance auction price floor and the Allowance Price Containment Reserve (APCR) are intended to collar the range of potential CCA prices.
 - “Of the 2,508.6 million metric tonnes (MMT) of allowances in the program over the 8-year period, 121.8 MMT of allowances are assigned to the price containment reserve to be made available in equal proportions at allowance prices of \$40, \$45, and \$50 in 2012 and 2013. In later years, these price levels increase by 5% plus the rate of inflation in the prior year.” (MSG report, May 2014, p. 14.)
- Setting a hard allowance price ceiling would contain rising prices in the event of allowance supply scarcity.

“Report of the Market Simulation Group on Competitive Supply/Demand Balance in the California Allowance Market and the Potential for Market Manipulation.”

Severin Borenstein, James Bushnell, Frank A. Wolak, and Matthew Zaragoza-

Watkins. July 2014



2013 Revised Cost Containment Rules

- Starting in 2015, in the last reserve sale prior to the November 1 compliance date, up to 10% of future vintage allowances will be made available to the Allowance Price Containment Reserve, when the number of allowances bid for in the Reserve exceeds the number of available reserve allowances.
- Qualified bids will be satisfied at the price of the highest price tier.
- However, in 2014 the Market Simulation Group recommended more changes to expand the APCR.



Proposed Price Containment Rules

- To ensure the APCR is not exhausted over the eight- year program and to minimize price manipulation, the Market Simulation Group recommended in 2014:
 1. Expanding the allowance pool by:
 - (i) authorizing ARB to sell post-2020 vintage allowances to use for compliance before 2020, or
 - (ii) allowing market participants to use compliance instruments from other carbon allowance markets, such as the European Union Emissions Trading System or the Regional Greenhouse Gas Initiative, or,
 2. Allowing Conversion of Future-Year Vintages for compliance by paying a price premium or cutting tonnes covered by these allowances by 25%, and
 3. Increasing publicly available data on CCA holdings.
- A hard price cap would be simpler and more reliable.



Behaviors & Uncertainties to Evaluate

- Free allowances will allow many industrials to avoid near-term purchases of allowances.
- High-emitting entities must cover short-falls in free allocations and, then, transfer allowances to Compliance Accounts to take advantage of the ARB's Limited Exemption, eliminating trading of potential surpluses that may arise.
- Hydro and renewables generation, emission rates for asset controlling suppliers, safe-harbor resource re-alignment (aka "resource shuffling"), and offset availability all affect CCA supply and demand.
- Regulatory complexity and restrictions can limit trading, increasing prices and volatility.





About Van Horn Consulting

www.vhcenergy.com



Van Horn Consulting

- Founded in 1987, Van Horn Consulting (VHC) helps its clients examine energy and environmental markets, technologies, regulations and contracts, evaluate competitive and regulatory issues, review projects, devise business strategies, prepare expert testimony and value assets.
- We have developed and analyzed strategies and conducted major studies for EPRI, EPA, electric and gas utilities & market participants, large and small.
- VHC provides independent reviews, evaluations, litigation consulting and expert testimony regarding electricity, fuels, technology and emissions markets, regulations and contracts.
- VHC advises utilities in soliciting and contracting for combined heat and power, renewables, conventional and demand-side resources, serves as an Independent Evaluator for electric utilities in California and analyzes the California electricity and GHG allowance markets.



VHC Senior Consultants



- **Michael Katz, M.S., P.E.**, Senior Consultant, has over 25 years experience in electric and natural gas markets, risk management, strategic planning and operations of physical assets. Mike leads VHC's Independent Evaluator assignments for renewable, conventional and combined heat & power contracts for San Diego Gas & Electric and previously for Southern California Edison. At Pacific Gas & Electric Company (PG&E), he led PG&E's Power Generation Department and was Director of Generation Portfolio Management and Power Generation Business Planning, after holding positions in Electric Resources Planning. He provides analysis and advice regarding procurement, operations, planning, technologies and management.
- **Edward Remedios, Ph.D., MBA**, Senior Consultant, formerly worked for Chevron Research and for Pacific Gas & Electric Company (PG&E). While at PG&E, Ed coordinated long-range planning and was the head of the Economics and Forecasting Department with responsibilities for economic and sales forecasts and project evaluations, including financial, economic and technical assessments. Ed provides evaluations of projects, RFO offers, contract terms and analyses of markets, tariffs and regulations.
- **Andrew Van Horn, Ph.D.**, Managing Director, has 35 years experience evaluating electricity, natural gas, coal and emissions markets, regulations, technologies and contracts. He advises market participants and serves as an Independent Evaluator for utilities procuring power and natural gas. He developed EPRI's first Integrated Resource Planning model, provided a price for the first SO₂ allowance trade in 1992, analyzed the 1977 and 1990 Clean Air Act Amendments and projected impacts of greenhouse gas (GHG) policies from 2000 to 2050. He advises clients on electricity and natural gas procurement processes, SO₂ and GHG markets and compliance planning, technology cost and performance, R&D, price forecasting, plant valuation and strategic planning. He has testified before the FERC, state agencies and courts about power, natural gas, steam and emissions contracts, economic damages, resource planning, reasonableness reviews, tariffs and the impacts of regulations.



Selected Clients

Alberta Department of Utilities
American Electric Power
Amgen
Arizona Public Service Company
Cinergy
Cogeneration Association of California
Colorado Independent Energy Association
Consolidated Edison of New York
Consolidated Natural Gas Transmission
CIGNA Insurance
City of Huntington Beach
Drummond Coal
Duke Energy
Electric Clearinghouse (Dynergy)
Electric Power Research Institute (EPRI)
Harvard Management Corporation
National Acid Precipitation Assessment Program
Northern California Power Agency

Orinda Union School District
PacifiCorp Power Marketing
PPL Corp
Pacific Gas and Electric Company
Pacific Gas Transmission
Pinnacle West
Port of Long Beach
San Diego Gas & Electric Company
Sithe Energies
Southern Company
Southern California Edison Company
SeaWest Wind Corp
Tennessee Valley Authority
The Emissions Exchange
Utility Air Regulatory Group
Universal Studios
U.S. Environmental Protection Agency
U.S. General Accounting Office

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