

Carbon Pricing and Complementary Policies for Lowering Transportation Emissions

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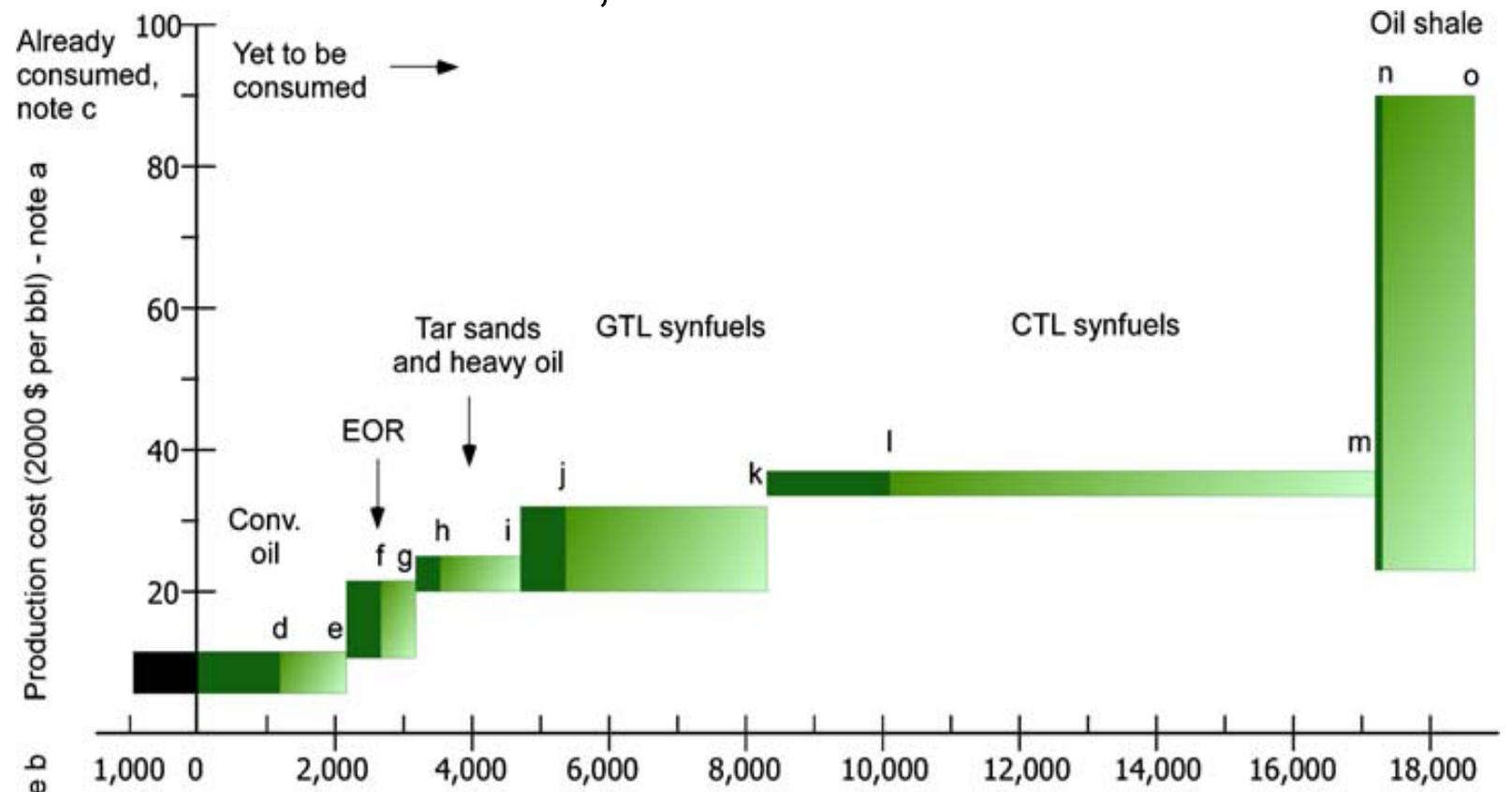
U.C. Berkeley

I. Two GHG Market Failures

- Failure to price negative GHG externality
- Failure to subsidize positive knowledge spillovers/externalities
 - Knowledge is technology/institutions/policy
 - Bigger failure here than elsewhere due to bigger gap in rent extraction of knowledge creator
 - Knowledge use in developing world benefits developed world, but very low revenue potential
- Price carbon to address negative GHG externality
- Other policies to address knowledge spillovers

II. Oil Market Implications of Alternative Fuel Transportation

- World oil market has a lot of cheap oil
 - Brandt and Farrell, 2007



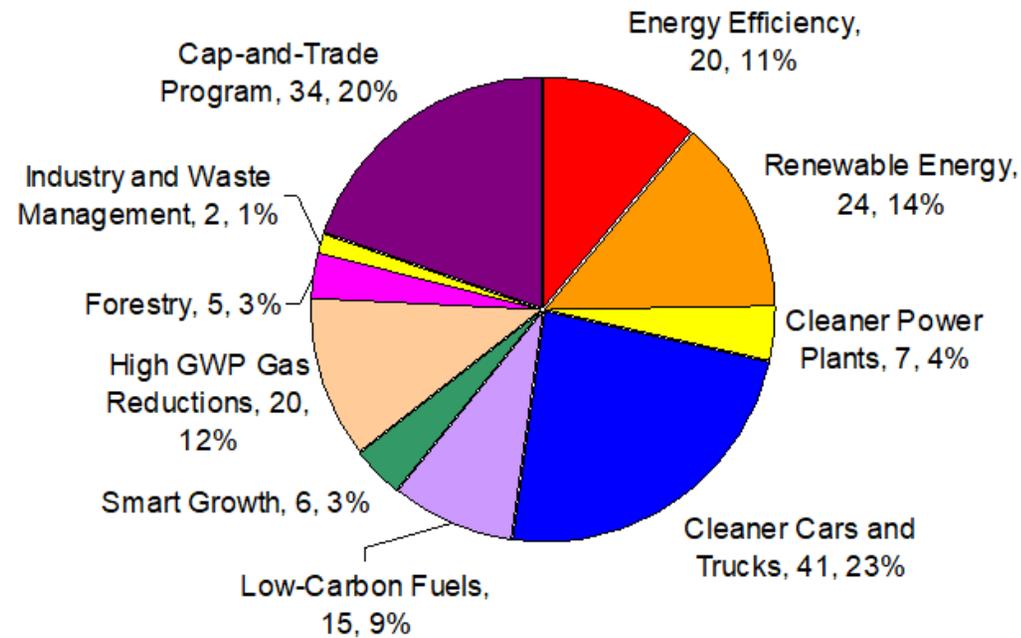
Oil Market Implications of Alternative Fuel Transportation

- World oil market has a lot of cheap oil
- Effect of significant demand reduction likely to be price crash
 - Implication for cost targets of alternative technologies
 - Implication for price of cap & trade allowance

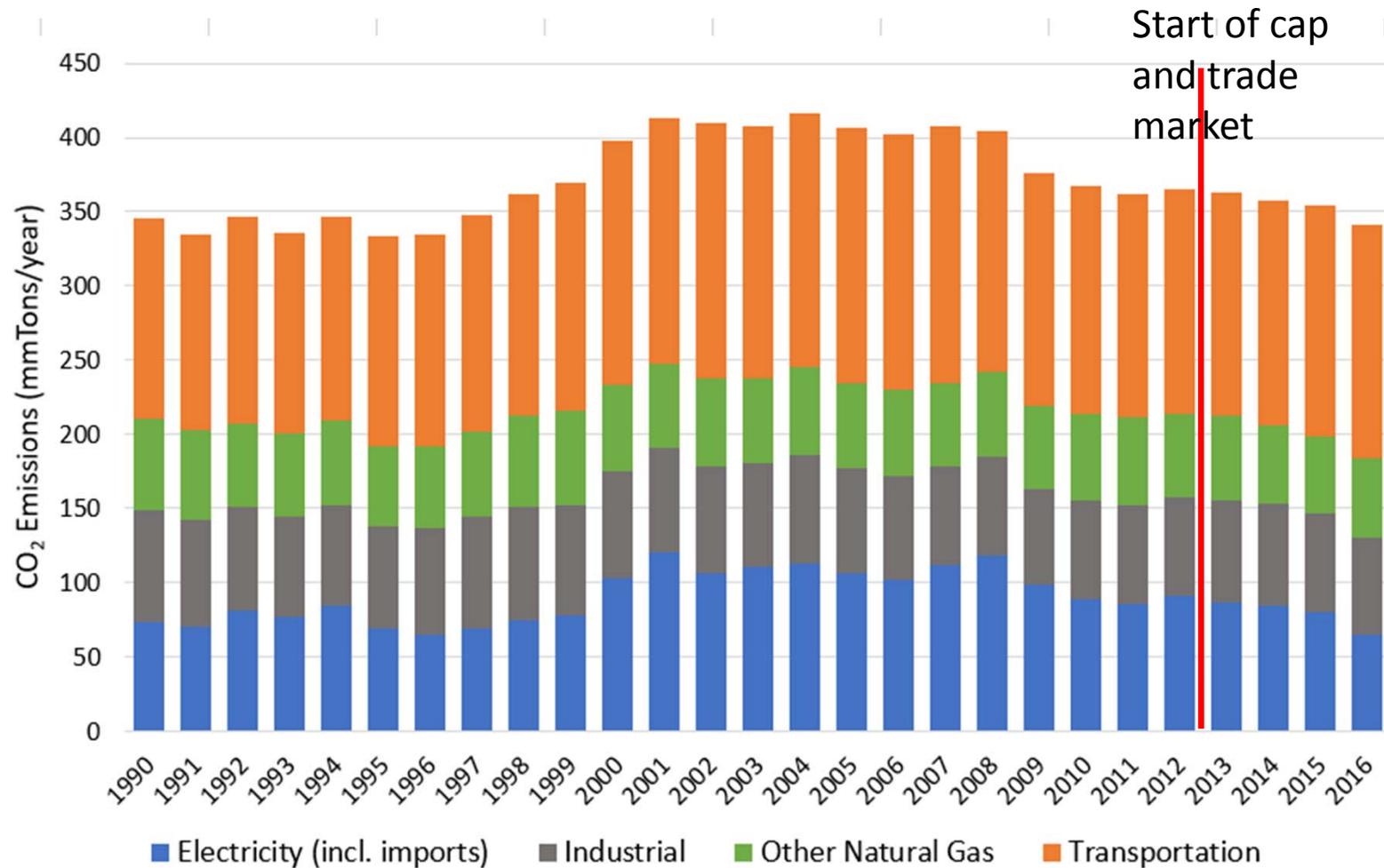
III. Market Mechanisms for GHGs

- Cap and Trade versus Carbon Tax
 - In theory, very different.
 - In practice, not-so-much

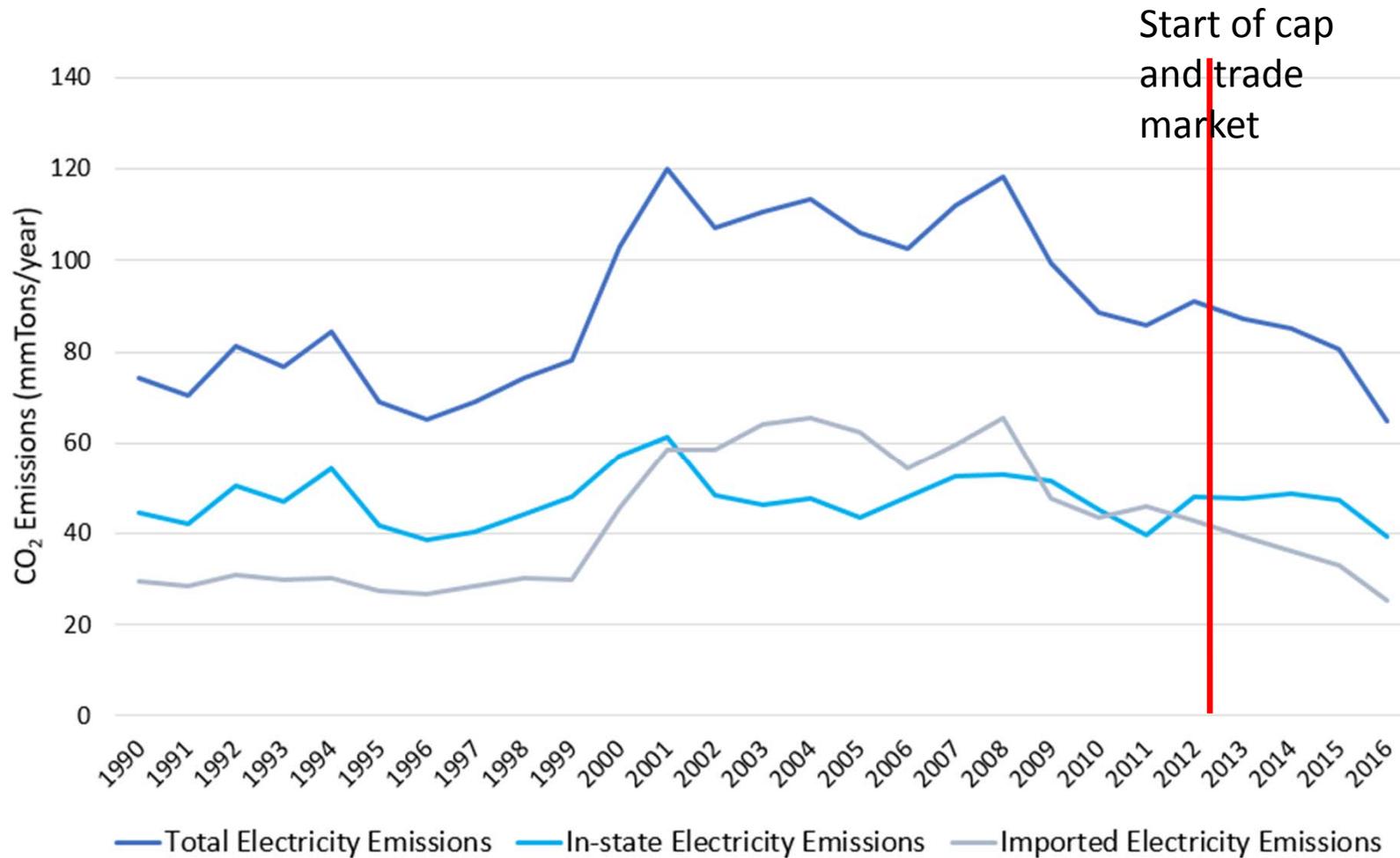
Cap-and-Trade Market is one piece of California's climate strategy



Cap-and-Trade covered GHG emissions have declined below 1990 level



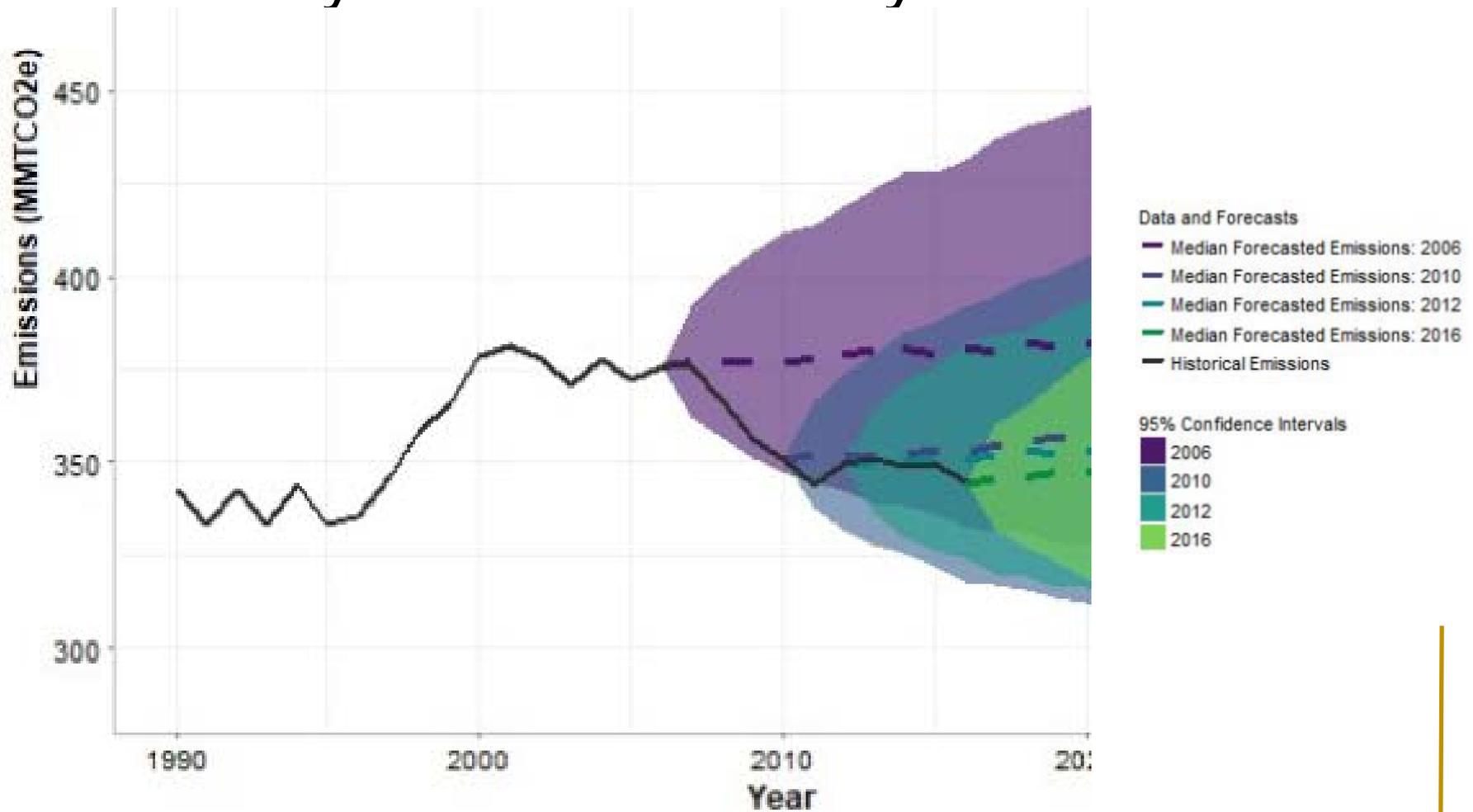
Most of the decline has been in electricity, most of that from imports



Non-Policy Factors Have Been Major Drivers of GHG Emissions Changes

- Outside California Policy Control
 - Macroeconomic fluctuations
 - World Oil Price
- Mostly Outside California Policy Control
 - Technology
 - International (and Interstate) Trade
- Complementary policies also important
- Cap and Trade has played a very small roll
 - No surprise at \$10-\$15 per metric tonne
- Due to other factors, very difficult to know how much decline needed to meet cap

Declined From What?: Business-As-Usual forecast depends very much on when you make it

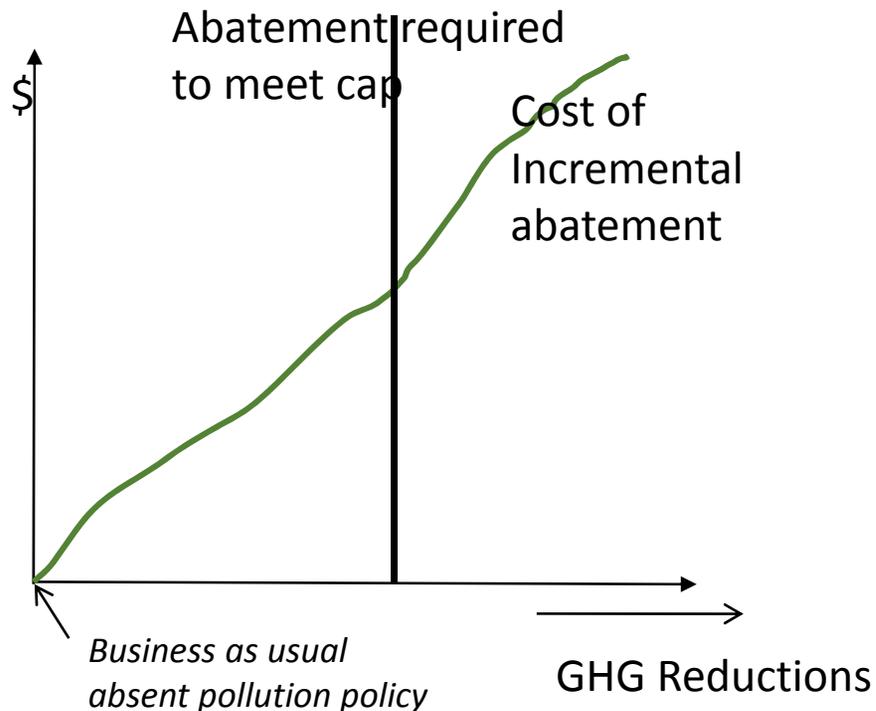


Predictable response of GHG emissions to pricing is small

- Price-responsiveness of end-use demand for natural gas, electricity, and refined oil products is much smaller than the uncertainty in emissions from non-policy factors
- BUT, there are unpredictable pathways – more than we can imagine – that can be discovered if the economic incentives are there
 - Innovation in alternative energy production technologies
 - Innovation in alternative technologies for providing the same energy services
 - But also innovation in fossil fuel production: fracking

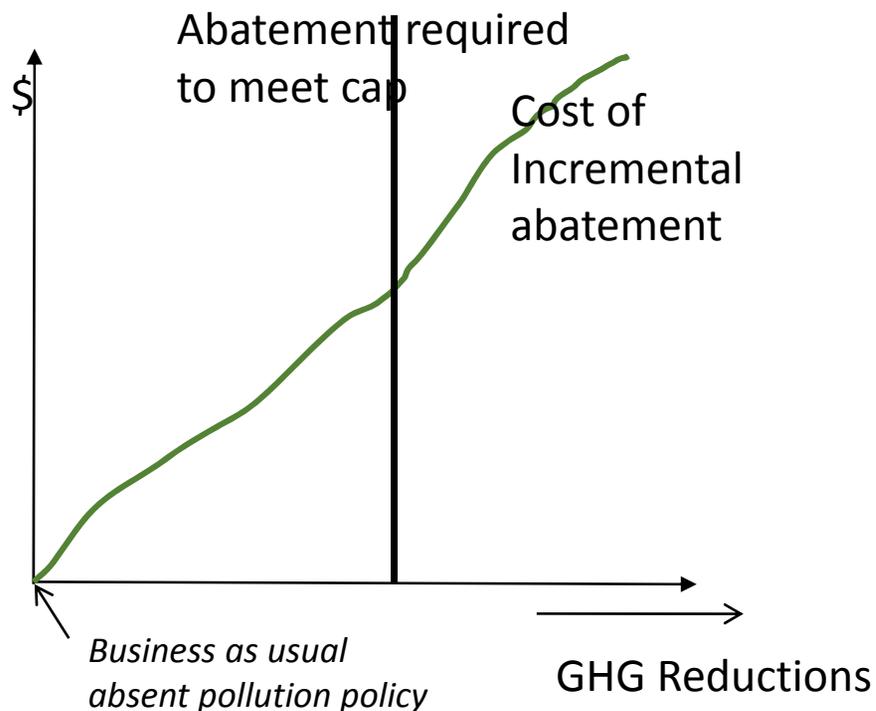
Cap and trade for GHGs in reality is likely to yield extreme prices

- Idealize cap and trade
- Reality

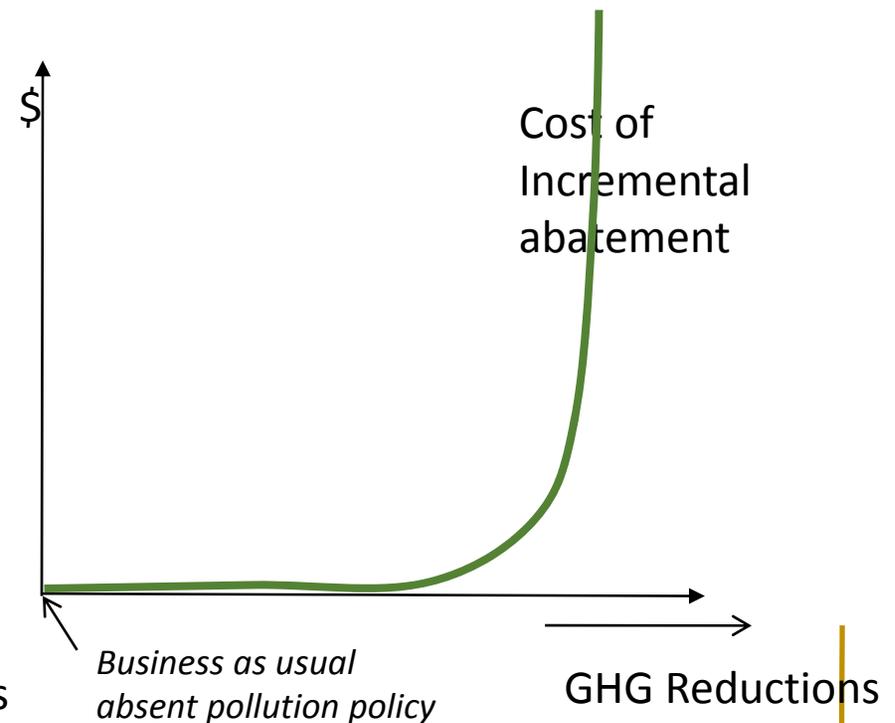


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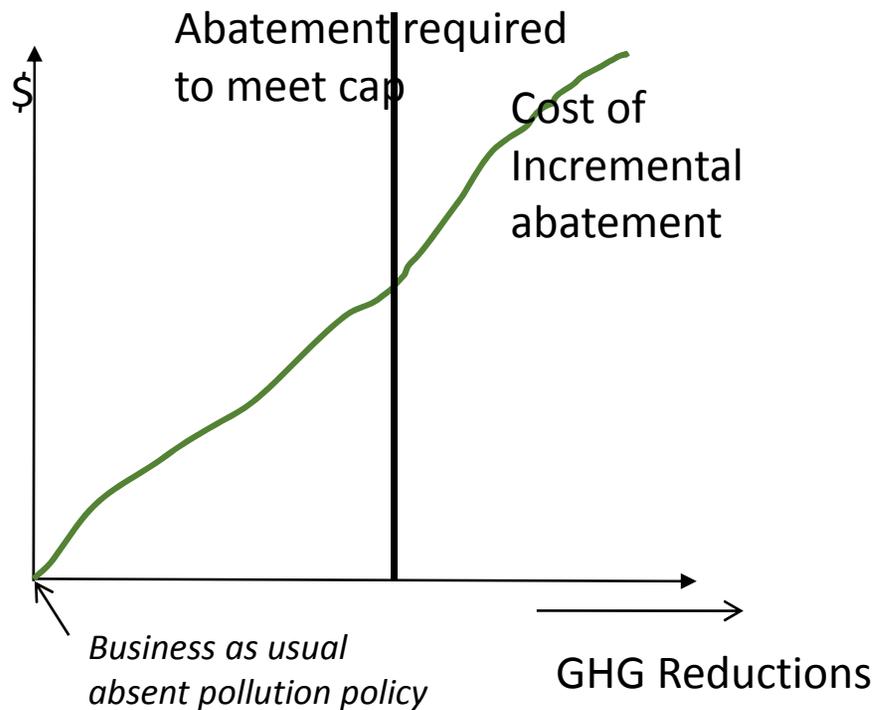


- Reality

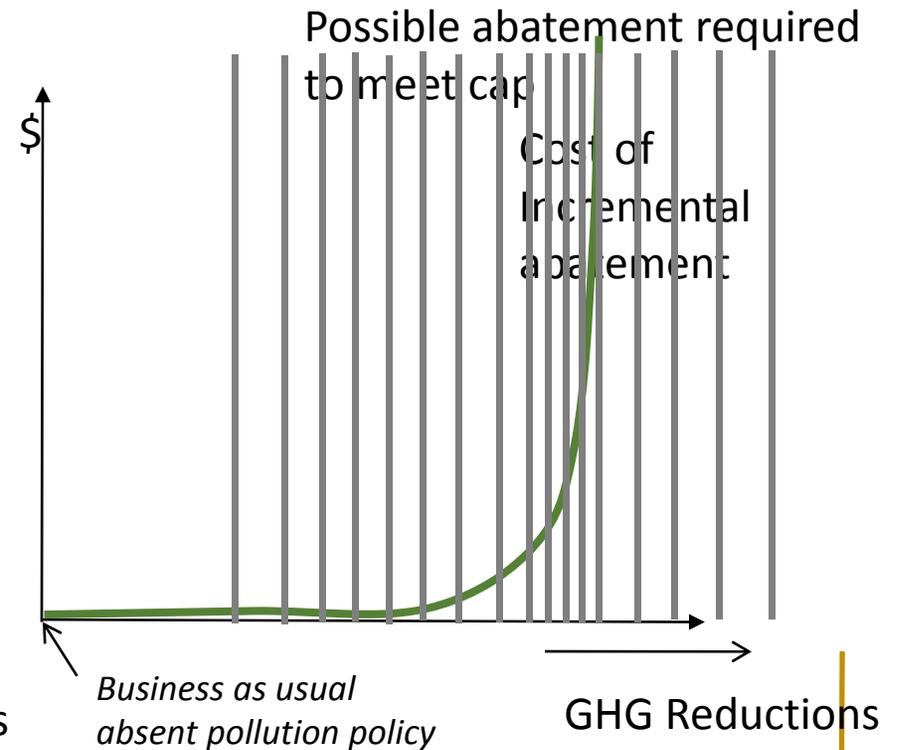


Cap and trade for GHGs is in reality likely to yield extreme prices

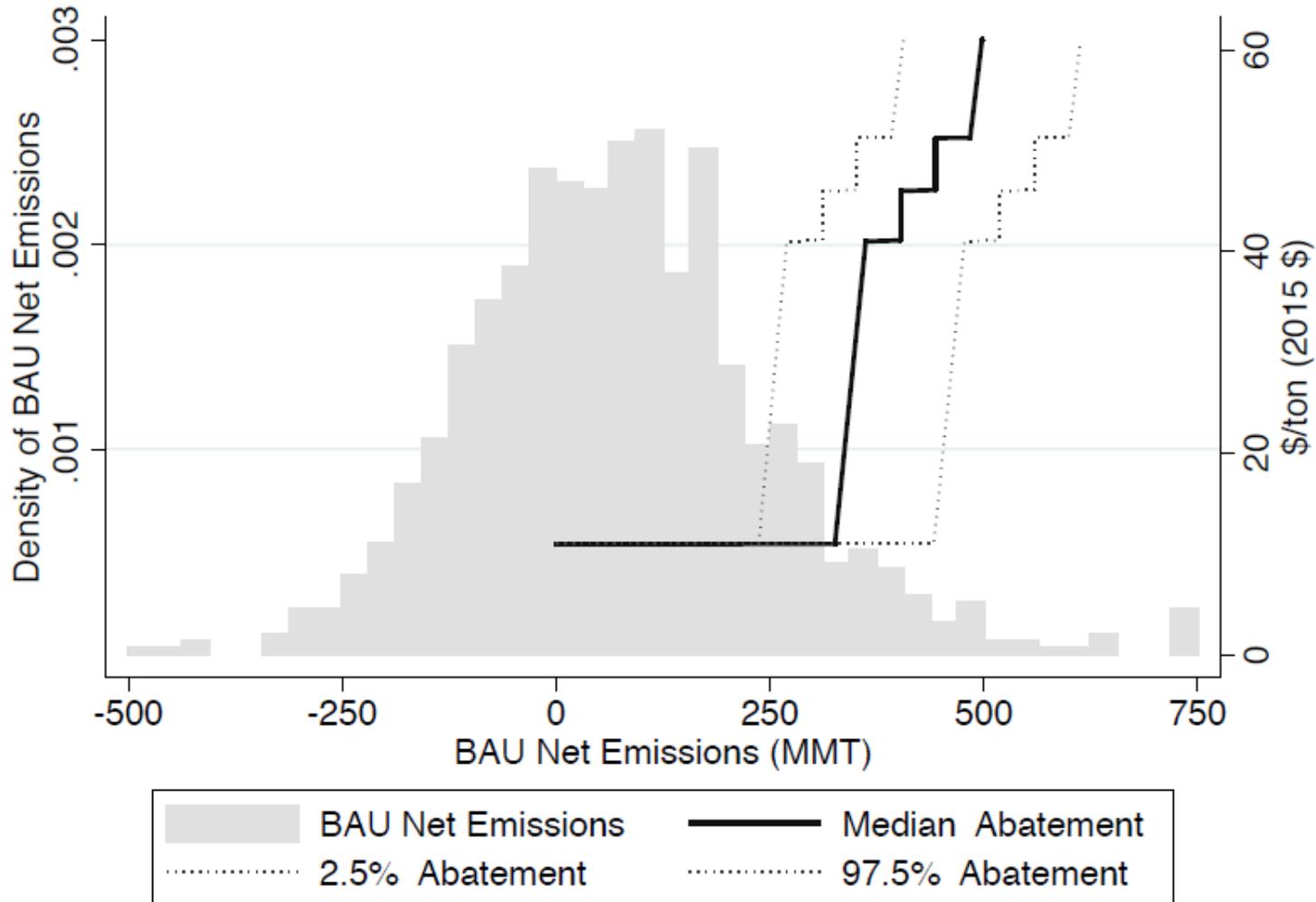
- Idealize cap and trade



- Reality



California 2020 cap was very unlikely to be binding even when it was set



BAU net emissions are (2013-2020) BAU emissions less allowances not in reserves

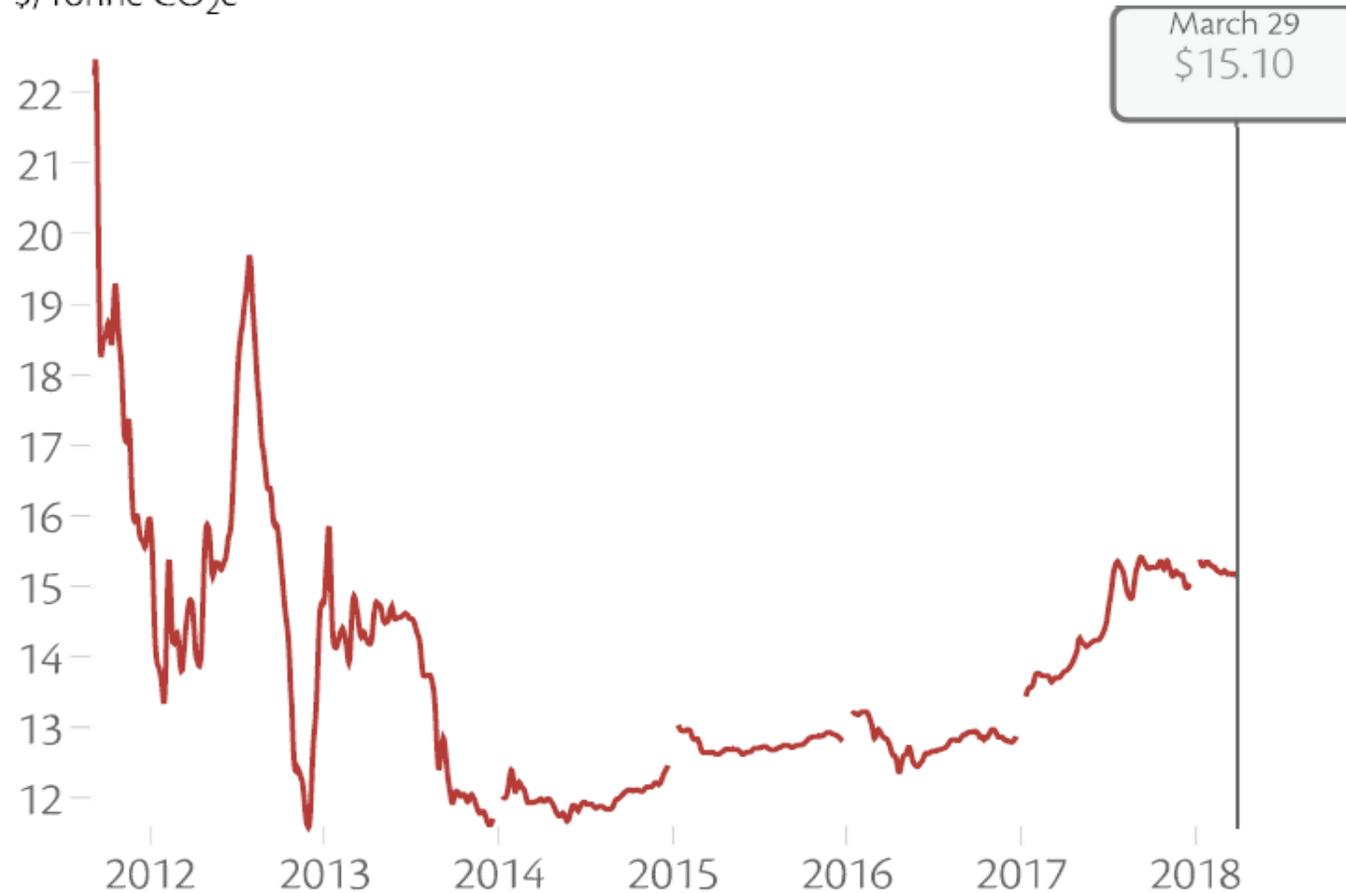
So, price collars (ceiling and floor) are critical to making cap and trade work

- When non-policy factors and complementary policies drive GHG emissions way down, we should not eliminate the incentive to reduce emissions and develop new technologies
- When non-policy factors drive GHG emissions way up, we won't let prices skyrocket with no intervention
 - And we should not cling to a specific target for emissions (over a limited time period) that does not correspond to a scientific imperative

Results So Far

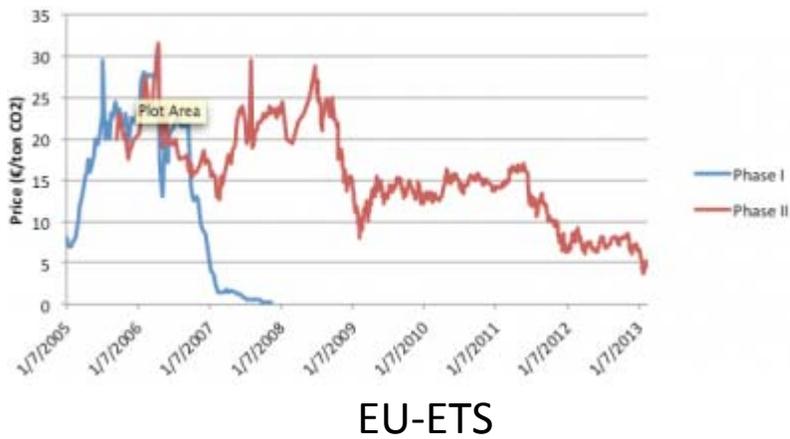
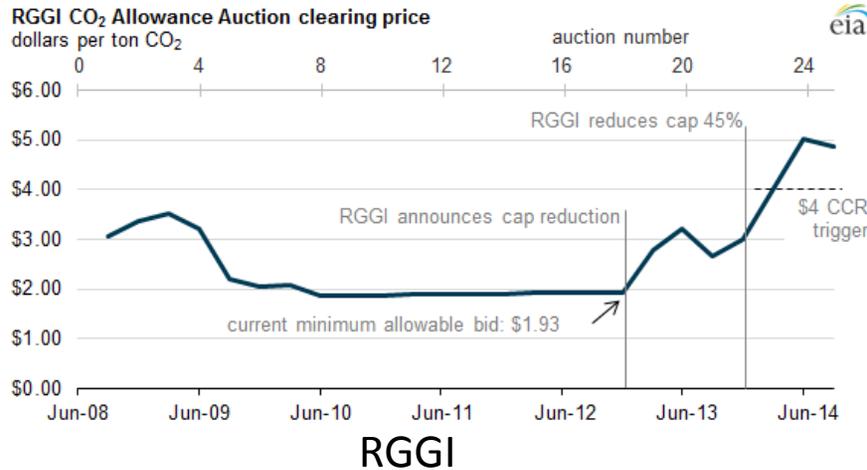
CARBON PRICE

\$/Tonne CO₂e



5-day moving average price and volume of California Carbon Allowance Futures over time from [ICE End of Day Reports](#). Daily trading volume units are 1000 allowance futures. [Download data](#).

Becoming a Familiar Pattern



CARBON PRICE



5-day moving average price and volume of California Carbon Allowance Futures over time from ICE End of Day Reports. Daily trading volume units are 1000 allowance futures. [Download data.](#)

IV. Co-Benefits and Environmental Justice

- Co-benefits play a major role in cost/benefit analysis of GHG policies
- But co-benefits will change with other technology and policy changes
 - Tailpipe emissions or congestion regulations
 - Cleanliness of the grid
- Focus on co-benefits can:
 - lead to disappointment because policy isn't aimed at maximizing co-benefits (eg, CA EJ controversy)
 - lead to disappointment because policy is aimed at maximizing co-benefits, undermines cost effective GHG abatement

Thank You!

■ FURTHER READING

- Borenstein, Bushnell, Wolak, and Zaragoza-Watkins, “[Expecting the Unexpected: Emissions Uncertainty and Environmental Market Design](#)”, Energy Institute at Haas Working Paper #274, Revised June 2018
- Borenstein, Bushnell and Wolak, “[California’s Cap-and-Trade Market Through 2030: A Preliminary Supply/Demand Analysis](#)”, Energy Institute at Haas Working Paper #281, July 2017
- Borenstein, “[Cap-and-Trade and Innovation](#)”, Energy Institute at Haas Blog, April 2, 2018
- Borenstein, “[What Do We Want From California Climate Policy?](#)”, Energy Institute at Haas Blog, February 27, 2017
- Borenstein, “[Fixing a Major Flaw in Cap and Trade](#)”, Energy Institute at Haas Blog, August 15, 2016
- Borenstein, [Oil price crash shows the challenge of breaking addiction](#), January 20, 2015