Cap and Trade in Practice: Barriers and Opportunities for Industrial Emissions Reductions in California

Climate Policy Initiative
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Key findings

The Cap and Trade Program is making a difference in how firms approach emissions reductions. Cement firms are factoring the carbon price into investment decisions and are exploring options to reduce emissions.

However, the impact of the carbon price on a decision to abate emissions also depends on a range of other factors. In most cases, the carbon price is not the most important factor in making an emissions reduction decision financially attractive.
Key findings

Under the Cap and Trade Program, California will meet its emissions reduction target as long as the cap is enforced. But policymakers can reduce the cost of meeting the target by taking further action to lower barriers to low-cost or cost-saving abatement options.

AB32 already takes this approach through sector-specific “complementary policies,” but policymakers can do more.
Background
The Cap and Trade Program is a relatively small but important part of California’s climate strategy.

Under AB32, the Cap and Trade Program wraps around a set of sector-specific policies, including the Renewable Electricity Standard and vehicle GHG standards. The Cap and Trade Program serves as a backstop to ensure that California meets its emissions reduction goals.
The cement industry is a key industrial emitter in California and many other states

~2% of emissions statewide; similar to national figure
Cement plants are the largest coal consumers in California

Fuel burned in California’s cement kilns (2009)

- Coal, 70%
- Petroleum coke, 16%
- Tires, 8%
- Natural gas, 5%
- Biomass, diesel, other waste, 1%
Methods
How do business decisions influence achievement of emissions reductions under cap and trade?

Our research questions:

• Are California’s cement firms likely to take the steps commonly discussed as abatement options for their industry?

• How large a role does the carbon price play in driving abatement decisions, relative to other factors such as energy prices and non-price barriers?

• What are the barriers to abatement in the cement industry that are not addressed by the carbon price? What other policy levers could address these barriers?
We modeled a set of representative abatement options under a range of carbon price scenarios:

1. Energy efficiency
2. Fuel switching: biomass, tires, natural gas
3. Blending of alternative materials

Image source: LBNL, “Opportunities for Energy Efficiency and Demand Response in the California Cement Industry”
Carbon price scenarios based on Cap and Trade Program regulation

Program currently in place through 2020

Highest reserve price tier

Lowest reserve price tier

Current margin over the floor price

Auction reserve price (floor price)
Findings
The Cap and Trade Program is a salient factor in business decisions. California’s cement firms factor the carbon price into their investment models and are exploring options to reduce emissions.
Most abatement options do not meet firms’ investment criteria at low carbon prices, but more do at high carbon prices.

Abatement option meets firms’ stated criteria for investment:

- Payback under 3 years (capital investments)
- Profitable immediately (operational changes)
Energy Efficiency

The carbon price makes already-profitable investments in energy efficiency more financially attractive. However, firms’ internal priorities and short required payback periods for investment will continue to limit investment, especially if carbon prices remain low.
Some fuel switching options appear very financially attractive with a carbon price. However, some promising options involve lower-carbon fuels that are not yet widely used in California. Firms require more certainty about future fuel availability and prices before making major investments.
The carbon price makes blending of supplementary cementitious materials (SCMs) financially attractive. However, the primary barrier to increasing SCM blending is technical specifications used by state agencies and other customers, which the carbon price alone will not address.
Non-price barriers are a significant obstacle to cost-effective abatement options

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<thead>
<tr>
<th>GREENHOUSE GAS ABATEMENT OPTIONS FOR CEMENT MANUFACTURING FIRMS</th>
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<tr>
<td>THERMAL ENERGY EFFICIENCY INVESTMENT</td>
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<td>FUEL SWITCHING OPTIONS:</td>
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<td>TIRES</td>
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<tr>
<td>BIOMASS INVESTMENT</td>
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<td>BIOMASS CO-FIRING</td>
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<td>NATURAL GAS INVESTMENT</td>
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<td>INCREASE BLENDING OF ALTERNATIVE MATERIALS (SCMs)</td>
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**Model 1**: Financial attractiveness of abatement options with barriers to investment

**Model 2**: with barriers removed

Barriers to firms’ adoption of possible abatement options:
- Payback period too long (capital investments) or not profitable in first year (operational changes)
- Uncertain availability of fuel
- Lack of customer acceptance
Policy Implications and Recommendations
The carbon price alone will not address these barriers, but other policy measures could help bring them down.

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<thead>
<tr>
<th>Carbon Price Scenarios</th>
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<th>Low $10-12/mT CO₂(e)</th>
<th>High $40-50/mT CO₂(e)</th>
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<tbody>
<tr>
<td>Greenhouse Gas Abatement Options for Cement Manufacturing Firms</td>
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<td>Thermal Energy Efficiency Investment</td>
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<td>Fuel Switching Options:</td>
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<td>Biomass Investment</td>
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*Model 1: Financial attractiveness of abatement options with barriers to investment*

*Model 2: with barriers removed*
Barrier: Short required payback period

Solution: Financial support (e.g., subsidized loans, leases) could give firms an incentive to invest in projects that reduce emissions and save money, but take longer to pay back.
Barrier: Lack of alternative fuel supply

Solutions:
Public investment could accelerate commercialization of alternative fuels. Guarantees could help provide certainty to firms considering fuel-switching investments.
**Barrier:** Inflexible customer demand

**Solutions:**

- **Customer education and outreach** could promote use of performance-based rather than prescriptive standards.
- **Government procurement** could expand the market for cement with more SCMs.
- **Research and engagement with standard-setting institutions** could expand the potential uses of blended cement.
Takeaway message: Think beyond the carbon price

Under the Cap and Trade Program, California will meet its emissions reduction target as long as the cap is enforced. But policymakers can reduce the cost of meeting the target by taking further action to lower barriers to low-cost or cost-saving abatement options.

AB32 already takes this approach through sector-specific “complementary policies,” but policymakers can do more.
Visit the California Carbon Dashboard for updates and information on AB32

http://calcarbodash.org

AB32 relies on a number of important complementary policies to achieve the bulk of reductions to meet California's statewide 427 million metric tons of CO2 equivalent (MMT C02e) emissions goal for 2020. The Cap and Trade Program acts as a backstop to these complementary policies. This graphic shows greenhouse gas emissions in 2020 under business-as-usual conditions and under AB32 implementation, and the expected contributions of each complementary policy to AB32 reductions. Moused over to see which policies apply to a given sector. Click on any policy for CARB's most recent regulatory details. Moused over to see which policies apply to a given sector. Click on any policy for more details.

**BUSINESS-AS-USUAL 2020**

- Advanced Clean Cars (Pavley II)
- Regional Transportation Targets
- Vehicle Efficiency Measures
- Goods Movement
- Low Carbon Fuel Standard
- Medium/Heavy Duty Vehicles
- High Speed Rail
- Renewable Energy

**COMPLEMENTARY POLICIES**

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<th>Policy Type</th>
<th>Update</th>
<th>Emissions Cap</th>
<th>Emissions History</th>
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