



# Analysis of the California ARB's Scoping Plan and Related Policy Insights

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 October 4, 2010  
 Sacramento, CA



**This work was performed at the invitation of and in collaboration with the California Air Resources Board in response to Resolution 08-47 with the goal of better understanding the sensitivity of economic impact estimates to methodologies, assumptions, and policy measures**

## Overview of the study

1. We modeled ARB's five core cases under input assumptions similar to ARB's.
2. In addition, five other cases under CRA's input assumptions were modeled.
3. Scenarios highlighted in the presentation

	SP (Case 1)	C&T	SP-Alt	SP-NoOff (Case 2)	SP_WMOS
Complementary Measures	Included	Excluded	Included	Included	Included
Cost Assumptions	ARB	ARB	CRA	ARB	ARB
Offset Availability	4%	4%	4%	None	WM

4. We used CRA's MRN-NEEM model for the analysis

Notes: SP = ARB Scoping Plan  
 WM = Waxman Markey  
 Complementary measures = LCFS, 33% RPS, EE/DSM, CHP, and 4% VMT Reduction



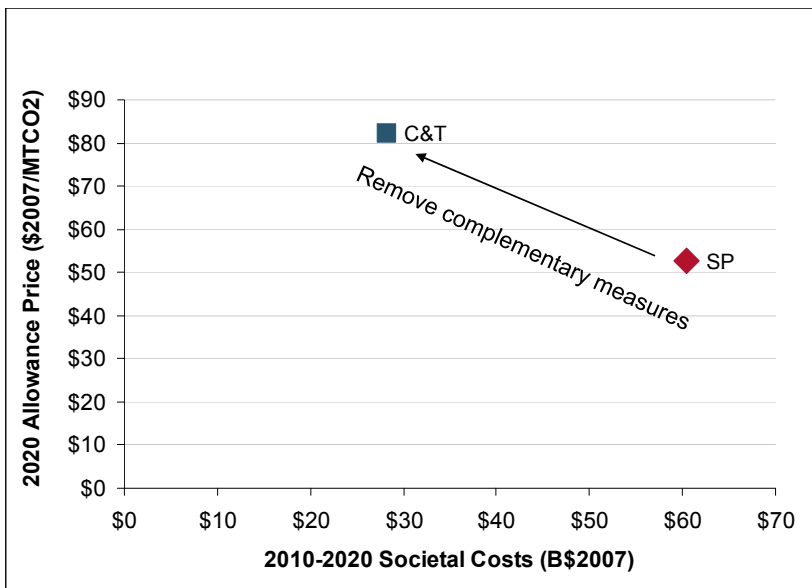
## Summary – Comparison of ARB and CRA Findings

- Estimates of overall impacts in 2020 vary greatly depending on the treatment of complementary measures, offsets, and technology cost assumptions:
  - Allowance prices range from \$50 to \$80 per metric ton of CO<sub>2</sub> (\$0.50 to \$0.80 per gallon of gasoline)
  - Costs range from \$200 to \$500 per capita (0.5% to 1.1% of income per capita)
- CRA and ARB both find even 4% offsets significantly reduce costs of meeting an emissions target with permit prices reduced by between 33% (CRA) and 80% (ARB)
- CRA and ARB differ in how command and control measures affect policy costs: CRA finds that measures that reduce flexibility (i.e., “complementary measures”), increase costs of complying with AB32; whereas ARB finds these measures reduce costs
  - RES and LCFS contribute most of the added cost in CRA’s analysis
- CRA’s and ARB’s models are sensitive to assumptions about technology costs, economic forecasts, and development so flexibility in policy design is critical
  - Accounting for likely higher costs of procuring and delivering low carbon fuels to the California fleet raises the costs of complying with the LCFS and increases the cost of the overall program by over 40%
  - Costs are significantly less under the IEPR 2009 emissions forecast, than under the 2008 Scoping Plan, which used the IEPR 2007 emissions forecast
- When comparing a case with limited complementary measures, Case 5, ARB finds 2020 per capita costs of \$270 vs. CRA’s cost estimate of \$290

<sup>2</sup> \*All numbers in 2007\$s.

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## Excluding complementary measures cuts program costs by 50%



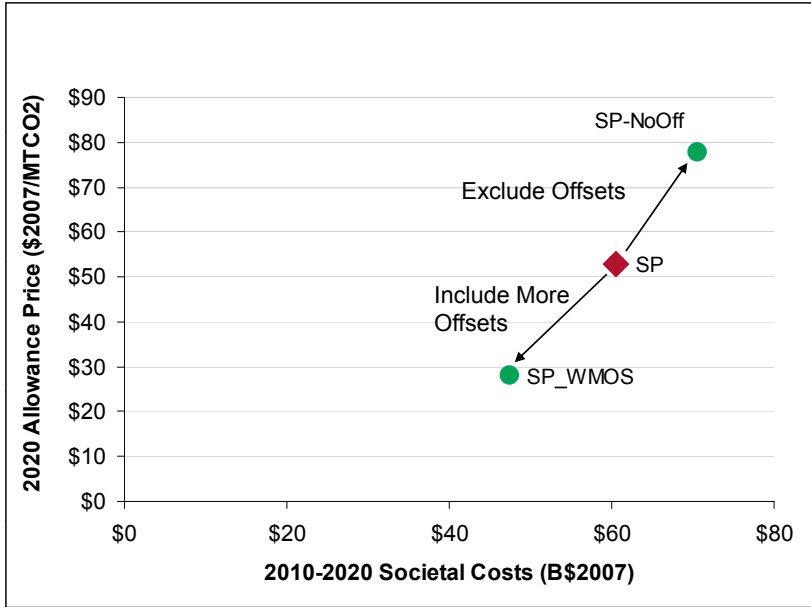
• Overall policy costs cannot be inferred from the CO<sub>2</sub> allowance price because AB32 combines a market-based program to reduce carbon emissions (e.g., cap-and-trade) with command-and-control mandates (e.g., complementary measures).

• Achieving the same cap, the complementary measures prescribe more expensive carbon emission reductions than the cap-and-trade program alone, resulting in lower allowance prices, but higher total compliance costs.

• RES and LCFS are responsible for most of the cost increase, not efficiency standards intended to address market failures in energy use

	SP (Case 1)	C&T
All Complementary Measures	Included	Excluded

## Allowing offsets mitigates costs of AB32



	SP (Case 1)	No Offsets (Case 2)	Waxman-Markey Offsets
Complementary Measures	Included	Included	Included
Offsets in 2020 (MMTCO2) or (%)	4%	None	50

- Allowing use of more offsets from a broader range of sources can cut costs by a third while preserving emission reductions

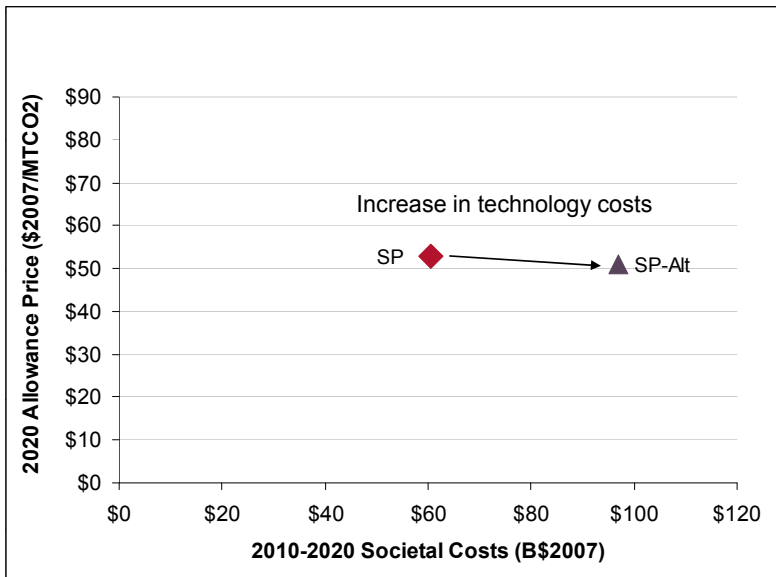
- It holds under both ARB and CRA modeling framework, with or with the complementary measures, and both sets of cost assumptions.

- Flexible mechanisms are valuable for mitigating cost increases due to higher than expected emissions and technology costs

- Offsets lessen incentives for investment to leave California by lowering allowance prices

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## Results are sensitive to assumptions about costs of new technologies



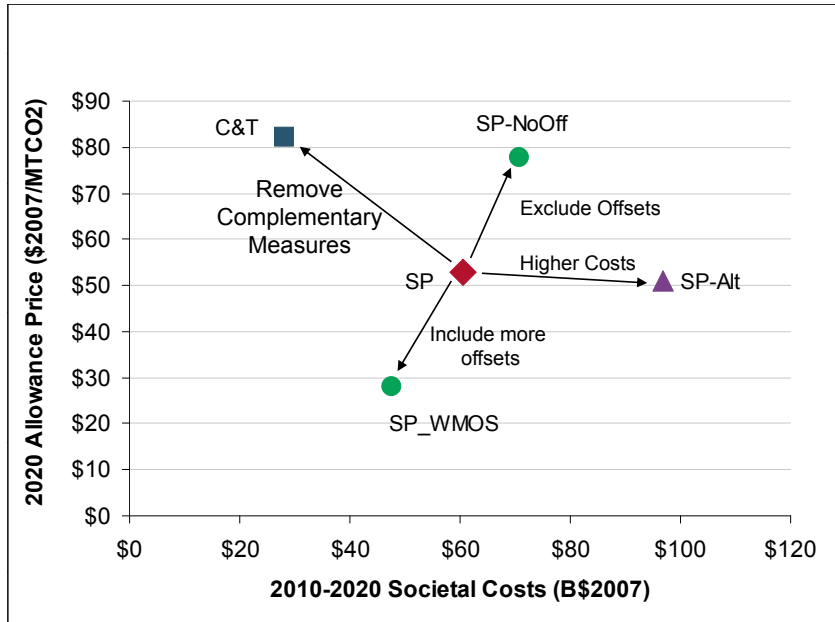
	SP (Case 1)	SP-Alt
Complementary Measures	Included	Included
Cost Assumptions	ARB	CRA

- Accounting for likely higher costs of procuring and delivering low carbon fuels to the CA fleet raises the costs of complying with the LCFS and increase the cost of the overall program.

- The overall program costs increase by \$40 billion dollars.

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## Policy Costs are Sensitive to Policy Decisions and Outside Forces



	SP (Case 1)	C&T	SP-Alt	SP-NoOff (Case 2)	SP_WMOS
Complementary Measures	Included	Excluded	Included	Included	Included
Cost Assumptions	ARB	ARB	CRA	ARB	ARB
Offset Availability	4%	4%	4%	None	WM

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## Conclusions – CRA’s Analysis Shows:

- Increased reliance on a market-based approach, e.g., cap-and-trade, can achieve the emission target at substantially lower cost than the Scoping Plan’s approach that relies heavily on complementary measures
  - Complementary measures that mandate technologies without an underlying market failure, like RES and LCFS, cause most of avoidable cost
  - Policy design choices have an important impact on total costs
- Including offsets reduces permit prices and overall program costs while maintaining overall emission reductions
  - 4% offsets lower program costs and permit prices by 15% and 33%, respectively
  - Increasing availability of offsets from 4% to the amount prescribed by the Waxman-Markey bill lowers program costs and permit prices further by another 15% and 33%
- External factors can also contribute to higher than expected costs, highlighting the need for compliance flexibility and cost containment mechanisms
  - Higher than expected emissions growth and technology costs would increase program costs substantially. For example, higher alternative fuel costs greatly increase the costs of complying with the LCFS.
- Replacing or linking AB 32 with a national cap and trade program could lower costs by 50% and achieve similar contributions to global emission reductions in the long run

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# Thank You

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For more details on this study, please see:

<http://www.crai.com/uploadedFiles/analysis-of-ab32-scoping-plan.pdf>

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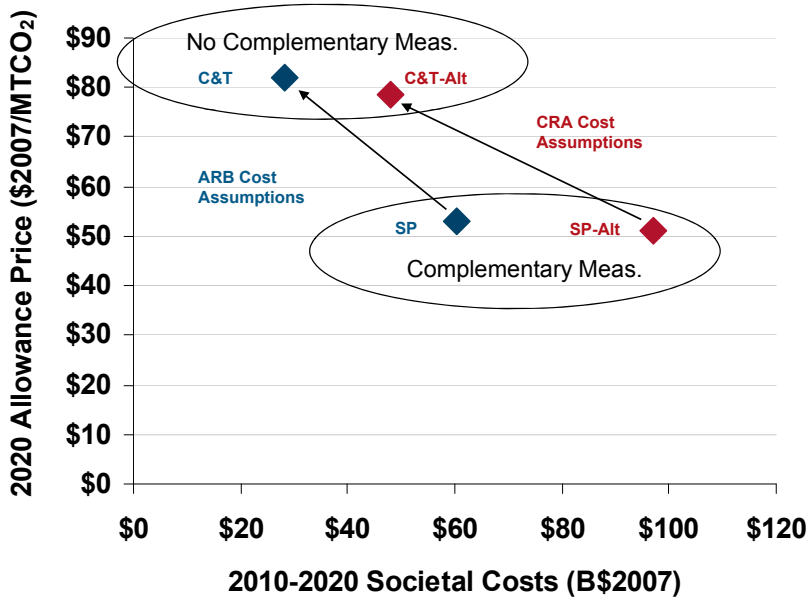
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# Backup Slides

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# Excluding complementary measures cuts program costs by 50%



- Overall policy costs cannot be inferred from the CO<sub>2</sub> allowance price because AB32 combines a market-based program to reduce carbon emissions (e.g., cap-and-trade) with command-and-control mandates (e.g., the complementary measures)
- Under either CRA or ARB assumptions, the complementary measures prescribe more expensive carbon emission reductions than cap-and-trade program alone, resulting in lower allowance prices, but higher total compliance costs.

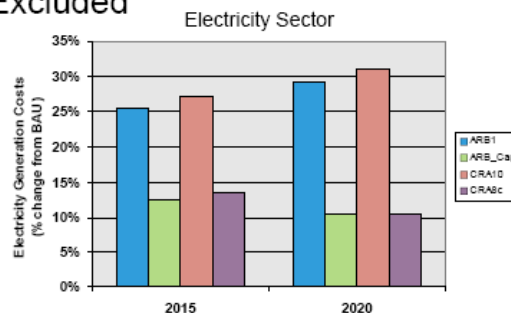
	SP (Case 1)	C&T	SP-Alt	C&T-Alt
Complementary Measures	Included	Excluded	Included	Excluded
Cost Assumptions	ARB	ARB	CRA	CRA



## Electricity and Fuel Costs Impacts Smaller when Complementary Measures are Excluded

Increase in the cost of generating electricity is only half to a third as great when RES 33%, DSM, and CHP measures are excluded

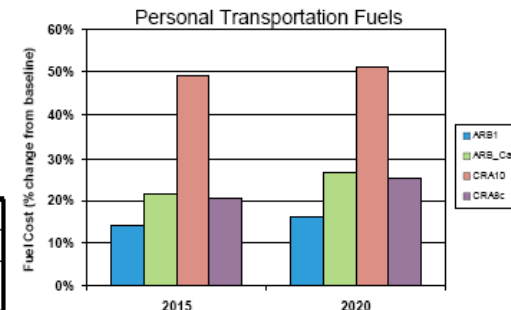
Note: Customer bills are impacted by many factors, including changes in generation costs. Electricity generation costs represent the % change in total costs to produce one MWh of electricity.



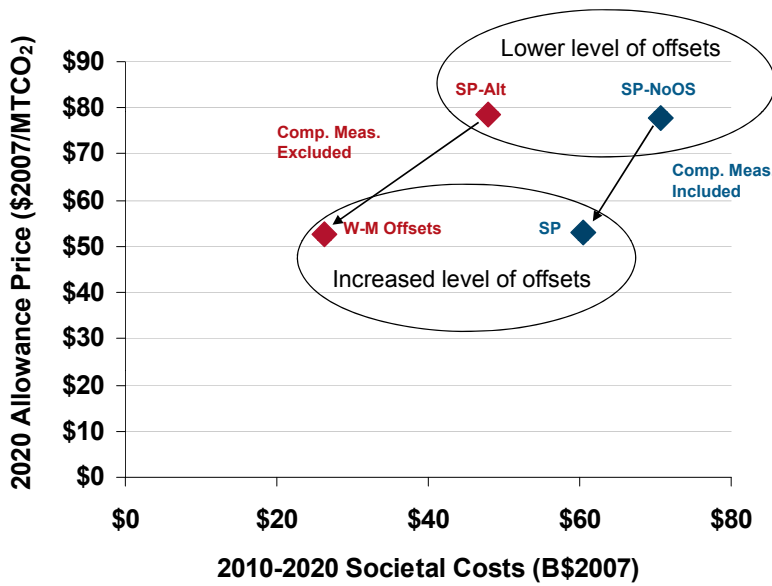
With LCFS in place, increase in prices of personal transportation fuels is about 2.5 times greater under alternative cost assumptions

With no LCFS provision, price of transportation fairly invariant to costs of alternative transportation fuels

	ARB1	ARB_Cap	CRA10	CRA8c
LCFS in place	Yes	No	Yes	No
Cost Assumptions	ARB	ARB	CRA	CRA



## Offsets reduce costs of AB32 implementation by \$7 to \$24 billion and allowance prices by about \$25/MTCO<sub>2</sub>

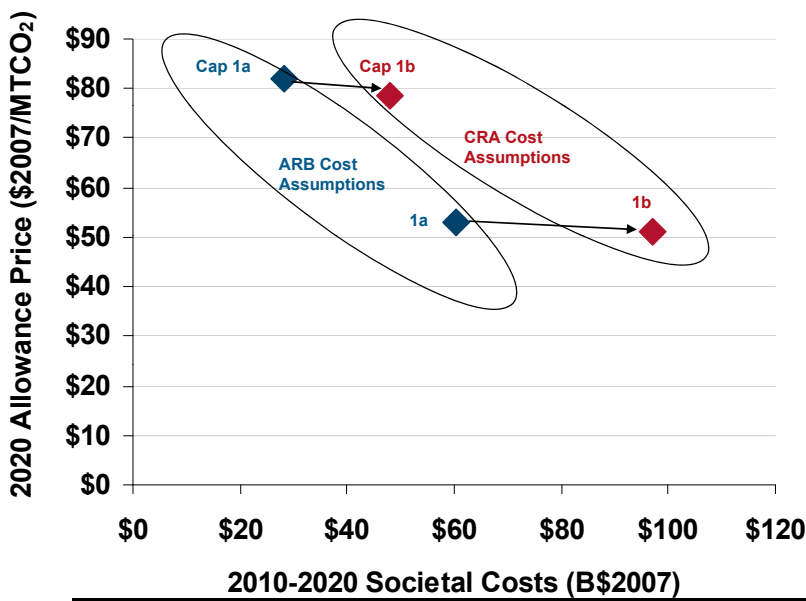


- Allowing use of more offsets from a broader range of sources can cut costs in half while preserving emission reductions
- Flexible mechanisms are valuable for mitigating cost increases due to higher than expected emissions and technology costs
- Offsets lessen incentives for investment to leave California by lowering allowance prices

	SP (Case 1)	SP-NoOS (Case 2)	Waxman-Markey Offsets	SP-Alt
Complementary Measures	Included	Included	Excluded	Excluded
Offsets in 2020 (MMTCO <sub>2</sub> ) or (%)	4%	None	55	4%

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## Cost of complementary measures more sensitive to technology costs than pure cap and trade program

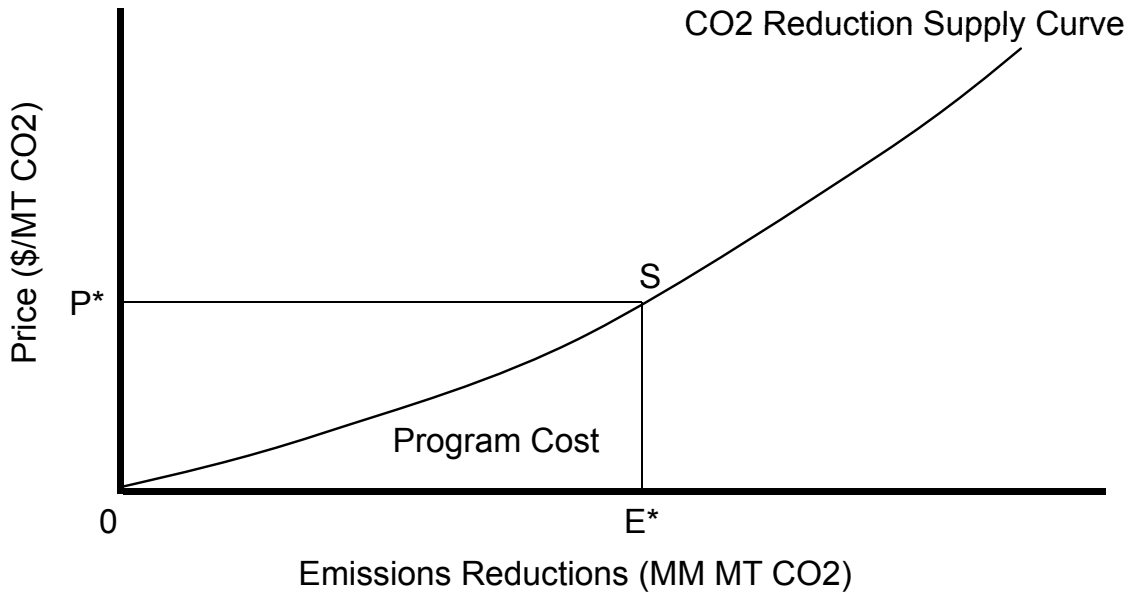


- Accounting for likely higher costs of procuring and delivering advanced low carbon fuels to the California fleet adds \$20 to \$40 billion dollars to the overall program costs
- When complementary measures are excluded program costs are less sensitive to technology uncertainty because the market is no longer constrained in its choice of technologies

	SP (Case 1)	C&T	SP-Alt	C&T-Alt
Complementary Measures	Included	Excluded	Included	Excluded
Cost Assumptions	ARB	ARB	CRA	CRA

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## CO2 Reduction Supply Curve

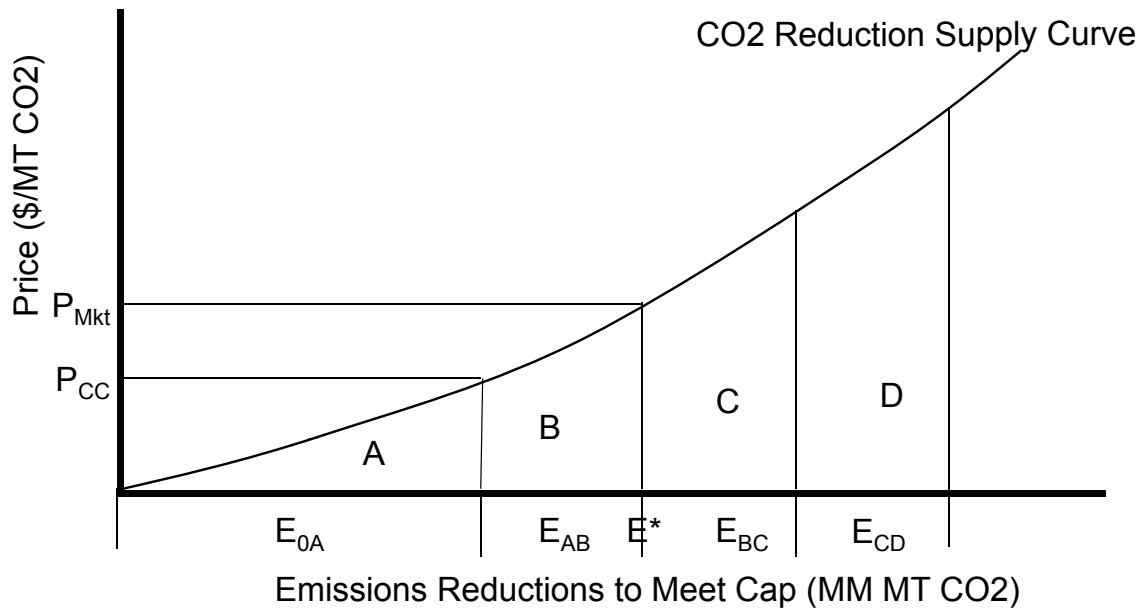


$E^*$  = Emission reductions needed to meet cap  
 $P^*$  = Permit price for  $E^*$  reductions  
 Program Cost = The area defined by  $0SE^*$

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## Command and Control Programs Raise Costs and Lower Permit Prices



C & D represent command and control measures  
 $E_{AB} = E_{BC} = E_{CD}$   
 Cost under efficient policy =  $A+B$ ; Permit price =  $P_{Mkt}$   
 Cost under C&C low cost =  $A+C$ ; Permit price =  $P_{CC}$   
 Cost under C&C high cost =  $A+D$ ; Permit price =  $P_{CC}$

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# Including Offsets Lowers Program Costs and Permit Prices

