



# Cap and Trade is Not Enough

**Jay Apt**

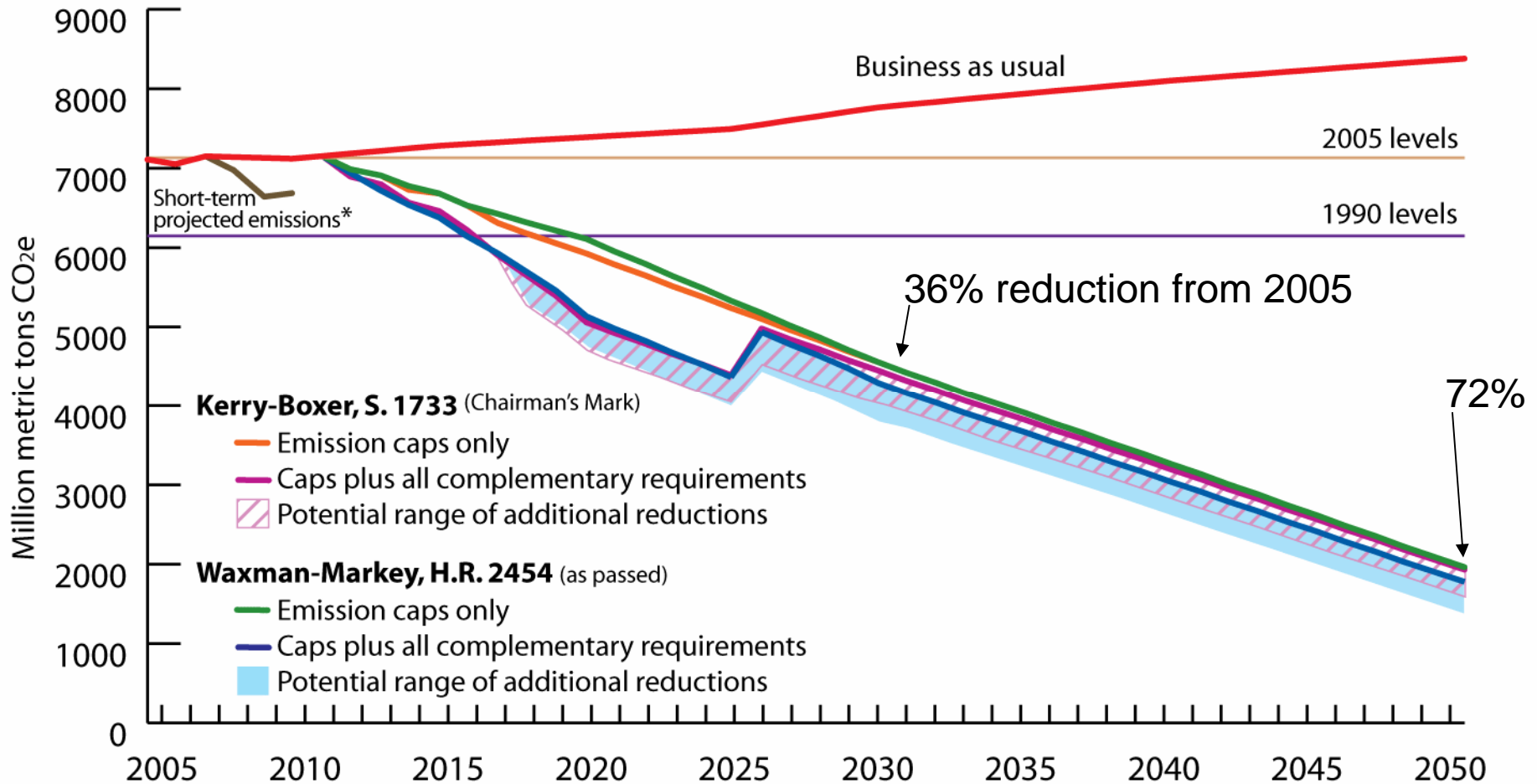
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**NARUC/NCEP Climate Change Conference:  
The Utility of the Future in a Carbon Constrained World  
December 3, 2009**



# Emission Reductions Under Cap-and-Trade Proposals in the 111th Congress, 2005-2050

October 28, 2009

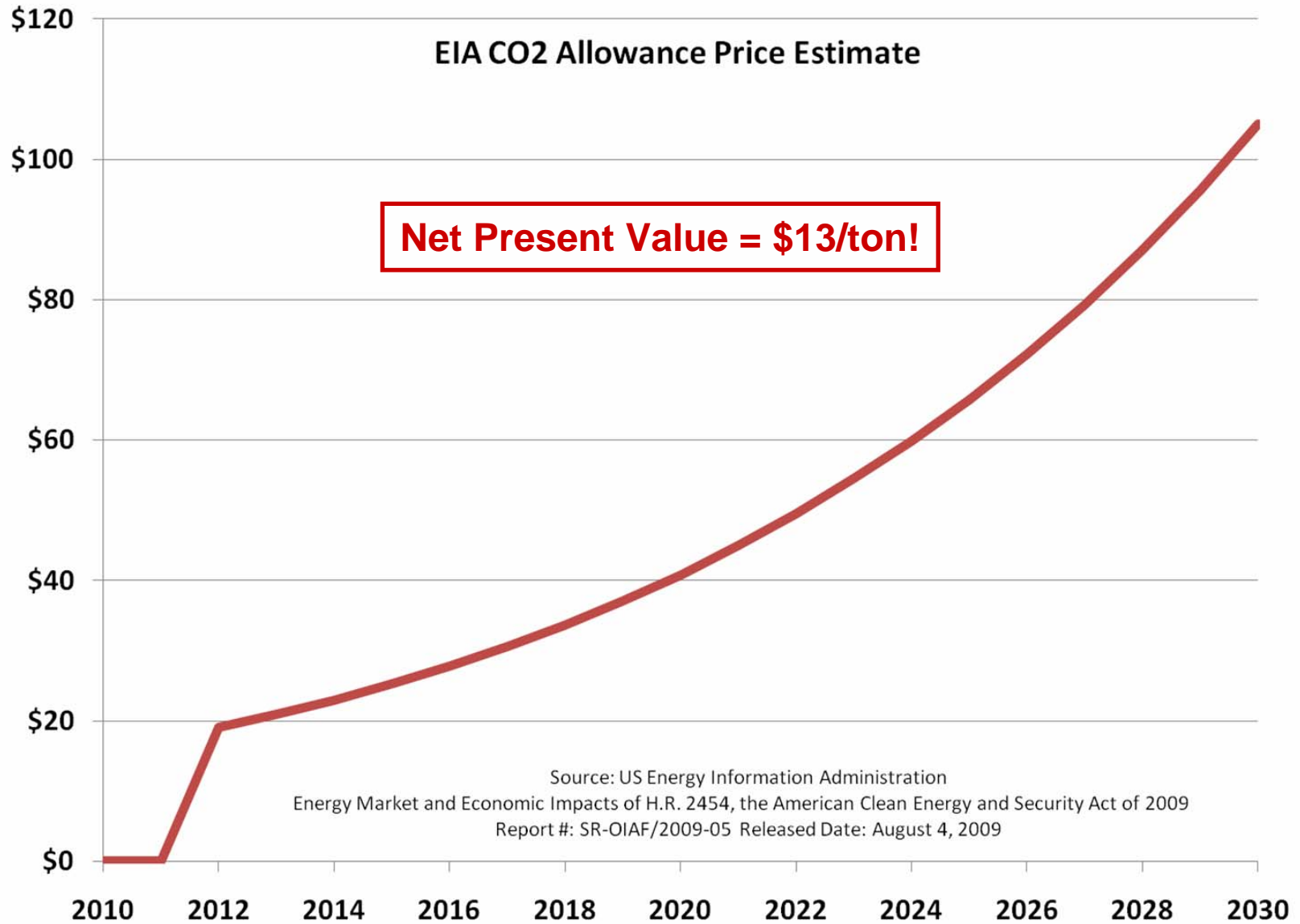


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For a full discussion of underlying methodology, assumptions and references, please see <http://www.wri.org/usclimatetargets>.

\* "Business as usual" emission projections are from EPA's reference case for its analysis of the Waxman Markey Discussion Draft. "Short-term projected emissions" represent EIA's most recent estimates of emissions for 2008-2010.

# Suppose Congress Enacts Waxman-Markey?



# CMU's Paul Fischbeck has looked at firm-level decisions

## Strategy regions for four decision options

Current Costs

EPA Forecast of Waxman-Markey

Natural Gas price (\$/MMBtu)

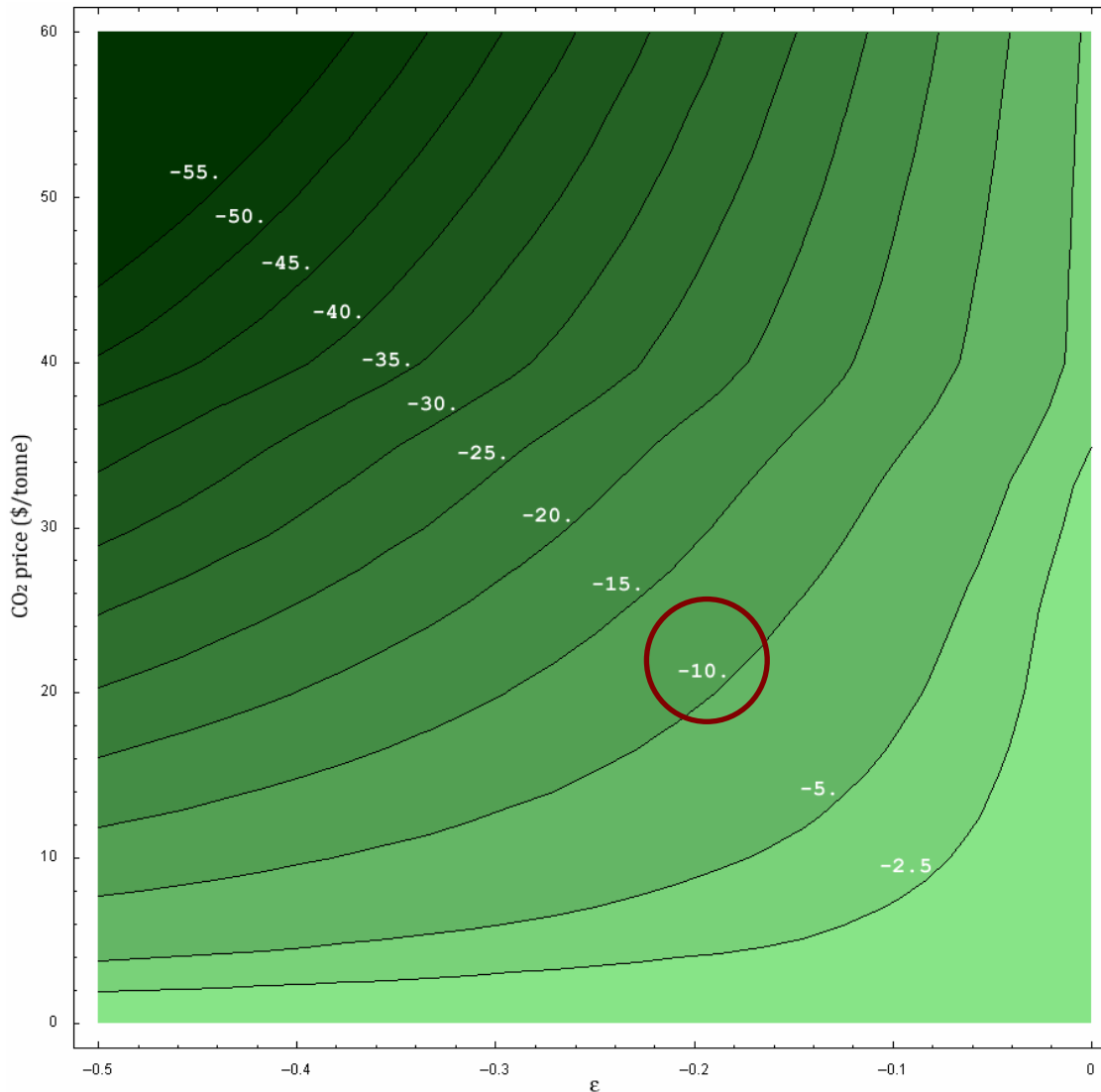
		Low	\$2	\$3	\$4	\$5	\$6	\$7	\$8	\$9	\$10	\$11	\$12	\$13	\$14	\$15	\$16	\$17	\$18	\$19	High		
CO2 Price per ton	Low	31.30	38.11	44.91	51.71	58.52	63.55	63.55	63.55	63.55	63.55	63.55	63.55	63.55	63.55	63.55	63.55	63.55	63.55	63.55	63.55	63.55	
	5	33.11	39.91	46.72	53.52	60.32	67.13	67.63	67.63	67.63	67.63	67.63	67.63	67.63	67.63	67.63	67.63	67.63	67.63	67.63	67.63	67.63	67.63
	10	34.92	41.72	48.52	55.33	62.13	68.94	71.71	71.71	71.71	71.71	71.71	71.71	71.71	71.71	71.71	71.71	71.71	71.71	71.71	71.71	71.71	71.71
	15	36.72	43.53	50.33	57.14	63.94	70.74	75.80	75.80	75.80	75.80	75.80	75.80	75.80	75.80	75.80	75.80	75.80	75.80	75.80	75.80	75.80	75.80
	20	38.53	45.33	52.14	58.94	65.75	72.55	79.35	79.88	79.88	79.88	79.88	79.88	79.88	79.88	79.88	79.88	79.88	79.88	79.88	79.88	79.88	79.88
	25	40.34	47.14	53.95	60.75	67.55	74.36	81.16	83.97	83.97	83.97	83.97	83.97	83.97	83.97	83.97	83.97	83.97	83.97	83.97	83.97	83.97	83.97
	30	42.15	48.95	55.75	62.56	69.36	76.16	82.97	88.05	88.05	88.05	88.05	88.05	88.05	88.05	88.05	88.05	88.05	88.05	88.05	88.05	88.05	88.05
	35	<b>NGCC without CCS</b>				71.17	77.97	84.77	91.58	92.21	92.21	92.21	92.21	92.21	92.21	92.21	92.21	92.21	92.21	92.21	92.21	92.21	92.21
	40	<b>NGCC without CCS</b>				72.97	79.78	86.58	93.38	96.22	96.22	96.22	96.22	96.22	96.22	96.22	96.22	96.22	96.22	96.22	96.22	96.22	96.22
	45	47.57	54.37	61.17	67.98	74.78	81.58	88.39	95.19	100.31	100.31	100.31	100.31	100.31	100.31	100.31	100.31	100.31	100.31	100.31	100.31	100.31	100.31
	50	49.37	56.18	62.98	69.78	76.59	83.39	90.19	97.00	103.80	104.39	104.39	104.39	104.39	104.39	104.39	104.39	104.39	104.39	104.39	104.39	104.39	104.39
	55	51.18	57.98	64.79	71.59	78.39	85.20	92.00	98.80	105.61	108.25	108.25	108.25	108.25	108.25	108.25	108.25	108.25	108.25	108.25	108.25	108.25	108.25
	60	52.18	59.79	66.59	73.40	80.20	87.00	93.81	100.61	107.42	108.81	108.81	108.81	108.81	108.81	108.81	108.81	108.81	108.81	108.81	108.81	108.81	108.81
	65	52.39	60.36	68.34	75.20	82.01	88.81	95.62	102.42	109.22	109.36	109.36	109.36	109.36	109.36	109.36	109.36	109.36	109.36	109.36	109.36	109.36	109.36
	70	52.61	60.58	68.55	76.52	83.82	90.62	97.42	104.23	109.92	109.92	109.92	109.92	109.92	109.92	109.92	109.92	109.92	109.92	109.92	109.92	109.92	109.92
	75	52.82	60.79	68.76	76.73	84.70	92.43	99.23	106.03	110.47	110.47	110.47	110.47	110.47	110.47	110.47	110.47	110.47	110.47	110.47	110.47	110.47	110.47
	80	53.03	61.00	68.97	76.94	84.91	92.89	100.86	107.84	111.02	111.02	111.02	111.02	111.02	111.02	111.02	111.02	111.02	111.02	111.02	111.02	111.02	111.02
85	53.24	61.21	69.18	77.15	85.13	93.10	101.07	109.04	111.58	111.58	111.58	111.58	111.58	111.58	111.58	111.58	111.58	111.58	111.58	111.58	111.58	111.58	
90	53.45	61.42	69.39	77.37	85.34	93.31	101.28	109.25	112.13	112.13	112.13	112.13	112.13	112.13	112.13	112.13	112.13	112.13	112.13	112.13	112.13	112.13	
95	<b>NGCC with CCS</b>				85.55	93.52	101.49	109.46	112.69	112.69	112.69	112.69	112.69	112.69	112.69	112.69	112.69	112.69	112.69	112.69	112.69	112.69	
High	53.88	61.85	69.82	77.79	85.76	93.73	101.70	109.67	113.24	113.24	113.24	113.24	113.24	113.24	113.24	113.24	113.24	113.24	113.24	113.24	113.24	113.24	

Coal without CCS

Coal with CCS



# A Carbon Price Will Cause Some Demand Reduction



By the way, a \$20/tonne CO<sub>2</sub> price increases gasoline price by about 20¢ per gallon.

Source: Newcomer, A., S.A. Blumsack, J. Apt, L.B. Lave, and M.G. Morgan, *Short run effects of a price on carbon dioxide emissions from U.S. electric generators*. *Environmental Science & Technology*, 2008. **42**(9): 3139-3144.

# Strategies to Control CO<sub>2</sub>

- An emissions tax
  - Favored by economists as the most efficient, but not politically feasible, and may not provide enough certainty to encourage multi-billion dollar investments
- Cap-and-Trade
  - Economists' second-favorite choice (after a carbon tax).
  - Requires an initial allocation of permits up to the cap
    - Auction revenues may be irresistible, but strong political pressures to allocate them to existing emitters (large wealth transfer in EU)
    - Price will be too low to change investment
- RPS
  - Excludes many less costly generators
  - Tries to pick technology or social winners

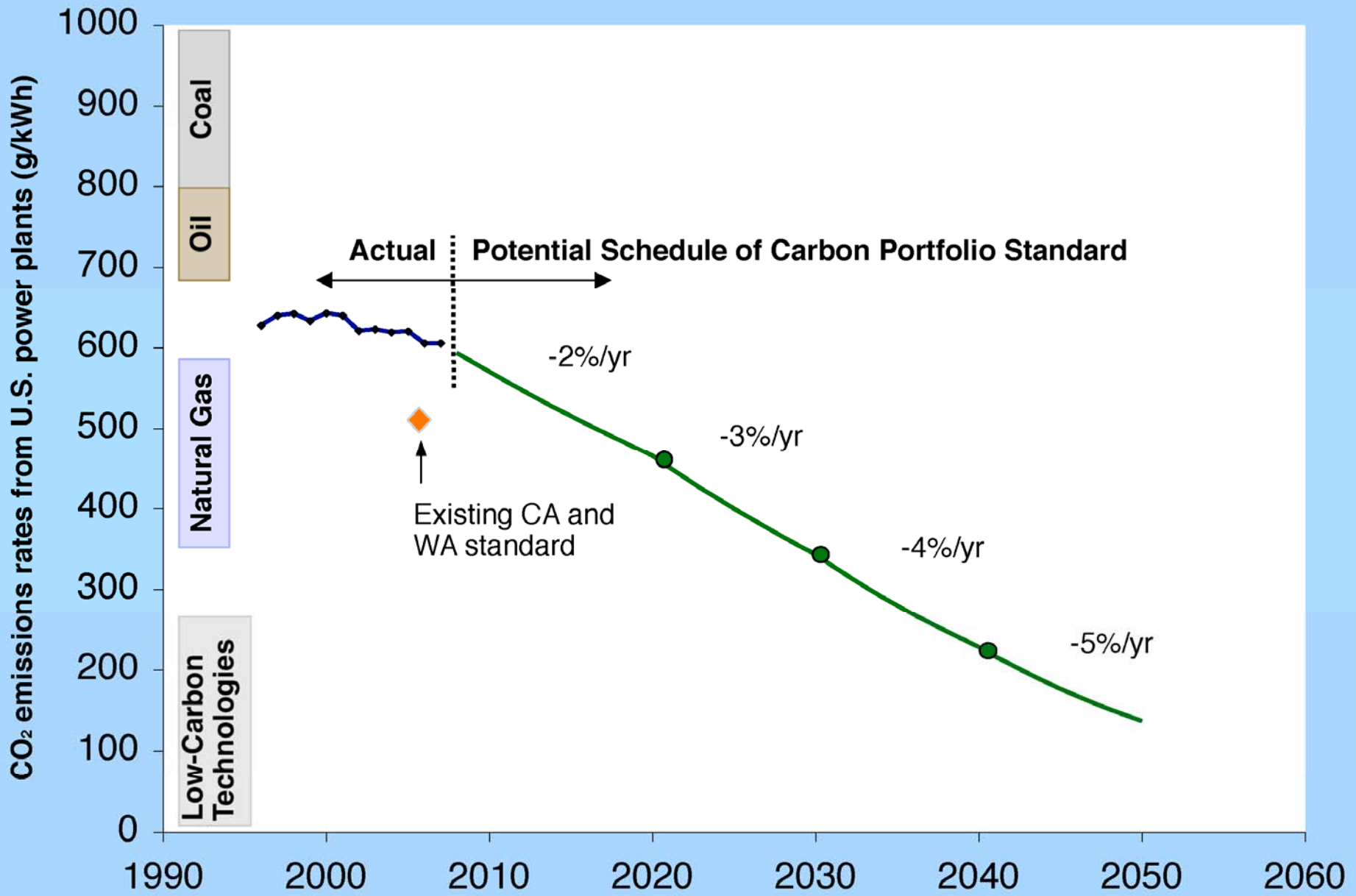
Point Carbon EUA OTC assessment





# Strategies to Control CO<sub>2</sub>

- A carbon emissions portfolio standard
  - Each electric supplier must meet an overall constraint, in pounds of CO<sub>2</sub> per MWh, which declines over time in a predictable way
  - Avoids the problem of allocating permits
  - Allows suppliers to seek the most inexpensive generation
  - Can allow trading for regional differences
  - Encourages efficiency, both in generation and use
  - Similar to CAFE standards





# If we let the least cost ones win, what might they be?

- Efficiency. Clearly the least expensive, but not considered by most state RPS legislation
- Geothermal. Hydrothermal sources are limited, but water-injection geothermal may be practical in the SW.
- Biomass co-firing, near where it is produced.
- Nuclear, if Westinghouse, GE, & Areva can keep costs down and performance up.
- Wind. 10 to 20% is probably practical in some regions. Requires going from the existing 18,000 wind turbines to 200,000 – 400,000 turbines & lots of transmission.
- Coal gasification and post-combustion capture.
- Natural gas, with post-combustion capture.
- Solar thermal, in a few of the best sites.





# Thank You!

For more information,  
see our briefing paper, *Cap and Trade Is Not Enough*  
[http://wpweb2.tepper.cmu.edu/ceic/papers/cap\\_and\\_trade.htm](http://wpweb2.tepper.cmu.edu/ceic/papers/cap_and_trade.htm)

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