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2007 Biobased Industry Outlook Conference

Ames, Iowa

“Low Carbon Fuel Policies: Creating an Environmental Dividend for Biofuels”

Sara Hessenflow Harper



Overview

- Policy Drivers
- Politics
- Market Potential



POLICY DRIVERS

Climate Change

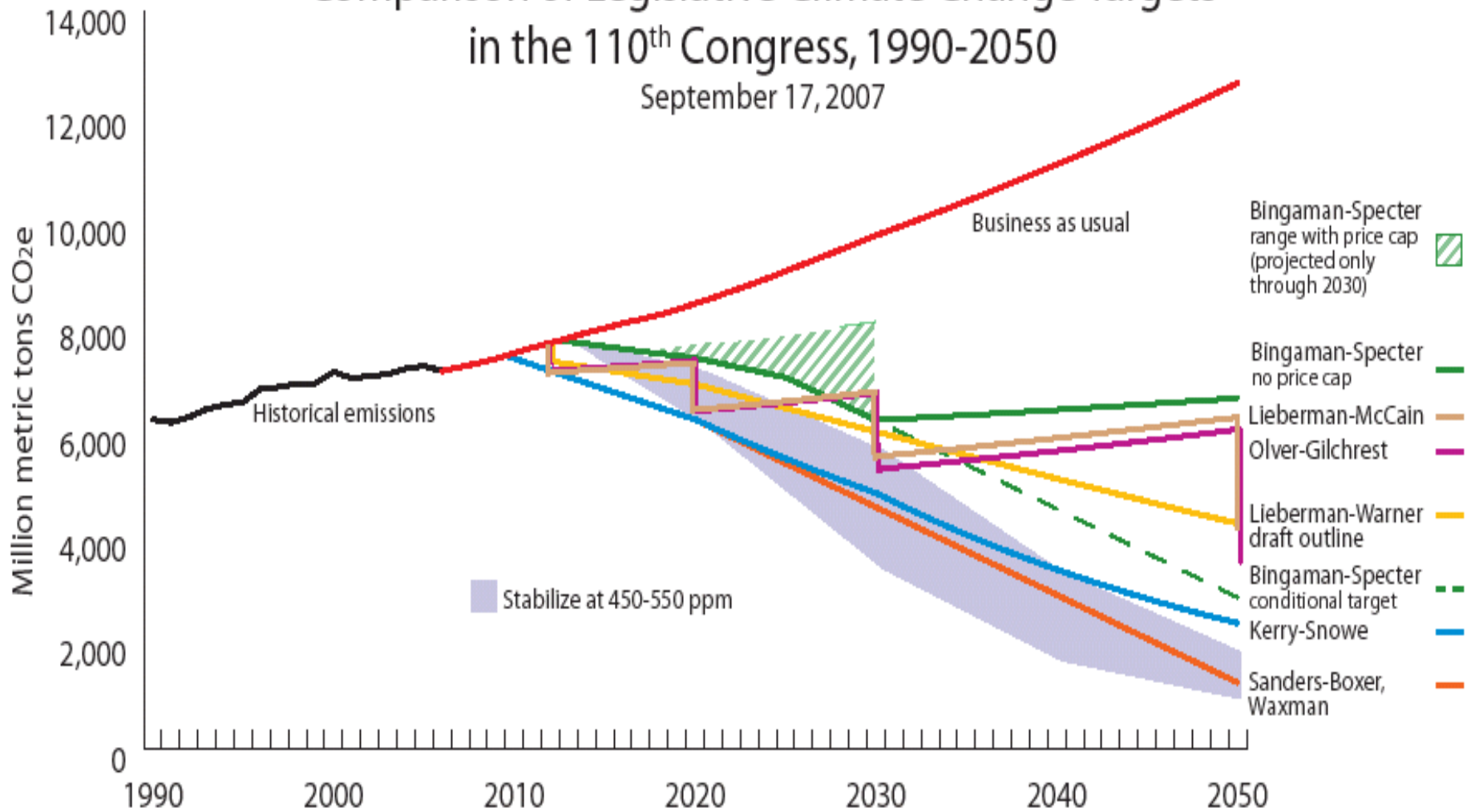
Low Carbon Fuel
Standard



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Comparison of Legislative Climate Change Targets in the 110th Congress, 1990-2050

September 17, 2007



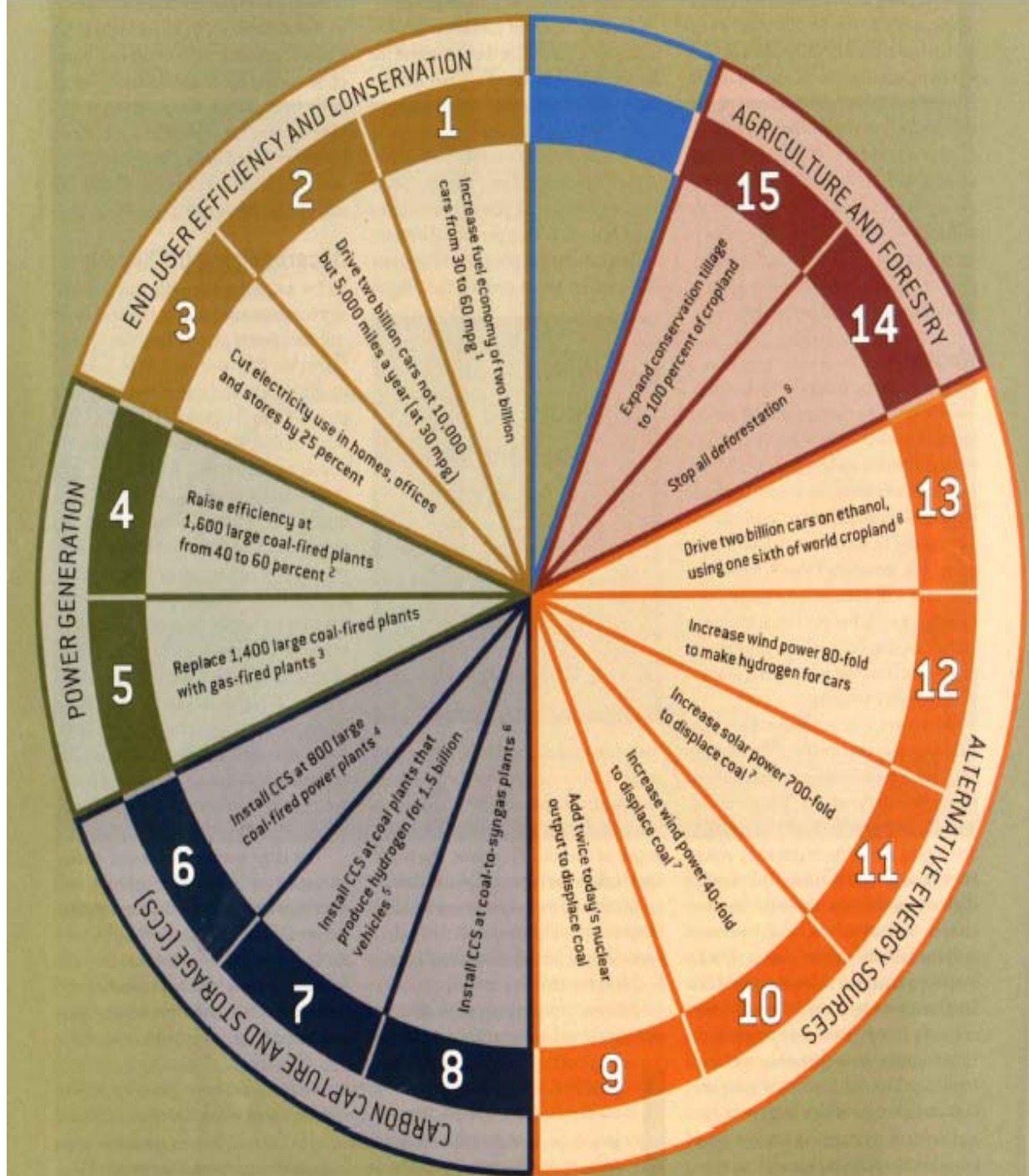
WORLD RESOURCES INSTITUTE

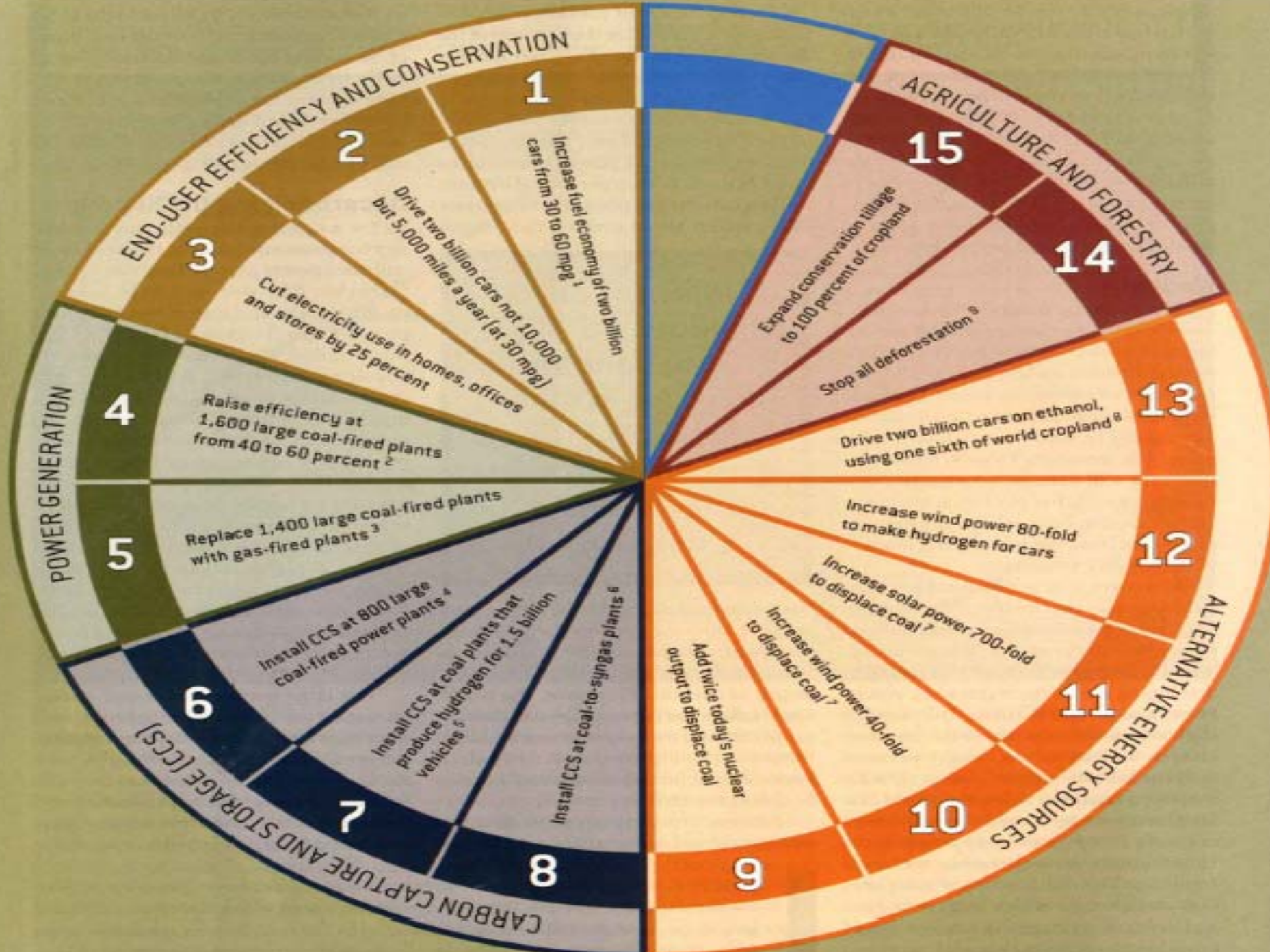
For a full discussion of underlying methodology, assumptions and references, please see <http://www.wri.org/usclimateproposals>. WRI does not endorse any of these bills. This analysis is for comparative purposes only. Data post-2030 may be derived from extrapolation of EIA projections.

Each “*De-carbonizing Wedge*” represents 25 billion tons of carbon avoided or reduced.

7 wedges needed to reach stabilize carbon emissions

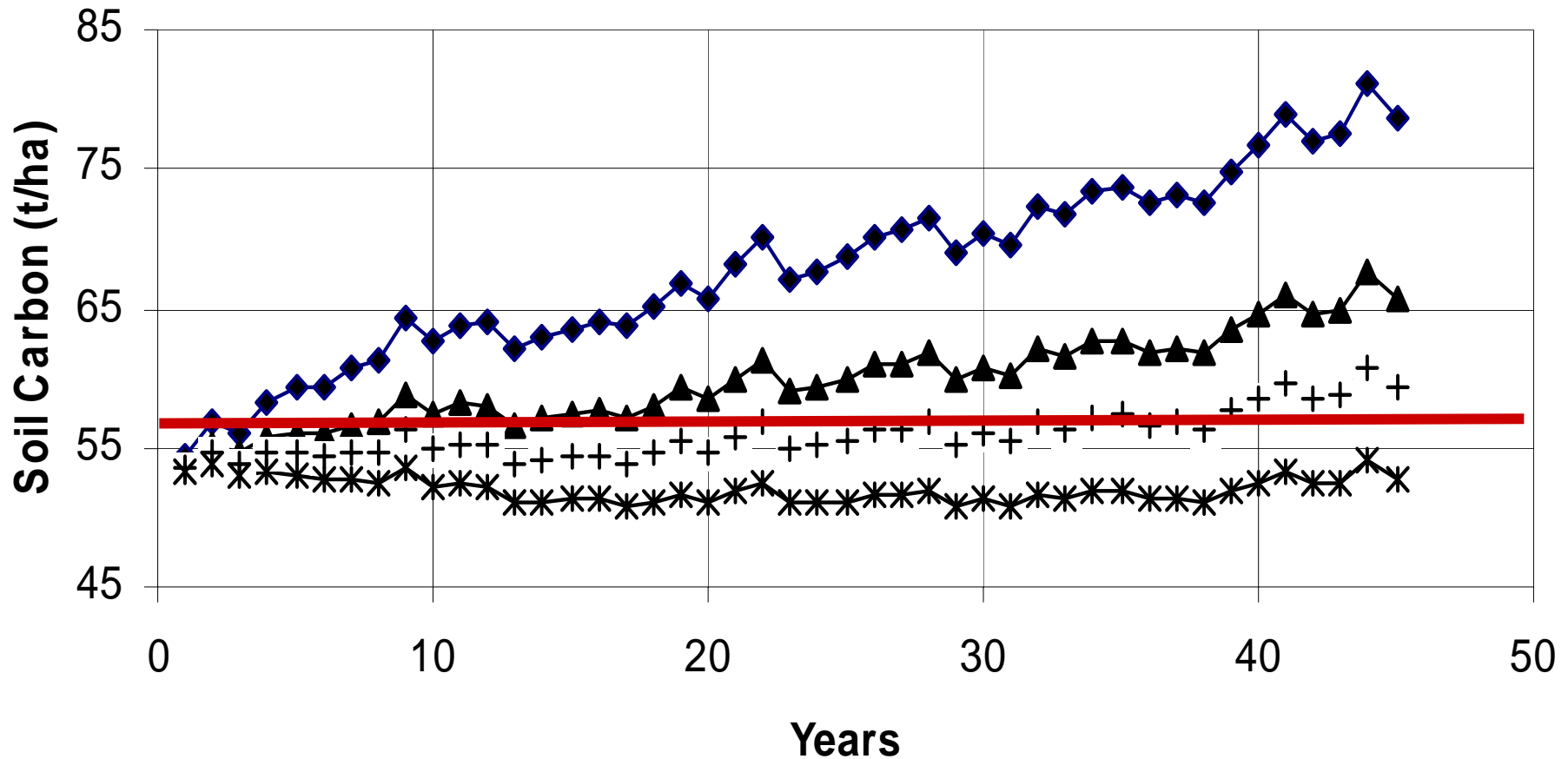
Source: Robert Socolow & Stephen Pacala; *Scientific American*, Sept. 2006





Source: Kansas State University (2007)

Soil carbon content of the top 30 cm soil under NT continuous corn production and different percentages of biomass removal in Manhattan, KS



—◆— 0% removed —▲— 40% removed —+— 60% removed —*— 80% removed

S. 1324 Low Carbon Fuel Standard (Sen. Obama, Reid, Harkin)

- (1) establish a fuel emission baseline;
- (2) identify qualifying low-carbon transportation fuels;
- (3) establish a low-carbon fuel certification and marketing process; and
- (4) require each obligated party to reduce the average lifecycle greenhouse gas (GHG) emissions per unit of energy of the aggregate quantity of fuels through the use of low-carbon fuels and improvements in the production of conventional fuels.



S. 1324 Low Carbon Fuel Standard (Sen. Obama, Reid, Harkin)

- Permits obligated parties to receive credits for achieving greater reductions in lifecycle GHG emission of the fuel produced, distributed, or imported than are required.
- Considers 1 gallon of cellulosic biomass ethanol or waste derived ethanol to be the equivalent of 2.5 gallons of renewable fuel through 2017 (currently there is no time limit).



- Requires the Administrator to establish: (1) a carbon intensity number and a green index number as part of the renewable identification number program; and
- (2) a set of standards to minimize the negative environmental impacts of an increase in the volume of fuels required by such Act and to ensure long term resource sustainability from the sourcing and production of low-carbon fuels.



Sustainability Study (Obama Bill)

Not later than 3 years after the date of enactment, EPA, USDA, DOE along with recommendations issued by the National Academy of Sciences, the Food and Agricultural Policy Research Institute, and not more than 2 other appropriate independent research institutes, shall establish a methodology to assess and quantify environmental changes associated with an increase in the volume of fuels required by this section



POLITICS

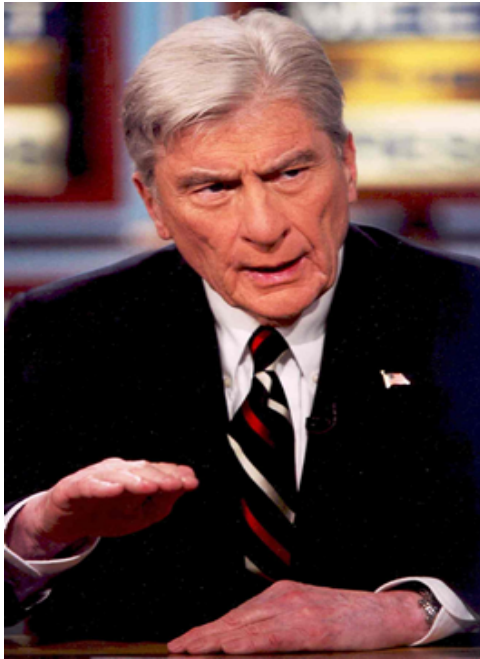


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- “President Bush touted federal support for renewable energy development today as a possible cure for high food prices fueled by the corn-ethanol boom.”
- “Bush told the Grocery Manufacturers Association meeting in Washington that the government is supporting "new technologies" to make fuel from wood chips, switchgrass and other sources.”



Lieberman-Warner climate legislation passes out of EPW subcommittee Nov. 1, 2007



Sen. John Warner (R-Virginia)

Senator Warner states that passing his climate change bill with Sen. Lieberman will be his “top priority” in the 14 months remaining in his term.



U.S. Climate Action Partnership Members



U.S. Climate Action Partnership



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SIEMENS



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Alex Farrell, author of California's Low Carbon Fuel **Standard** and director of the UC Berkeley Transportation Sustainability Research Center.

“There is more of an interest in finding . . . performance attributes, like low carbon, that are important in our fuels.”

“. . . biofuels per se can be a contributor, but they're not as good as actually measuring what we're interested in, which in this case is greenhouse gases and the carbon impact.”



MARKET POTENTIAL



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PRIME
BioSolutions

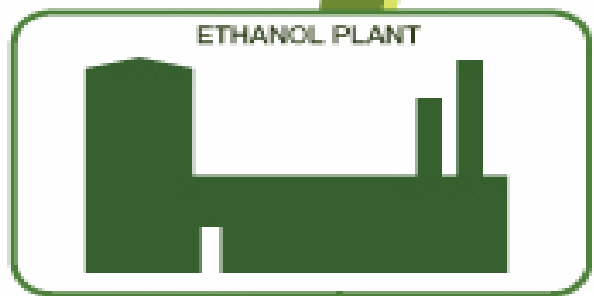
Full compliance with CAFO & IPA registration for dairies and feedlots.



Dairy/feedlot produces manure to process into biogas and bio fertilizers.



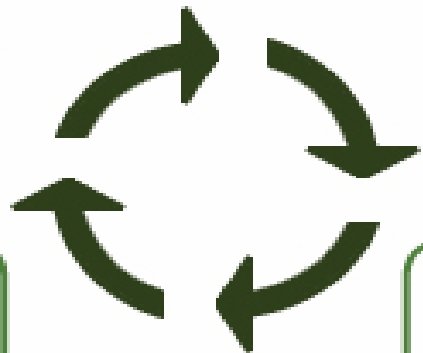
Produces milk, cheese, and beef.



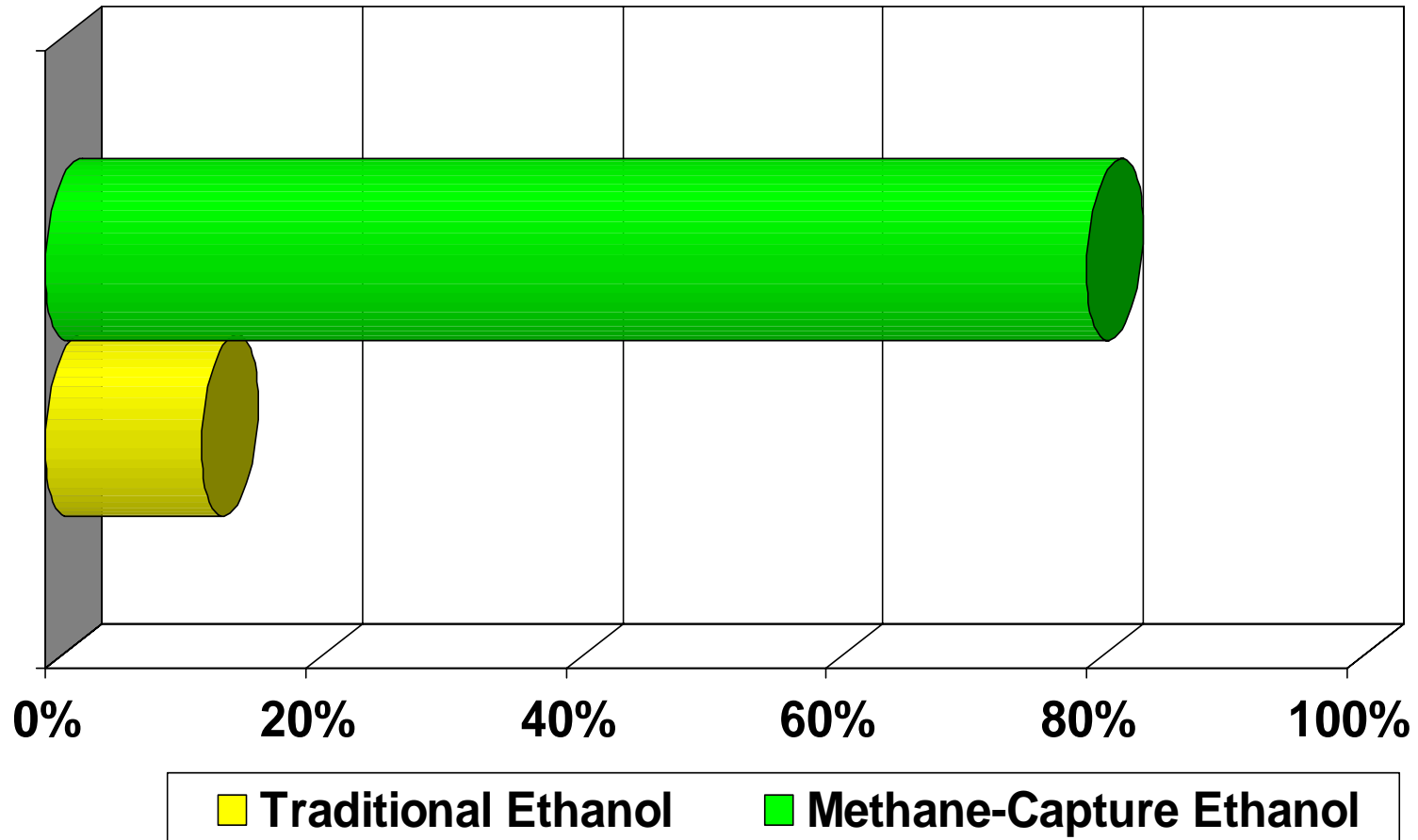
Produces ethanol at costs far below industry norms.

Ethanol plant produces up to 40% of the feed used by the dairy or feedlot.

Digester produces 100% of energy to operate the ethanol plant.



Two research groups preliminarily verified PRIME's system reduces GHGs by 80% beyond gasoline.



Using 2004 Emission Levels . .

- Producing 9 billion gallons of ethanol using a PRIME BioSolutions process would result in Greenhouse Gas *reductions* of: 56.4 million metric tons CO2 equivalent
- Equivalent to .9% of U.S. annual emissions (2004)

Source: Prime BioSolutions



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Using 2004 Emission Levels . . .

- Producing 15 billion gallons of ethanol this way would represent GHG *reductions* of 94.1 million metric tons CO2 equivalent on an annual basis
- Equivalent to 1.5% annually.

Source: Prime BioSolutions



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Context

- The most stringent climate bill calls for 2% reductions/year starting in 2011
- The emissions reductions discussed above are ONLY due one processing change
- More efficient feedstocks would yield even greater reductions.



Corn-Ethanol System	Emission Reduction	Carbon Offset (Mt)*	Carbon Credit (\$) **
Industry aggregate estimate (Farrell 2006)	13%	76,370	305,481
Natural gas-fired dry-mill plant w/ drying DG	40%	234,986	939,943
Natural Gas-fired dry-mill plant w/ wet DG	70%	411,225	1,644,900
Closed-loop plant w/ feedlot & an. digestion	80%	469,971	1,879,885

*Based on a 100 million gallon ethanol plant; fermentation CO₂ not included (neutral)

**\$4 per metric ton CO₂, Dec. 2006, <http://www.chicagoclimateexchange.com/>

SOURCE: Adam J. Liska, University of Nebraska Department of Agronomy and Horticulture, Nebraska Center for Energy Sciences Research.

Estimates for a mandatory carbon market

- Mandatory carbon market price estimate = \$10-20/MMTC.
- To get a more realistic picture of potential market value, let's assume \$15 MMTC



Corn-Ethanol System	Emission Reduction	Carbon Offset (Mt)*	Carbon Credit (\$)***
Industry aggregate estimate (Farrell 2006)	13%	76,370	\$1,145,550
Natural gas-fired dry-mill plant w/ drying DG	40%	234,986	\$3,524,790
Natural Gas-fired dry-mill plant w/ wet DG	70%	411,225	\$6,168,375
Closed-loop plant w/ feedlot & an. digestion	80%	469,971	7,049,565

*Based on a 100 million gallon ethanol plant; fermentation CO₂ not included (neutral)



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